Water Management Plan

for the Confirmation and Exploration Program

Pine Point District, Northwest Territories

Version 1.6

May 2025

**Purpose**

This Water Management Plan is provided to fulfill Water Licence MV2020L8-0012 Part F Condition 3, issued by the Mackenzie Valley Land and Water Board for the Pine Point Mining Limited Confirmation and Exploration Program.

**Version History**

Pine Point Mining Limited (PPML) is responsible for the distribution, maintenance, and updating of this document. Changes that do not affect the intent of the document will be made as required (e.g., phone numbers, names of individuals). The table below indicates the version of this document, and a summary of revisions based on the Confirmation and Exploration Program approved Water Licence MV2020L8-0012.

| Revision # | Section(s) Revised | Description of Revision |
|---|---|---|
| **1 (Groundwater Management Plan Framework) November 2020** | - | Groundwater Management Plan Framework. Framework document submitted for Type A Water Licence and Type A Land Use Permit Applications. |
| **WMP-1 7 March 2022** | **All** | First version of the Water Management Plan submitted for approval, based on the Groundwater Management Plan Framework, and updated as per Type A Water Licence MV2020L8-0012 and Reasons for Decision dated 27 October 2021. |
| | **4.2.6** | Defines the approach to water discharge to a receiver pit that possesses a chemocline in the pit at the time of discharge. |
| | **3.2** | Reflects the commitment to include a placeholder for an annex to a future Water Management Plan. The annex will list and describe the identifiers, locations, and monitoring undertaken at SNP Stations 2 (source) and 3 (receiver) used in the previous calendar year. When the revised Water Management Plan is submitted to the MVLWB, PPML will request a change to the Licence SNP Annex to align the monitoring requirements with the Water Management Plan, if applicable. |
| | **4.4.1** | Reflects the commitment that the determination of compatibility of the source waters and receiving waters will be based solely on the monitoring data that are collected in advance of a water transfer taking place, and not include historical data where they are available. However, where historical data are available, they may be reviewed for additional context, but only the pre-testing monitoring data will form the basis for the compatibility screening. |
| | **4.2.5** | Reflects the commitment that the minimum threshold for the coefficient of determination (R2) for the use of this total dissolved solids (TDS):specific conductivity relationship is 0.8. |
| | **4.3** | Reflects the commitment to conduct fish presence surveys in pits prior to conducting water transfers. |
| | **4.3** | Reflects the commitment of avoiding transferring water into fish bearing pits (Reasons for Decision, Part F: Water Management Plan Revised). This commitment was made during the Technical Sessions in Responses to IR Comments.<br>Fish bearing pits were again discussed during the Hearing and in the Response to interventions, PPML proposed to conduct toxicity testing of the source (Drawdown) |

| Revision # | Section(s) Revised | Description of Revision |
|---|---|---|
| | | water prior to transfers (response to ECCC-1). This requirement is included in Part F, Condition 19 of the water licence. |
| | **4.4** | Reflects the commitment that in the event that the receiving pit is dry, the water quality of the nearest pit or wells containing water will be used for the compatibility assessment. If these data are not available, PPML would interpolate the water quality of the pit or groundwater using a broader existing dataset for the local region. |
| | **Table 4.2;** | Clarifies that the water quality guidelines referenced in Figure B1 of the 20 April 2021 PPML technical memorandum, are the Canadian Council of Ministers of the Environment (CCME 2022) chronic guidelines for the protection of aquatic life (except sulphate where the British Columbia Ministry of Environment and Climate Change Strategy [BC ENV 2021]) hardness-based guideline will be applied). |
| | **4.4.1 and 4.4.2** | Clarifies that the acceptability criteria for TDS and focus constituents of potential concern (CoPCs) are based on a 30% acceptability factor rather than the “upper bound” used by PPML prior to the hearing (i.e., for source water to be compatible with the receiver water, the TDS and CoPC concentrations in the source water cannot be 30% higher than the TDS and CoPC concentrations in the receiver water). |
| | **4.3** | Reflects the commitment of managing potential adverse risk during pit water transfers to receiver pits with fish presence by conducting acute toxicity testing of source pit water prior to transfer to a receiver pit. This commitment was determined to be sufficient for protection of aquatic life in lieu of Government of the Northwest Territories request that water to be discharged to pits with fish to meet the CCME Guidelines for the Protection of Aquatic Life. Further field and lab-based water quality monitoring for groundwater testing has been developed to meet Environment and Climate Change Canada’s recommendation that PPML monitor and review water quality data for a full suite of parameters to confirm parameter concentrations are compatible for transfer. |
| | **4.5** | Reflects the commitment that water transfers will be managed through visual observations so that they do not result in temporary flooding from pit or groundwater well overflows or the drying up of nearby natural waterbodies. |
| | **4.4.4** | PPML committed to providing the Water compatibility test results to Indigenous groups at the same time they provide the results to the MVLWB and the Inspector. |
| | **5.0** | Reflects PPML’s commitments to ECCC for contingency planning. |
| **WMP-1.1**<br>**27 June 2022** | **All** | Reflects revisions throughout the plan to clarify and/or confirm commitments per directives provided by the MVWLB in a letter to PPML dated 30 May 2022. |
| **WMP-1.2**<br>**26 August 2022** | **All** | Updated section numbering. |
| | **4.0** | Incorporated supplemental text based on reviewer comments of Version 1.1, specifically to address the MVLWB Directives associated with the water management contingencies for the hydrogeological testing program (Table 4.1). |
| **WMP-1.3**<br>**4 April 2023** | **1.1** | Updated Introduction to include Version 1.3. |
| | **1.7.4** | Added section to outline the existence of drainage ditches within PPML area. |
| | **2.1, 2.1.1, 2.1.2, 2.1.3, 3.5** | Added supplemental text to include the use of existing ditches as well as temporary piping for the transfer of water from a source location to a receiver location. |
| | **3.3** | Reflects PPML’s commitments and methods to prevent fish from entering the ditches from the fish-bearing pits and surrounding waterbodies. |

| Revision # | Section(s) Revised | Description of Revision |
|---|---|---|
| | **3.4.1** | Updated to clarify that reference to receiver waters includes ditches where fish have been identified as being present. |
| | **3.4.3** | Added "for source pits". |
| | **3.5.1** | Incorporated supplemental text to include flow monitoring for the ditches during the groundwater testing program. |
| | **Table 4-1** | Added issue of potential breach of ditch banks. |
| | **Appendix B** | Monitoring of water transfers using existing ditches is described in Appendix B. |
| **WMP-1.4** **10 September 2024** | **All** | Various edits throughout for clarity and accuracy. |
| | **1.1** | Updated Introduction to include Version 1.4. |
| | **1.4, Appendix A** | Updated conformity table to list the Board's Directives per the Reasons for Decision report in the approval of the Type A Water Licence (MV2020L8-0012) Amendment Application. |
| | **1.5** | Updated information related to the revised and supplemental management plans associated with Water Licence. |
| | **2.1** | Updated to reflect the Board's Directives per the Reasons for Decision report in the approval of the Type A Water Licence (MV2020L8-0012) Amendment Application. |
| | **3.3** | |
| | **3.4** | |
| | **3.5.2** | |
| | **3.5.2.1** | |
| | **3.6** | |
| | **4** | |
| | **6** | |
| | **Appendix B** | |
| | **3.5, Appendix B** | Added description of a test to measure seepage from the ditch. |
| | **Appendix G** | DFO's Letter of Advice included to note planned concordance with reference standard fish capture techniques and safe relocation of these fish should fish be observed as stranded during monitoring prior to and during hydrogeological testing activities. |
| **WMP-1.5** **20 January 2024** | | Required updates based on 28 October 2024 letter from The Board. |
| | **1.2** | Added the hydrogeological testing and the conveyance of water. |
| | **3.4** | Reference to source waters now includes constructed ditches used for water transfer. Details were added which describe the compatibility assessment in the case of dry open pits and constructed ditches. |
| | **3.5** | Revised to address the use of monitoring wells during the temporary hydrogeological testing. |
| | **3.5.1** | Added reference to the Standard Operating Procedure (SOP) in Appendix B. |
| | **Table 4.1** | Added row that addresses the scenario of pumped transfer water approaching the surface of the ditch channel with the potential to overtop the ditch. |

| Revision # | Section(s) Revised | Description of Revision |
|---|---|---|
| | | Added row 1 to address issues of slumping banks, sediment build-up, channel blockage, and/or imminent failure of erosion control structures in constructed ditch. |
| | **Appendix B** | Standard Operating Procedure for Constructed Ditches During Hydrogeological Pumping Tests to Prevent Overtopping has been added.<br>Updated with context of monitoring well usage.<br>Updated with in-field flow measurements collected from the ditch during the pump test. |
| | **Appendices E/F** | Added flow chart diagram that addresses the compatibility process for the constructed ditches if is required prior to the water conveyance during a hydrogeological pump test. |
| **WMP-1.6**<br>**7 May 2025** | **Board Directives for the Water Management Plan from the Board review of the 2023 Annual Water Licence Report (24 March 2025)** | |
| | **Section 2.1** | Indicate that PPML will avoid conducting hydrogeological testing in the winter months to avoid instrumentation malfunction, where practical. |
| | **Section 3.2.1, Field Analysis**<br>**Section 3.5.2.1** | Indicate that PPML will ensure additional probes will be available during hydrogeological testing for contingency. |
| | **Section 3.5.2** | Describe the compatibility criteria for the post-hydrogeological test water quality results (i.e., the SNP station 3 sample taken three to four days after the hydrogeological test). |
| | **Board Directives for the Water Management Plan from the Board review of the Water Management Plan V1.5 (24 March 2025)** | |
| | **Section 3.4**<br>**Section 3.5** | Clarify monitoring in the Plan that applies to dry ditches (if any), including, but not limited to:<br>a) Reflecting that existing or new monitoring wells will not be used to detect changes to groundwater quality when dry ditches are used; and<br>b) Clarifying that Appendix B Protocol 2 (Seepage Evaluation Testing and Monitoring) does not apply to dry ditches |
| | **Appendix B, Protocol 2**<br>**Section 6.0** | Include details of the ditch infiltration test, including the method of the test (i.e., how the data will be collected, analyzed, and reported) |
| | **Section 3.5** | Note that PPML will seek approval of using dry ditches to conduct hydrogeological testing after the results from the ditch infiltration test are available |

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## Abbreviations and Definition

| Abbreviation | Definition |
|---|---|
| CCME | Canadian Council of Ministers of the Environment |
| CEP | Confirmation and Exploration Program |
| CoPCs | constituents of potential concern |
| DFO | Fisheries and Oceans Canada |
| DO | dissolved oxygen |
| ECCC | Environment and Climate Change Canada |
| GNWT | Government of Northwest Territories |
| HRI | Hydro-Ressources Inc. |
| IRs | information requests |
| K | hydraulic conductivity |
| MVLWB | Mackenzie Valley Land and Water MVLWB |
| NWT | Northwest Territories |
| QA/QC | quality assurance and quality control |
| $R^2$ | coefficient of determination |
| PPML | Pine Point Mining Limited |
| Project | Pine Point Project |
| PTT | profile tracer tests |
| SNP | Surveillance Network Program |
| TDS | total dissolved solids |
| WMP | water management plan |

## Units and Definitions

| Unit | Definition |
|---|---|
| % | percent |
| °C | degrees Celsius |
| km | kilometre |
| m | metre |
| m/km | metres per kilometre |
| m/s | metres per second |
| $m^2/s$ | square metres per second |
| $m^3/s$ | cubic metres per second |
| mg/L | milligrams per litre |
| µS/cm | microsiemens per centimetre |

# 1.0 Introduction

## 1.1 Background

Pine Point Mining Limited (PPML) plans to continue mineral exploration in the area of the historical Pine Point Mine with the objective of recommencing mining of zinc and lead deposits in the area. PPML is the private joint venture company formed following transactions between Osisko Metals Inc. (Osisko) and Appian Natural Resources Fund III LP (Appian) to advance the Pine Point Project. The Pine Point District contains approximately 100 known zinc and lead deposits, distributed along three trends, which extend in aggregate along 65 km length and 7 km of width.

The historical Pine Point Mine is located in the Northwest Territories (NWT) within the South Slave Mining District, south of Great Slave Lake, approximately 175 km directly south of Yellowknife, 75 km east of Hay River, and 53 km southwest of Fort Resolution. The closest major transportation hubs are Edmonton, Yellowknife, and Hay River. Access to the Project is via all-weather Highways 5 and 6 (Figure 1).

To advance exploration at Pine Point, PPML applied to the Mackenzie Valley Land and Water Board (MVLWB) for new Type A Water Licence (MV2020L8-0012) and Land Use Permit (MV2020C0017) on 27 November 2020 for the Confirmation and Exploration Program (CEP; the Project). Historical mining in the Pine Point area encountered groundwater during mining of the deposits that flowed into the open pits unless mitigated. A groundwater testing program was planned as part of the CEP.

As part of the application process, PPML submitted a Groundwater Management Plan Framework. The intent of the framework document was to provide initial information related to the approach and methods for conducting the groundwater tests and associated monitoring while acknowledging that the specific details of the program were still being determined and allow for feedback from reviewers prior to the submission of the Groundwater Management Plan to the MVLWB for approval. On 2 February 2021, PPML provided initial responses to reviewer questions on the Groundwater Management Plan Framework. At the technical sessions on 24 and 25 February 2021, parties indicated that additional information was required related to the plan as part of the Water Licence review process. PPML responded to information requests (IRs) from the technical sessions on 12 March 2021. Additional review comments were received on the IRs, and PPML provided responses on 30 March 2021. A technical memorandum related to the Groundwater Management Plan was also produced and submitted to the MVLWB on 20 April 2021. PPML also provided additional information in the responses to interventions on 11 May 2021.

PPML received Water Licence MV2020L8-0012 from the MVLWB effective 8 December 2021 and expiring 7 December 2028. As per the Water Licence, PPML is required to submit to the MVLWB a revised Water Management Plan (formerly called the Groundwater Management Plan) for approval within 90 days of the effective date of the Licence. The Water Management Plan was developed to meet the requirements of Schedule 4, Condition 1 of the Water Licence.

Version 1.1 of the Water Management Plan (version WMP-1.1) incorporated updated information from previous responses on the framework document, as well as relevant feedback from the public hearing and engagement with parties, as well as confirming directives from the MVLWB as provided to PPML in a letter dated 30 May 2022.

Version 1.2 of the Water Management Plan incorporated required information addressing directives from the MVLWB as provided to PPML in a letter dated 8 August 2022.

Version 1.3 of the Water Management Plan incorporated the potential use of existing ditches as well as temporary piping for the transfer of water from a source location to a receiver location.

Version 1.4 of the Water Management Plan incorporated the Board Directives in the Reasons for Decision Report issued by the Board on 25 April 2024, as part of the approval of the Type A Water Licence (MV2020L8-0012) Amendment (MVLWB 2024).

This version of the Water Management Plan (Version WMP 1.5) incorporates the list of required revisions issued by the Board on 28 October 2024, as part of the approval of the Type A Water Licence (MV2020L8-0012) Amendment (MVLWB 2024).

## 1.2 Purpose

The purpose of this Water Management Plan is to:

- describe the approach to monitoring surface water and groundwater during hydrogeological testing;
- outline water management during water transfers from source locations to receiver locations using pipes or constructed ditches during hydrogeological testing;
- present the adaptive management framework;
- list the contingencies to water management, when needed; and
- the potential use of pit water for dust suppression.

The key activity within this Water Licence and Water Management Plan is groundwater testing. The planned groundwater testing is required to obtain hydrogeological data and parameters that will enable the development of quantitative models of groundwater and flow rates for the aquifers to support future groundwater and surface water management planning for the Pine Point Project. This is an exploratory data collection program to fill data gaps and further the understanding for future development of the Pine Point Project. This information will be used to update the water management plan for the Pine Point Project.

Potential mining resource areas will be characterized and investigated for the purposes of understanding and predicting the efforts needed for groundwater testing. There are three methods proposed to determine the groundwater characteristics depending on where the testing is located: transfers from an existing pit to another pit; transfers from a groundwater well to another well; and transfers from a pit to a well. To complete the transfers as described above, the source water must be compatible for the transfer. An outline of the compatibility requirements for any water transfer is described in the plan, as well as the monitoring to be completed before and during the testing. An adaptive management response framework is provided, which includes contingencies should they be required.

The option for the use of pit water for dust suppression is also presented. In executing the Project, access roads and pads may require dust suppression, especially in the summer periods. PPML will source water for dust suppression from approved natural waterbodies, as per the waterbodies permitted for water withdrawal under the Type A Water Licence, including pit waters, as listed in the Water Withdrawal Plan for the CEP (v2.3; PPML 2024). In doing so, PPML would adhere to the GNWT's Guidelines for Dust Suppression (GNWT 2013) to confirm that any pit water used for dust suppression does not enter and potentially contaminate waterbodies, including surface and groundwater.

## 1.3 Contacts

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## 1.4 Conditions for the Water Licence (MV2020L8-0012)

On 8 December 2020, the MVLWB issued Authorization MV2020L8-0012 for a Type A Water Licence (amended July 12, 2024). The Water Management Plan is to comply with the requirements of Schedule 4, Condition 1 of the Water Licence. Appendix A provides a summary of the conditions of Schedule 4, Condition 1, and the corresponding sections in this management plan where the requirement is addressed.

## 1.5 Related Plans

The following plans associated with Water Licence MV2020L8-0012 are to be read in conjunction with the Water Management Plan:

- Water Withdrawal Plan (updated based on Board Directives in the Reasons for Decision Report dated 25 April 2024 for the Water Licence [MV2020L8-0012] Amendment Application)
- Spill Contingency Response Plan
- Sediment and Erosion Management Plan (drafted based on Board Directives in the Reasons for Decision Report dated 25 April 2024 for the Water Licence [MV2020L8-0012] Amendment Application)
- Waste Management Plan
- Closure and Reclamation Plan

**Figure 1: Project Location**

## 1.6 Geological and Hydrogeological Setting

### 1.6.1 Geology

The topography of the regional area around the Pine Point site can be characterized as low relief, poor drainage, swampy muskeg, and shallow ponds. Glacial till makes up the near surface materials, consisting of sand, gravel, and clay, which produce a low-lying terrain that slopes gently towards the north and Great Slave Lake (Giroux 2004).

Giroux (2004) summarizes that the area around the Pine Point site lies within the northwestern part of the interior platform, an area consisting of gently west-dipping sedimentary strata between the Precambrian Shield to the east and the Foothills belt of the Cordilleran orogen to the west. It is the Middle Devonian Givetian barrier reef complex that hosts the mineralization at Pine Point. The barrier reef complex is approximately 10 km wide and 200 m thick, formed by a linear buildup of carbonate facies. The Givetian barrier complex outcrops on the eastern half of the Pine Point property and dips shallowly to the west (1.9 m/km) (Giroux 2004).

The Givetian barrier complex stratigraphy has been subdivided into numerous formations, but it is the Pine Point and Sulphur Point Formations which contain the lead-zinc mineralization. The mineralization is contained within the dolomitized units and within paleo-karstic openings of these formations and follows the trends established by prior karst development. Mineralization occurs within the karst networks as replacement material and generally consists of bodies of galena and sphalerite (Giroux 2004).

### 1.6.2 Hydrogeology

Regionally, shallow groundwater flows originate at topographic highs (recharge areas) such as the Caribou Mountains located 200 km south of the Pine Point area and are radially distributed in a northerly direction towards natural groundwater discharge areas, primarily to the Hay River valley to the northwest, Great Slave Lake to the north, and the Little Buffalo River and Slave River valleys to the northeast (JDS 2017). The area surrounding Great Slave Lake represents a lowland and is considered a major groundwater discharge area, evident by many springs in the area and high specific conductance in surface water (JDS 2017).

Local groundwater recharge to the bedrock is likely to be variable and partially controlled by the overburden geology. Recharge generally will be limited by the presence of till or lower permeability overburden materials (JDS 2017). Recharge from infiltration is limited due to the relatively low annual precipitation (i.e., annual average: 315 mm; NRCan 1981 to 2010 data record).

The most productive bedrock aquifer at the Pine Point site, known as the Presquile Aquifer, is summarized in JDS (2017). This bedrock is well-fractured dolomite with paleo-karst cavity networks and described as ranging in thickness from 20 to 65 m.

JDS (2017) also reports the glacial till overburden has a shallow water table at depths between 7 to 30 m in the vicinity of the Pine Point site. The till unit has a relatively low permeability and negligible interaction between the upper and lower water bearing zones. As a result, groundwater in the overburden is not expected to significantly influence testing requirements and most overburden areas are not saturated.

The hydraulic conductivity (K) of the Pine Point formation bedrock was defined by Hydro-Resources Inc. (HRI) through multiple exploration holes in 2021. The average K value of the rock is between $1\times10^{-5}$ to $1\times10^{-4}$ m/s, with most of the formation possessing a K value around $3\times10^{-5}$ m/s. Recent testing, including Profile Tracer Tests (PTT), slug tests, and injection tests, indicates that the groundwater flow is mostly controlled by water-bearing structures, such as vertical faults and occasionally along potential bedding planes, and that the bedrock formation does not show many karstic features. The groundwater circulates through open faults of a few centimetres width. The testing suggests vertical faults likely control the flow.

The K values in the Sulphur Point Formation are very similar to those in the Pine Point formation. Also, groundwater flow in the Sulphur Point Formation occurs mostly through faults and bedding planes, with recent data showing no real difference in flow regime in areas outside and inside of mineralization. As such, it is currently difficult to separate the Pine Point and Sulphur Point formations on a hydrogeological standpoint. At a high level, therefore, K values and groundwater flows are expected to be similar in the Project area and at various depths.

The direction of groundwater, seasonal variation in flows and groundwater level, and interaction with surface water are in the process of being characterized through work being conducted in the CEP. Further, groundwater testing to be undertaken by PPML as described in this plan is crucial to the development and understanding of this existing hydrogeological condition. This information will be presented in a future update of this plan based on the initial results of the hydrogeological test work.

Groundwater quality in the Project area has been characterized by multiple consultants over the years (Stevenson 1984; Brown et al 1981; Golder 2020b; and HRI *In prep*). Several groundwater profiles of water chemistry were done throughout the property, which included assessing variations of specific conductivity, water temperature, salinity, and total dissolved solids (TDS). Specific conductivity values range from 2,500 to 4,500 µS/cm across the Project area, and most of the testing wells showing a slight increase of the specific conductivity with depth (approximately 500 µS/cm). The range of specific conductivity values is consistent with the specific conductivity values recently profiled by HRI (*In prep*).

The corresponding range of TDS concentrations is 900 to 2,500 mg/L, with most concentrations around 1,200 mg/L. The main ionic constituents in the groundwater (which primarily comprise the TDS) are calcium and magnesium (which also generate the water hardness) and reduced sulphur forms. This is not surprising considering the presence of the host rock type (carbonate) and the presence of sulphur in the mineralized area. Due to the high sulphur content, the groundwater at site would not be potable. Evidence of sulphur precipitation can be observed in an historical underground mine on the North trend of the site. Old dewatering wells are showing artesian conditions, and reduced sulphur in water is quite evident.

In addition to reduced sulphur, groundwater also contains elevated concentrations of reduced iron and manganese, which can lead to orange and black deposits around artesian holes (due to oxidization). Other measurable constituents in groundwater across the site include mercury, uranium, and arsenic, which are present slightly above potable criteria, and chloride, sodium, and zinc.

### 1.6.3 Existing Open Pits

The existing pits were created during previous mining by Cominco Ltd. in the 1960s to 1980s. Since mining stopped in 1987, many of these pits have become filled or partially filled with water, which is a combination of groundwater inflows from the bottom of the pit and surface water inflows from precipitation, runoff, and snowmelt (dominant portion of groundwater). In most of these pits, the water depth ranged between 9 and 15 m.

The quality of water-filled pits and groundwater in the area of the Project (Golder 2020a,b,c) was characterized, and included pit water surveys completed in 2005, 2017, 2018, and 2020 (mostly in late summer conditions [August/September]), and groundwater surveys completed in 1980, 1983, 2006, 2011, and 2018 by PPML and various consultants. The pit water characterization included an evaluation of the range of water chemistry of water in the pits as well as an overview of the physico-chemical conditions throughout the water column of select pits. At a high level, the water quality showed some spatial variability with respect to specific conductivity and TDS, and therefore, major ions, but relative consistency in the concentrations of nutrients and metals between pits. Of some note, where multiple sampling events occurred in one pit, water quality as indicated by TDS or specific conductivity showed some consistency between years.

A high-level water quality summary of the water-filled pits based on recent surveys and historical information (Golder 2020a,b,c; 2022) is as follows:

- The waters were clear, with low total suspended solids concentrations and turbidity values.
- pH measurements indicated that the pits were neutral to slightly alkaline and within the Canadian Council of Ministers of the Environment (CCME) water quality guideline for the protection of aquatic life range.
- Thermoclines were present in almost all water-filled pits during late summer and early fall and were located between approximately 4 and 5 m below surface. The observed thermal stratification is typical for deeper waterbodies in the North during these seasonal conditions as ambient temperatures decrease throughout the fall and into winter some water column mixing (partial or full) before ice cover is expected to occur.
- Chemoclines were not often associated with the presence of thermoclines (most water-filled pits exhibited well mixed conditions), but where they were present, they occurred generally at the same depth as the thermoclines.
- Concentrations of dissolved oxygen (DO) throughout the water column in the water-filled pits during late summer and early fall were generally well mixed, but the presence of oxyclines, where identified, corresponded with the thermocline depth. Throughout the water column of the water-filled pits, DO was measured above the minimum CCME water quality guideline of 6.5 mg/L (CCME 2022), except near the bottom of the pits that possessed an oxycline. In these pits, DO decreased to minima of approximately 1 to 5 mg/L, indicating an elevated oxygen demand/productivity process or some influence of anoxic groundwater infiltration.
- Regional variations in specific conductivity and TDS concentrations were observed in the water-filled pits, suggesting that these parameters are spatially varied within geological features across the historical Pine Point Mine site. The lowest values were identified in the pits located in the southwest area of the historical Pine Point Mine site (<500 µS/cm), with the largest values measured in the pits near the centre of the historical Pine Point Mine site (>2,500 µS/cm).

- The major ions in the water-filled pits were sulphate and calcium, except for the pits located in the southwest area of the historical Pine Point Mine site, where bicarbonate replaced sulphate.
- Within water-filled pits, where multiple water column profile physico-chemical profile data were collected during a single survey, the profile data were similar indicating little spatial in pit variability.
- Concentrations of measured parameters measured in the water-filled pits were below the CCME acute guidelines for the protection of aquatic life, except infrequent occurrences of dissolved zinc in two pits.
- Concentrations of most parameters measured in the water-filled pits were below the CCME chronic guidelines for the protection of aquatic life except for fluoride in the surveyed pits, and occasional occurrences of total cadmium, total chromium, total lead, total uranium, and dissolved zinc. Guideline exceedances of total lead and total zinc occurred more frequently in the water-filled pits compared to the other metals occasionally measured above guidelines.

There are constructed channels and diversion ditches around the pits and occurrences of small-bodied fish within these channels and ditches were identified, which suggested the possibility that fish may also be present in some of the pits in the Project area. Subsequent fish sampling (Golder 2020c, 2022) confirmed the presence of small-bodied fish (e.g., Ninespine Stickleback, Lake Chub) in some of the existing open pits during baseline field programs. These small-bodied forage fish species have likely accessed the pits through existing mine drainage channels, or flooding during high flow years.

### 1.6.4 Existing Drainage Ditches

Within the PPML project area, several channels and ditches constructed by Cominco were used for water management during their operations. PPML is considering utilizing these ditches for future mine operations to convey water within the property. As part of the hydrogeological testing program, these ditches will be evaluated to determine their suitability and effectiveness for future use in PPML's mining operations.

# 2.0 Groundwater Monitoring During Aquifer Testing

For PPML to collect the data required to plan for potential future mining, both in respect to operations and environmental considerations, monitoring will be completed during the groundwater testing program. The primary areas for groundwater monitoring consideration during aquifer testing are as follows:

- drawdown or build-up to the bedrock or overburden aquifers in the surrounding area of extraction and injection
- hydraulic connectivity of the open pits to the surrounding aquifers and potential for influences on nearby surface water and groundwater chemistry and levels
- groundwater chemistry of the bedrock aquifer during production and groundwater placement in a pit or the aquifer via injection

## 2.1 Approach to Groundwater Transfers

There are three aquifer testing methods proposed to determine the aquifer characteristics depending on where the groundwater testing is located. These include transferring water from pit to pit, well to well, or pit to well. No well to pit testing will be conducted.

If the immediate area where extraction wells need to be drilled is dry, drilling may be done year-round. However, if the area is persistently wet (e.g., saturated, consistent with the fen wetland class [Environment Canada 1987]) as occurs throughout and downstream of the Project area, the wells will be drilled in the winter months when the ground is frozen. Temporary piping and existing constructed ditches will be used to transfer the water (Appendix B); water transfer by piping is regarded as a direct transfer process and water transfer by drainage ditches is regarded as an indirect transfer process.

Ditches remaining from the Cominco activities could be used to transfer water indirectly from source to receiver locations, especially where the distance between the source and receiver waters is longer than 200 metres (m). In many cases, the ditches do not extend to the source or receiver water's edge, so temporary piping and pumps would need to also be used in transferring the water from source to ditch and/or from ditch to receiving location (i.e., a combination of direct and indirect water transfer processes). Prior to use in water transfers during hydrogeological testing, the ditches will be inspected to document habitat and plan for application of mitigations should any obstructions or areas of erosion risk be identified. If the constructed ditches have to be modified to be used to transfer and direct water flow and retain the transferred water effectively within the ditch channel (e.g., channel stabilization, bank reinforcement, installation of berms), reclamation of these modifications will occur as necessary immediately following the testing. Berms will have a height of less than 2.5 m and will re-direct water rather than impound, and so they will not meet the definition of a dam under the Dam Safety Guidelines.

Hydrogeological testing will be conducted during warmer months (i.e., when minimum temperatures are above 0°C), where practical, to avoid the risk of equipment and instrumentation malfunctions associated with winter conditions. The groundwater tests are short-term in nature (i.e., typically less than 7 days for pit sources or up to 14 days for well transfers). Once a test is completed at a site, the equipment (e.g., pumps, piping) will be removed and used at the next location.

Once locations for water transfers have been identified, and before compatibility testing has been commenced, PPML will notify the Indigenous communities. Feedback from the communities regarding the transfer locations will be considered in the final selection.

For each of the testing methods, PPML will install monitoring (or observation) wells at varying distances from the planned source pit or extraction well (Section 3.5.1, and Appendix B). These wells will comprise 3- to 6-inch diameter boreholes with a 2-inch monitoring well installed to similar installation depths as the associated source pit or extraction well. These monitoring wells will be equipped with temporary transducers during groundwater testing and be programmed to read at regular intervals during the water transfer activity. The number and location of the monitoring wells will be finalized based on the objective of each well and test.

In previous versions of the CEP, specific information regarding the pit waters and wells that will be used for the hydrogeological testing was not known. PPML has commenced planning of the testing program and details regarding source and receiver locations will be provided to the Inspector in advance of the testing program. Figure 2 provides the locations of existing pits in the Pine Point Project area that may be potentially used by PPML as source or receiver locations for hydrogeological testing. Existing wells have not been identified in Figure 2 because there are thousands of wells on the property that could potentially be used in the hydrogeological testing; as specific wells are selected, their locations will be provided to the Inspector.

**Figure 2: Existing Pits in the Area of the Project that may be Potentially used for Hydrogeological Testing under the CEP**

### 2.1.1 Method 1: Pit to Pit Transfers

The first aquifer test method involves extracting pit water from one existing open pit and transferring it to another existing open pit. Many of the open pits in the Pine Point Project area have naturally filled with water since the end of mining, comprising groundwater inflows and surface water inputs. These tests will provide information on the following:

- the source pit water levels response to water extraction and recovery of the aquifer through groundwater recharge
- the response of water levels in the receiving pit and the rate of return to the pit water level present prior to the test

Water will be pumped from the source pit to the receiving open pit using temporary piping and existing constructed ditches so that water transfers are directed to the surface of the receiver waters. This approach will result in passive mixing of the receiver waters should the receiver pit possess a chemocline at the time of discharge.

Flow meters and electronic pressure transducers will be installed in the source and receiving pits. Per the Water Licence (MV2020L8-0012), Part D, Condition 3, the maximum volume that can be extracted from the source pit is 15,000 cubic metres ($m^3$) per day.

Water transfers will be managed so that they do not result in pit overflow. Per the Water Withdrawal Plan, the receiver pit will be filled to a water level that remains below 1 m from the bedrock elevation at the pit edge.

### 2.1.2 Method 2: Well to Well Transfer

The second aquifer testing method will use wells installed near a mineral deposit to draw down the water table through conventional extraction pumping. The extracted groundwater from tests will be re-injected into another well located far enough away to not affect the extraction site. The injection well will be located at least 1 km from the extraction well. The water transfer will be undertaken using temporary piping and existing constructed ditches.

Each aquifer test is planned to have an extraction phase and a recovery phase, each of equal duration. Aquifer tests are expected to be 14 days or less, with typical test durations for each phase of three to seven days; however, longer test times may be deemed necessary based on aquifer characteristics. Pumping durations will be determined in advance of the program and modified as required. Drilling and testing will be performed at well to well aquifer test locations as follows (modifications to this method may be made based on field conditions and updated testing objectives):

- Extraction wells will require up to 12- to 16-inch open boreholes installed to a depth of 75 to 200 m. Casing will be installed in the overburden section of the borehole.
- Injection wells diameters and drilling methods will be determined according to rock permeability and injection pressures required, and will be located sufficiently far enough away to minimize recharge effects on the source aquifer.
- All extraction and injection wells will be developed following installation to optimize data collection.

- The collection of data (e.g., flow volumes and rates, physico-chemical data) may be modified based on aquifer testing, but it is currently suggested that:
  - the extraction well will be equipped with a back-up and direct read transducer for collection of groundwater testing data
  - the injection well will be equipped with a transducer during groundwater testing and set to read at regular intervals
  - manual readings will be done in case of malfunction and supervision will be performed during the day shifts of each pump test
- Ideally, the first part of the groundwater testing will consist of a step rate test in the extraction well using an electric submersible pump to determine an appropriate rate for a constant rate test. Following this, the well will be left to recover to 90% of the static water level or the length of time the step rate test occurred, whichever occurs first. The extraction well will then be pumped at a constant rate for the pumping period (to be determined). Recovery will be monitored for equal duration to pumping, or until the well recovers to 90% of the static water level, whichever occurs first.

### 2.1.3 Method 3: Pit to Well Transfers

The third aquifer test method involves extracting pit water from an existing open pit to an injection well. These tests will provide information on the following:

- the source pit water level response to water extraction and recovery of the aquifer through groundwater recharge
- the response of water level in the receiving injection well

Water will be pumped directly from the pit to the injection well using temporary piping and existing ditches. The injection well will be installed and developed as described under Method 2.

Per the Water Licence (MV2020L8-0012), Part D, Condition 3, the maximum volume that can be extracted from the source pit is 15,000 $m^3$/day.

## 2.2 Schedule and Location of Groundwater Testing

The schedule and location of aquifer testing is to be determined, as is the pumping duration and flow rates for each transfer. These details will be provided to the Inspector not less than 10 days prior to the test. The details provided to the Inspector will describe the identifiers, locations, and monitoring undertaken at Surveillance Network Program (SNP) Stations 2 (source), 3 (receiver) and 7 (constructed ditches used for water transfers) used in the previous calendar year. When the revised Water Management Plan is submitted to the MVLWB, PPML will request a change to the Licence SNP Annex to align the monitoring requirements with the Water Management Plan, if applicable.

# 3.0 Water Management During Groundwater Testing

## 3.1 Approach to Water Management

During the groundwater testing, the program will consider the following:

- Monitoring prior to pit and well testing.
- Fish presence surveys.
- Water compatibility for water transfers.
- Fish-bearing status of the pit(s).
- Monitoring during groundwater testing.
- Adaptive management response framework.

## 3.2 Studies Prior to Groundwater and Pit Testing

Prior to determining if the water is compatible for transferring, data will be collected for the compatibility assessment (Section 3.4).

### 3.2.1 Water Quality

Prior to initiating groundwater testing, water quality samples will be collected at source and receiver waters (pit, groundwater wells, and/or constructed ditches) to assess their compatibility for transfers. In addition to the collection of water samples, physico-chemical parameters (i.e., pH, DO, turbidity/TSS, temperature, and specific conductivity) will be measured.

For the well to well transfers, PPML has assumed that any groundwater transferred from a source well to an injection well will occur within the vicinity of the same aquifer, which suggests that the source and receiver water quality would be compatible. However, physico-chemical measurements and samples for water quality analysis from the extraction wells and injection well will still be collected prior to testing. If the injection well is determined to be in a different aquifer to the source well, additional water quality sampling and follow-up studies may be recommended, which may include the development of a mixing model to evaluate potential for changes and extent of any changes to groundwater quality.

Samples may also be collected for water quality analysis from the overburden and bedrock monitoring wells around the injection wells and/or pits following well development to establish baseline aquifer conditions. If a pressure response to the injection of water in a well is noted at a groundwater observation point, a post-test sample may be collected and compared to baseline for evaluation of changes in water chemistry.

**Field Analysis**

Field measurements of physico-chemical water quality parameters will be collected from the source and receiver waters. These parameters will include pH, temperature, specific conductivity, and DO, and where possible, redox potential, and turbidity/TSS. Prior to water column profile measurements being collected in the pits, bathymetry measurements of the pit waters will be collected using a depth sounder approach or sounding line, as appropriate, to identify the deepest location in the pit. Physico-chemical water column profile measurements for the pits, especially those where the maximum pit depth is greater than 5 m, will be collected at regular depth intervals (approximately 1 m) from the deepest region of the pit, with a surface measurement collected at 0.3 m. For pits with a maximum depth less than 5 m, water column profile measurements will be collected at 0.3 m depth intervals. For the wells, measurements will be collected from water that is either pumped from various depths (which would require protocols to make sure the measurements are representative of the sampling depth) or from sensors lowered through the well.

During the hydrogeological testing, additional field monitoring equipment will be available as contingency in case the primary equipment malfunctions.

**Laboratory Analysis**

The samples from both source and receiver waters will be sent to the analytical laboratory for the analysis of the following water quality constituents:

- conventional parameters — conductivity, hardness, acidity, total alkalinity, TDS (measured and calculated), total suspended solids (TSS), turbidity, and colour
- major ions — bicarbonate, bromide, calcium, carbonate, chloride, fluoride, magnesium, potassium, sodium, and sulphate
- nutrients — nitrate, nitrite, total ammonia, total nitrogen, total Kjeldahl nitrogen, total and dissolved phosphorus, orthophosphate, and total and dissolved organic carbon
- total and dissolved metals — aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silicon, silver, strontium, sulphur, thallium, tin, titanium, uranium, vanadium, and zinc

The determination of compatibility of the source waters and receiving waters will be based solely on monitoring data that are collected in advance of a water transfer taking place and will not include historical data where they are available. However, where historical data are available, they may be reviewed for additional context, but only the pre-testing monitoring data will form the basis for the compatibility screening.

Emphasis would be first placed on TDS (calculated; TDS), which will be derived from the field measurements of specific conductivity, and secondly on sulphate, fluoride, aluminum, cadmium, chromium, copper, iron, lead, thallium, uranium, and dissolved zinc because except for TDS, this list of constituents has been measured above generic CCME (2021) chronic guidelines for the protection of aquatic life (except sulphate, where the British Columbia Ministry of Environment and Climate Change Strategy [BC ENV 2021] hardness-based guideline is applied). For example, sulphate and fluoride are frequently measured above guidelines in the pit waters and groundwater in the area of the Project; the remaining constituents, which are metals, have been occasionally measured above guidelines. These 12 constituents have been identified as constituents of potential concern (CoPCs). These CoPCs are the focus constituents in determining whether waters can be transferred between sources and receivers in the CEP groundwater testing program.

### 3.2.2 Use of TDS as an Initial Indicator

The applicability of focusing on TDS as an initial indicator for water transfers is because a reliable site-specific relationship can be made with specific conductivity. As specific conductivity is easily measured in the field and will be used as a field measurement for water column profiles in the pits, these data can be converted to TDS measurements very easily (see Section 3.2.5).

Because the surface waters (especially pit waters) in the area of the Project are influenced by groundwater exposed to the underlying geology, they are characterized as possessing elevated and varied TDS (major ion) concentrations, in which the dominant ions are calcium and sulphate, with the elevated calcium concentrations resulting in relatively high hardness. TDS, therefore, represents an important initial indicator in the water transfer compatibility assessment. TDS concentrations can be derived from laboratory analysis using two methods (i.e., measured TDS, which is the gravimetric analysis of an evaporated water sample [e.g., APHA Method 2540B; APHA 2012], or calculated TDS, which is derived from the sum of major ions [e.g., APHA Method 1030E; APHA 2012]). PPML prefers the calculated TDS method (i.e., using the sum of major ions) because observations from water quality monitoring studies in northern Canada over the years have shown measured TDS can often be overestimated by ~20%. Unlike measured TDS, calculated TDS implicitly assumes the ionic constituents exist in the sample in the forms analyzed, so are not influenced by any changes that may occur when taken out of solution. This method is, therefore, more accurate than measured TDS because of the practical limitations in handling and measuring TDS gravimetrically. Using calculated TDS concentration, therefore, means that changes in the amount of TDS will be detected with more certainty than if measured TDS concentrations are used. However, measured and calculated TDS values will continue to be requested as part of any analytical monitoring list of constituents.

### 3.2.3 Thermoclines and Chemoclines

Available pit water data indicate that the pit waters can establish thermal stratification (Golder 2020b,c, 2022). The maximum water depth in these pits is approximately 15 m, which is relatively shallow compared to pits associated with northern mining developments that can extend to several hundred metres (e.g., the diamond mines in the NWT). As such, the pit waters in the area of the Project that experience thermoclines are expected to turn over in spring and late fall. As a consequence, any mixing of waters in a receiver pit possessing a chemocline during the water transfer is not anticipated to adversely affect the water quality.

Corresponding chemical stratification in pit waters with thermal stratification appears occasionally. A chemocline occurs where a lower specific conductivity surface water zone overlies a deeper higher specific conductivity zone. Occurrences of distinct chemoclines (from specific conductivity water column profiles) in the pit waters indicate deeper water zones that have specific conductivity that can be around 30% higher than the overlying water. The presence of these chemoclines will be considered in the compatibility assessment for water transfers using a water column averaging approach to characterize TDS (Section 3.2.6). Where chemoclines are identified, water samples will be collected in the surface water and deeper water zones of the pit. Except for TDS, where an average pit TDS concentration would be determined from the average of the water column specific conductivity measurements, average CoPC concentrations in the samples collected from the two pit depths in the source and receiver pits would be compared to determine the compatibility prior to water transfer (at similar depth).

### 3.2.4 Acute Toxicity Testing

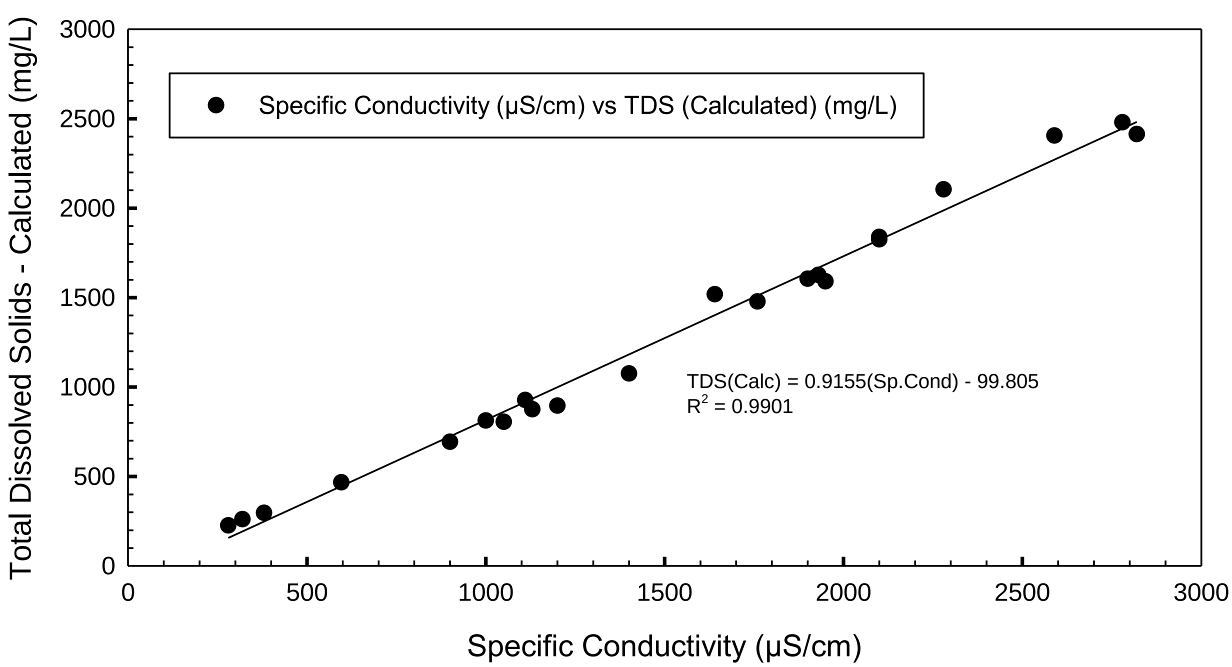
In addition to the field physico-chemical water quality measurements and analytical chemistry data from collected water samples, PPML will include acute toxicity testing for water from a source location that will be directed to a receiver pit where fish are known or have been identified to be present. Toxicity testing will include Rainbow Trout (*Oncorhynchus mykiss*; Environment Canada 2007) and *Daphnia magna* (Environment Canada 2000).

### 3.2.5 Site-specific Relationship between Calculated TDS and Specific Conductivity

The site-specific relationship between field-measured specific conductivity and the corresponding laboratory-calculated TDS for existing surface waters will be used to estimate TDS in the source and receiver waters. These estimations would be verified from the analysis of TDS in water samples from the source and receivers collected as part of the water quality monitoring associated with the compatibility assessment.

At the time of the preparation of this plan, corresponding specific conductivity and laboratory-calculated TDS data for 21 pit waters were available for surveys conducted in the area of the Project between 2005 and 2021. The relationship between specific conductivity and laboratory-calculated TDS is very strong ($R^2$ = 0.99; Figure 3), indicating that it could be applied to the field monitoring of water sources on site and provide reliable estimates of TDS concentrations for the compatibility determinations.

**Figure 3: Relationship between Specific Conductivity and Laboratory-calculated TDS Concentrations from 21 Pit Waters in Surveys Conducted in the Area of the Project between 2005 and 2021**



As more specific conductivity and laboratory-calculated TDS data are collected on site through the groundwater testing program, this relationship will be updated. The minimum threshold for the coefficient of determination ($R^2$) for the use of this TDS:specific conductivity relationship is 0.8.

### 3.2.6 Pit Water Chemistry Averaging Process

As a component of the pit water compatibility process for identifying or confirming source and receiver water transfers, including monitoring completed during and after testing, the site-specific calculated TDS: field specific conductivity relationship will be used to generate a pit water average TDS concentration. Using this approach, an estimate of pit water TDS concentration can be provided as soon as specific conductivity field data are collected from each depth interval through the water column.

Although water column physico-chemical data show that most pit waters are relatively homogenous, some pit waters may possess a chemocline (Golder 2020b,c; 2022), where a lower specific conductivity surface water zone overlies a deeper higher specific conductivity zone. The compatibility assessment for pit transfers considers chemoclines in the approach should a chemocline be present (Section 3.2.3).

For water-filled pits, the pit water average TDS concentration would be the average over the depth of the water column for the calculated TDS determined from the specific conductivity measurements, as shown in the example in Table 3.1.

**Table 3.1: Example of the Derivation of an Averaged Calculated TDS for a Pit Water from a Specific Conductivity Profile Measurement that Exhibit a Discernible Chemocline**

| Pit N42: Date Sampled – 09-Sep-21 | | | |
|---|---|---|---|
| **Depth** | **Field Specific Conductivity (µS/cm)** | **Calculated TDS (mg/L)[(a)]** | **Pit Water Average Calculated TDS (mg/L)** |
| 0.3 | 2,309 | 2,014 | **2,183** |
| 1 | 2,309 | 2,014 | |
| 2 | 2,306 | 2,011 | |
| 3 | 2,308 | 2,013 | |
| 4 | 2,311 | 2,016 | |
| 5 | 2,311 | 2,016 | |
| 6 | 2,438 | 2,132 | |
| 7 | 2,559 | 2,243 | |
| 8 | 2,580 | 2,262 | |
| 9 | 2,612 | 2,291 | |
| 10 | 2,626 | 2,304 | |
| 11 | 2,653 | 2,329 | |
| 12 | 2,674 | 2,348 | |
| 13 | 2,703 | 2,375 | |
| 14 | 2,711 | 2,382 | |

a) Calculated TDS derived from current site-specific specific conductivity relationship (TDS[Calc] = 0.9155 x specific conductivity – 99.805).

The pit water averaging approach for TDS for the compatibility assessment in these circumstances is acceptable for water-filled pits that possess a chemocline because of the relatively small pit volumes, the low differences in TDS where a chemocline has been observed (differences do not typically exceed 20% in the deeper water zone of the pit: i.e., average difference = 9%; range of differences = -4% to 22%;

n = 12 pits), and because these pit waters are expected to overturn (i.e., fully mix) at least twice each year. Further, although the water transfers associated with the groundwater tests are short-term in nature (i.e., three to seven days, and typically less than 14 days), the pumped volumes from the source pits are conservatively expected to result in fully mixed receiver pit waters during each transfer.

The TDS averaging approach used for pit waters may also be considered for the wells where specific data are available at various depth locations. However, depth profile data generally follow a consistent specific conductivity profile, which limits the need to utilize an averaging step. There are some locations where there are shifts to increasing specific conductivity at the bottom of these profiles (e.g., HG-21-PP-004, at several hundred metres below surface), but groundwater from these depths would not be expected to be encountered in the testing transfers and where they did, not markedly influence the averaging condition.

## 3.3 Fish Presence Surveys

Fish presence surveys will be conducted in the receiver pits prior to conducting water transfers. For the existing pits, high-density minnow trapping and seine netting around the shoreline will be the primary sampling methods, supplemented by backpack electrofishing where conditions are suitable and safe. As the pits were developed through past mining and are not natural waterbodies, many of the pits have limited areas of "shoreline" around the pit edge with a sharp drop off. As a result, littoral habitat for fish and areas for safely wading to conduct fish sampling are limited. For the ditches, visual monitoring at select locations along the ditches where suitable water depth and fish habitat are identified will be undertaken from bankside observations or wading. If necessary, minnow trapping and seine netting (and electro-fishing) along the ditch may be conducted.

PPML will use a qualified fish biologist to undertake fish presence surveys. The fish presence survey will be conducted over a minimum of two days to allow minnow traps to be set overnight. This method was successfully used in the summer of 2020 and 2021 to establish the presence of small-bodied fish in some existing flooded pits and to confirm the absence of fish in other pits. PPML will notify the Indigenous communities prior to undertaking fish surveys and when fish are confirmed to be present in a waterbody, watercourse, or constructed ditch. PPML will also provide opportunities for Indigenous Parties to be involved in the field program.

With respect to the constructed ditches for the pit-to-pit pump tests, they are expected to be frozen to the bottom in winter and thus not naturally contain fish. However, before using any constructed ditches, mitigation will be implemented in late winter at the identified ditches to prevent fish migration during spring freshet. PPML proposes to install temporary fish exclusion measures as soon as practicable before the spring thaw to prevent fish from entering the ditches from the fish-bearing pits and surrounding waterbodies. Fish exclusion measures, such as block nets, fish fences, and/or fish panels, will be installed in and adjacent to the ditches while anchor ice is still in place and some ice cover remains. The disturbance associated with these mitigations will be minimal and fully reversible. The effectiveness of the fish exclusion measures will be regularly inspected and monitored prior to and during water transfers. These measures will be removed once the pump tests are complete and are expected to be in place for a maximum of three weeks.

The determination of fish presence in a receiver pit or constructed ditch does not mean that a water transfer cannot occur. The two-step screening process in the compatibility assessment process (Section 4.4) is protective for fish and aquatic life; further, where fish presence is determined in the receiver pit, acute toxicity tests will be conducted on the source pit water that has been passed the screening process prior to any transfer (Section 3.4.3). If fish are determined to be present in the constructed ditches prior to the water transfer activity, compatibility testing of the ditch water will occur for comparison to the source and receiving waters before hydrogeological testing is undertaken.

Also, with respect to the use of ditches for water transfer, the implementation of mitigation to prevent fish entering the ditches during spring conditions, no fish are expected to be killed. Water intakes in the pits will be screened and follow the Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater (DFO 2020). During water transfers using a constructed ditch, monitoring for the presence of fish will be completed along the ditch during pumping (Table 4.1 includes a contingency if fish are observed in the constructed ditch during pumping).

During pumping, PPML on-site personnel will visually monitor to confirm that fish-bearing pits or ditches do not approach levels where fish stranding could occur. PPML will stop withdrawing water prior to creating a situation where fish would become stranded. If fish become trapped in an isolated or enclosed work area, PPML will safely capture and relocate them to an appropriate location in the same waterbody. Where appropriate, PPML will seek input from Indigenous community regarding fish relocation.

## 3.4 Water Compatibility for Water Transfers

Prior to the initiation of any pit water transfers to other pits or to injection sites, compatibility will be determined based on the water quality of the source and receiving sites (and constructed ditches where they are to be used if it is determined they have fish present) using a decision tree approach that comprises a two-step screening approach. The guiding principle for compatibility is that the waters need to be "similar" with respect to TDS and a number of specific water quality parameters to allow for effective and rapid assimilation during pumping without substantially changing the chemical characterization of water within the pit, aquifer, or constructed ditch used for water transfer. For this section, reference to source waters include constructed ditches where water transfers will be directed to a receiver pit identified as having fish present, and receiver waters including constructed ditches.

The two-step threshold approach for water transfers involves initially comparing TDS concentrations between the source (i.e., SNP 2) and receiver waters (SNP 3), and if they are determined to be compatible for TDS, comparing CoPC concentrations (i.e., those parameters above guidelines in the area of the Project that have been measured in surface waters). If these CoPCs are compatible, the source water can be deemed acceptable for transfer. The approach, described in more detail below, has been designed to limit the amount of change in the receiver pit water quality, which provides a strong basis for limiting risk to aquatic life in the pit water. The compatibility would apply for transfer within the same aquifer or for discharges to a nearby aquifer.

If the receiving pit (SNP 3) is dry, the water quality of the nearest pit containing water or monitoring well will be used for the compatibility assessment. If these data are not available, PPML would interpolate the water quality of the pit or groundwater using a broader existing dataset for the local region. A similar requirement would not apply to constructed ditches that are dry. The water quality in the ditches (SNP 7) is expected to differ substantially from pits due to the distinct hydrological characteristics of the two types of existing infrastructure. Pits in the area of the Project typically accumulate water over time and have been shown to strongly interact with groundwater, and thus possess water quality within the lower pit zones similar to that of the local groundwater regime, which necessitates a detailed compatibility assessment to evaluate the potential risk of the hydrogeological testing between a source pit and a receiver pit to aquatic life. In contrast, constructed ditches are designed for temporary surface water conveyance and do not necessarily interact with groundwater in the same way as they were typically constructed with low permeability materials that limit this interaction. Therefore, applying the same compatibility assessment for when a ditch is dry is unnecessary; that is, if a constructed ditch to be used for water transfers during hydrogeological testing is dry, compatibility testing of the ditch will not be required. However, where water is present in the constructed ditches, a compatibility assessment between the source water and the water in the constructed ditch would be undertaken prior to pumping to reduce the risk of water quality change to aquatic life in the constructed ditch due to the influx of pit water or groundwater.

To further mitigate any potential for risk to aquatic life, where fish are identified as present in the receiver pit waters (or constructed ditches), PPML would include acute toxicity testing of the source pit (SNP 2) and constructed ditch (SNP 7) water using Rainbow Trout (Environment Canada 2007) and Daphnia magna (Environment Canada 2000) in the compatibility monitoring program. In this case, a non-acutely lethal result for both tests would be required along with a compatibility pass associated with TDS and CoPC concentrations.

The steps in the compatibility assessment are described below and have been conceptualized in decision tree diagrams for pit to pit, well to well, pit to well and pit/well to constructed ditch transfers in Appendices C through F, respectively.

For any of the water transfers, should a pause of greater than three (3) months be required at a test site either from the time the initial water quality data are obtained or if the pump test is interrupted, the compatibility assessment will be repeated before pumping resumes.

PPML will use a qualified scientist to assess the water quality sampling results to determine compatibility between the source and receiver locations.

### 3.4.1 Step 1 – Comparison of TDS Concentrations

The first step in the compatibility process is the TDS comparison.

A spatial review of available surface water quality and groundwater quality data in the area of the Project indicates that TDS concentration is a reliable initial indicator of the compatibility for water transfers between source and receiver pit waters. The TDS characterization of groundwater is a result of dissolution processes as groundwater slowly moves through open fractures in the underlying geology in the area of the Project, which results in the expression of elevated TDS concentrations in the surface groundwater regime and surface waters (e.g., pit waters and watersheds). Surface water TDS concentrations range from around 80 mg/L to 7,300 mg/L, with an average of approximately 1,100 mg/L and a median of 690 mg/L across the area of the Project (based on surface water data for natural watercourse, waterbodies, and historic pits within the area of the Project from 1980 to 2021; n = 108). For most of the surface water data, this TDS concentration range is very high compared to that in the surface waters of Great Slave Lake and the waters in the Canadian Shield to the north that drain into Great Slave Lake. The ionic composition of these waters is dominated by calcium, sulphate, and other forms of sulphur), although where lower TDS concentrations are prevalent, calcium and bicarbonate are the major ions. The range of average TDS concentrations in groundwater wells in the Pine Point Project area is 900 to 2,500 mg/L, which is consistent with the range of surface water TDS concentrations (HRI *In prep*).

For source water (SNP 2) to be compatible with the receiver water (SNP 3), the TDS concentration of the source water cannot be 30% higher than the TDS concentration of the receiver water. The rationale for the 30% threshold is based on acceptability criteria for duplicate samples applied by analytical laboratories as part of their internal quality control (QC) procedures; this accounts for potential variability associated with sample collection and representativeness of the sample at the time of collection and laboratory analysis. This 30% threshold would also be applicable to other field-based physico-chemical measurements. Further, the 30% acceptability factor was considered appropriate to reflect the observed spatial variability in surface water quality of the water-filled pits (Golder 2020a,b,c; 2022; PPML 2021), and where applicable, account for variability in TDS between the surface waters in the pit and the underlying higher specific conductivity/TDS waters with depth within the pits. By establishing an acceptability factor that covers the range of temporal and depth-related TDS concentrations within a pit, an appropriate level of compatibility is applied to accommodate the water transfer to maintain a similar water quality during and after pumping and to provide a level of protection in the event there are aquatic biota present in the pit waters.

The TDS concentrations for the source (SNP 2) and receiver waters (SNP 3) would be determined from field measurements and laboratory analysis of samples collected prior to the transfer taking place. The sampling locations in the source and receiver locations would be in accordance with SNP stations 2 (source), 3 (discharge location), and 7 (constructed ditch) as per the Type A Water Licence. TDS concentrations for the source and receiver locations would be developed from the field measurements of specific conductivity (see Section 3.2.5) and verified from the laboratory-derived TDS concentrations from the collected water samples (i.e., from samples collected from the source and receiver wells, constructed ditches, and pits, including pit samples above and below a chemocline, if present). Where pits represent source and or receiver locations, the TDS comparison would be based on a water column average TDS concentration for the source and receiver waters following the approach described in Section 3.2.6.

If applicable, existing water quality data for the source and receiver will supplement any data collected as part of the compatibility assessment to assist informing the decision-making process. Where the source water is determined to be compatible for TDS, the assessment moves to Step 2 in the compatibility evaluation. Where the TDS concentration of the source water is determined to not be compatible, an alternate receiver would need to be identified, or the source water would not be transferred.

### 3.4.2 Step 2 – Comparison of CoPC Concentrations

The second screening step to confirm compatibility between the source and receiver waters, once compatibility with TDS has been determined, is a comparison of CoPC concentrations. As identified in Section 5.2, the CoPCs comprise sulphate, fluoride, aluminum, cadmium, chromium, copper, iron, lead, thallium, uranium, and dissolved zinc because they have occasionally been measured in surface waters and groundwater in the area of the Project above generic CCME (2022) chronic guidelines for the protection of aquatic life (and the BC ENV [2021] hardness-based guideline for sulphate). The guidelines that will apply to the CoPC comparisons are presented in Table 3.2.

The CoPC concentrations to be used in the compatibility assessment will be from data reported for samples collected from sampling locations in the source and receiver locations in accordance with SNP stations 2 (source), 3 (discharge location), and 7 (constructed ditch) per the Type A Water Licence prior to the water transfer. Although existing water quality data for the source and receiver will not be used in the compatibility assessment, any available pre-existing water quality data for source and receiver locations may be referenced to assist informing the decision-making process.

**Table 3.2: Water Quality Guidelines Applicable to the CoPC for the Compatibility Assessment, including Applicable Exposure and Toxicity Modifying Factors**

| Parameter | Unit | Guidelines for the Protection of Aquatic Life (a) | Exposure and Toxicity Modifying Factor (as applicable) |
|---|---|---|---|
| Fluoride(b) | mg/L | 0.12 | - |
| Sulphate(c,d) | mg/L | 128<br>218<br>309<br>429<br>Site-specific | ≤30 mg/L $CaCO_3$<br>31-75 mg/L $CaCO_3$<br>76-180 mg/L $CaCO_3$<br>181-250 mg/L $CaCO_3$<br>>250 mg/L $CaCO_3$ |
| Aluminum | mg/L | 0.005<br>0.1 | <6.5 pH<br>≥6.5 pH |
| Cadmium(c) | mg/L | 0.00004<br>$10^{\{0.83(\log(hardness))-2.46\}}$<br>0.00037 | <0.17 mg/L $CaCO_3$<br>17-280 mg/L $CaCO_3$<br>>280 mg/L $CaCO_3$ |
| Chromium | mg/L | 0.001 as CrVI<br>0.0089 as CrIII | - |
| Copper(c) | mg/L | 0.002 mg/L<br>$0.2*e^{\{0.8545[\ln(hardness)]-1.465\}}$<br>0.004 mg/L | <82 mg/L $CaCO_3$<br>82-180 mg/L $CaCO_3$<br>>180 mg/L $CaCO_3$ |
| Iron | mg/L | 0.3 | - |
| Lead(c) | mg/L | 0.001 mg/L<br>$0.2*e^{\{1.273[\ln(hardness)]-4.705\}}$<br>0.007 mg/L | ≤60 mg/L $CaCO_3$<br>60-180 mg/L $CaCO_3$<br>>180 mg/L $CaCO_3$ |
| Thallium | mg/L | 0.8 | - |
| Uranium | mg/L | 0.15 | - |
| Dissolved zinc | mg/L | 0.007 | - |

(a) CCME (2022).

(b) This guideline is an interim CCME guideline.

(c) Hardness-dependent.

(d) BC ENV (2021).

For source water to be compatible with the receiver water, the CoPC concentrations in the source water cannot be greater than 30% higher than their corresponding CoPC concentrations in the receiver water. That is, the source water will not be compatible with the receiver if any CoPC concentrations in the source water are greater than 30% higher than their corresponding CoPC concentration in the receiver water. The rationale for this acceptability buffer in the CoPC's is aligned with the acceptability criteria for duplicate samples applied by analytical laboratories as part of their internal QC procedures (Section 3.4.1). Further, CoPC concentration differences greater than 30% in the source water may not result in the receiver CoPC concentration exceeding a guideline, and where there might exceed a guideline in the receiver, the exceedance does not imply that adverse effects to aquatic life will occur. Thus, the risk of effects to aquatic life is considered acceptable for the transfer, which can be further evaluated as part of the compatibility assessment. Further, CoPC guideline exceedances in the surface waters and groundwaters are not consistently measured across the area of the Project or for all CoPC's.

Where pits represent source and or receiver locations, and chemoclines are identified from water column specific conductivity profile measurements collected in the field, water samples will be collected in the surface water and deeper water zones of the pit. For the CoPC comparisons in Step 2, consistent with the approach for TDS in Step 1, the compatibility assessment would compare the average CoPC concentrations from the sample results for that CoPC from the two sampling depths in the source and receiver pits to determine the compatibility prior to water transfer.

If CoPCs are determined to be compatible, source water would be deemed acceptable to transfer. This approach minimizes the potential for change to the receiver water quality, and thereby also limits the potential for risk to aquatic life.

### 3.4.3 Supplemental Step – Acute Toxicity Testing

As presented in Section 3.3, where receiver waters and constructed ditches are identified as possessing fish, a supplemental step in the compatibility assessment will be required. This step would include acute toxicity testing for water from the source (SNP 2, 3, and/or 7) in advance of the transfer to confirm that the source water is not acutely lethal. For the source water to be compatible with the receiver water, including constructed ditch, where fish are present, pass test results would be required for Rainbow Trout (Environment Canada 2007) and *Daphnia magna* (Environment Canada 2000).

**Further Mitigation for Pits with Fish Present**

Where possible, groundwater testing will prioritize receiver pits where fish are not present.

For source pits, PPML will follow mitigation outlined in the Water Withdrawal Plan ((v2.3; PPML 2024)) as it relates to the application of the Fisheries and Oceans Canada (DFO) protocol, *Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories* (DFO 2010) during water transfers. Where a groundwater test includes a source pit where fish are known or likely to be present, pit water levels will be monitored during pumping to confirm that levels stay within a range that continue to support fish habitat. For example, during water transfer from source pits where fish are known or likely to be present, water level changes will not exceed 10% for fish-bearing pits, and where applicable, at least 2 m of water will remain in the pit. Further, pumping rates will follow the DFO interim code of practice for end-of-pipe fish protection screens by installing suitable screens and not exceeding a pumping rate of 0.15 $m^3$/s.

Where fish presence is determined in constructed ditches to be used for water transfer and/or the receiver pit, acute toxicity tests as listed above will be conducted on the source pit water that has passed the two-step screening process prior to any transfer.

### 3.4.4 Water Compatibility Report for Submission to the Inspector and Indigenous Communities

PPML has developed a reporting template for use in supporting any proposed decision regarding the compatibility of a source water and a receiver water for transfer (Appendix F). The report is provided in Excel format, which allows the insertion of measured TDS data (derived from the field specific conductivity measurements, the focus CoPC concentrations, and the acute toxicity testing results (if required). Based on these data, the template would populate a recommendation. The resulting report could then be issued to the Inspector for a decision regarding the approval of transfer activities ten (10) days in advance of the hydrogeological testing, per Part F, Condition 20. At the same time as the template is provided to the Inspector, a copy will be sent to the Indigenous Communities listed in the Engagement Plan (V2.2).

## 3.5 Monitoring During Groundwater Testing

Monitoring during groundwater testing and water transfers between source and receiver locations would include water quantity and water quality conditions. As the groundwater tests are short-term in nature (i.e., typically less than 14 days), the water quantity and water quality monitoring approaches have been designed to align with the short-term nature of the activity.

Monitoring of water transfers using existing ditches is required for SNP 2, 3 and 7, is described in Appendix B. The field testing and monitoring protocols in Appendix B include flow monitoring techniques in the ditches and a protocol to evaluate seepage from the ditches during the water transfer activity, provided in response to questions regarding seepage during the water licence amendment process (MVLWB 2024).

Installation of monitoring wells (or use of existing wells in the vicinity of the hydrogeological testing, if and where available, would occur irrespective of whether pipes or constructed ditches (containing water or dry) are to be used for water transfers. Monitoring wells installed for temporary hydrogeological testing will be used to detect potential changes in groundwater level and chemistry (e.g., specific conductivity) during the pumping, near both the source and receiver locations. These tests are being conducted by PPML to inform potential future mining plans, particularly in relation to operational and environmental considerations, such as:

- Drawdown or build-up of groundwater in the bedrock or overburden aquifers in the surrounding area of extraction and injection.
- Hydraulic connectivity of the open pits and wells to the surrounding aquifers and potential for influences on nearby surface water and groundwater chemistry and levels.
- Groundwater chemistry of the bedrock aquifer during production and groundwater placement in a pit or the aquifer via injection.

Water transfers will also be managed through visual observations so that they do not result in temporary flooding from well, pit, or constructed ditch overflows or overtopping, or the drying up of nearby natural waterbodies. Visual observations would be conducted for natural waterbodies within 100 m of the pumping test to make sure that they are not subject to temporary flooding from pit or well overflows and constructed ditch overtopping or dry up during water transfer activities.

Prior to conducting any further hydrogeological test, PPML will conduct seepage test using overburden piezometers to confirm the low permeability assumption of the material used to develop the constructed ditches, as detailed in Appendix B (Protocol 2). This test will be conducted within defined reaches at a number of select ditches to inform seepage potential when constructed ditches are used for water transfers. By the nature of the testing to be undertaken, this activity is limited to ditches that possess water. Appendix B (Protocol 2) describes how the testing will be performed, how the data will be collected and analyzed, and reported. PPML will not conduct hydrogeological test using dry constructed ditches without obtaining an approval from the Board.

### 3.5.1 Water Quantity

The water quantity monitoring requirements for each of the water transfer options are listed below.

Pit to Pit

- Pit water level in the source pit and the receiver pit will be monitored using electronic pressure transducers (e.g., Leveloggers) at regular data record intervals (e.g., 15 minutes) as well as occasional manual readings to track depletion rate and supplementation rate during water transfer.
- Water levels within monitoring wells adjacent to the pits will also be monitored to understand the influence of the water transfer to the surrounding aquifers.
- Pumping rates from the source pit will be monitored using flow meters and recorded at regular intervals (e.g., 15 minutes).

Pit to Well

- Pit water levels will be monitored in the source pit using electronic pressure transducers (e.g., Leveloggers) at regular data record intervals (e.g., 15 minutes) as well as occasional manual readings to track depletion rate during water transfer.
- Water levels will be monitored in the receiving well using electronic pressure transducers.
- Water levels in the monitoring wells around the source pit and the injection well will be monitored using electronic pressure transducers at regular data record intervals (e.g., 15 minutes) to understand influence of the water transfer to the surrounding aquifers.
- The injection well will also be monitored for pressure build-up at the well head; the injection rate would be managed accordingly.
- Pumping rates from the source pit will be monitored using a flow meter and recorded at regular intervals (e.g., 15 minutes).

Well to Well

- Water levels will be monitored in the extraction well, monitoring wells, and the receiver well, using electronic pressure transducers at regular data record intervals (e.g., 15 minutes) and occasional manual measurements.
- The injection well will also be monitored for pressure build-up at the well; the injection rate would be managed accordingly.

- Pumping rates from the source well will be monitored using a flow meter and recorded at regular intervals (e.g., 15 minutes).

Flow data will be collected from the constructed ditches during the groundwater testing program when these ditches are indirectly used for water transfers. A staged pumping approach will be utilized, along with monitoring flow rates and water levels at various points along the ditch, including any low areas, to minimize the potential for water to overflow during the pumping process. Pumping will begin at 10% of the maximum pumping rates (i.e., 150 $m^3$/day) and will only increase as the ditch's capacity is confirmed to accommodate the flow. PPML have also committed to undertaking visual monitoring along the constructed ditches during water transfers. The frequency of these checks will be based on field operational needs and risk assessments, which may result in observations being more frequent during the initial pumping phase and when the water level within the constructed ditch approaches the water level threshold, ensuring they are sufficient to identify any potential risks of breaching or overtopping in a timely manner. Flow monitoring protocols in the ditches are described in the standard operating procedures (SOPs) in Appendix B (i.e., Protocol 1) and the water level criterion to prevent overtopping from constructed ditches is listed in Table 4.1 (Water Management Contingencies).

#### *3.5.1.1 Quality Assurance and Quality Control*

Quality assurance and quality control (QA/QC) processes that would apply to the water quantity monitoring component include field and office processes. Field QA/QC procedures would pertain to the maintenance and operation of equipment and instrumentation, and field survey methods. Office QA/QC procedures would include validation of field measurements and analysis results.

Use of experienced field staff and applying field operation procedures would provide known, acceptable, and defensible quality. To this end, the following QA/QC measures will be implemented:

- Field staff will be proficient in standardized procedures, data recording, and equipment operations applicable to field measurements.
- Detailed field notes will be recorded in waterproof field books or on pre-printed waterproof field data sheets in pencil. Data sheets will be checked at the end of each field day for completeness and accuracy.
- Operation of continuous data loggers will be verified prior to installation. Data will be regularly downloaded to reduce the risk of complete data loss in case of instrument malfunction or damage to the monitoring station. Digital data downloads will be archived prior to analysis to preserve original data sets.
- Field survey and velocity meter equipment will be maintained regularly. The results of the calibration and any required maintenance will be recorded in the field data sheets or notebooks.
- Water level surveys will rely on redundant measurements including leveling surveys, transducer readings and, if applicable, staff gauges.

### 3.5.2 Water Quality

During groundwater testing, physico-chemical water quality data (i.e., specific conductivity, pH, temperature, DO, redox potential, and turbidity/TSS) and samples for water quality analysis will be collected from the source (pit, wells, and/or constructed ditches) and receiver (pits, injection wells, and constructed ditches) at regular intervals. These are described below.

PPML will also complete a review of nearby surface water sources to the source pit and receiver pit or injection well. If a potential hydraulic connection of the source or receiver pit to the surface water source exists, a pre-test and post-test water quality survey (i.e., physico-chemical measurements and collection of a sample for water quality analysis) will be conducted to identify any potential influence from the testing activity.

For the well to well transfers, PPML has assumed that any groundwater transferred from a source well to an injection well will occur within the vicinity of the same aquifer, which suggests that the source and receiver water quality would be compatible. However, physico-chemical measurements and samples for water quality analysis from the extraction wells and injection well will be collected at regular intervals during and after testing.

Ongoing acceptability in water transfer between the source and receiver pits will be determined from the following monitoring data:

**Source Water and Receiver Water**

- Field physico-chemical (i.e., specific conductivity, pH, temperature, DO, redox potential, turbidity) measurements in the source and receiver waters (these measurements would be through the water column for the pit waters).
- Laboratory analysis of water quality parameters (refer to constituent list in Section 4.2.1).

Once pumping commences, the following monitoring will be conducted in source and receiving waters during water transfers and in receiving waters three to four days after water transfers:

**Source Water (SNP 2)**

- Daily field physico-chemistry (i.e., specific conductivity, pH, temperature, DO, redox potential, turbidity/TSS) measurements in the pumped source water (these measurements would be collected from the pumped transfer from the pit waters).
- Laboratory analysis of water quality parameters in samples collected every three days from the pumped water source (refer to constituent list in Section 4.2.1) or if the specific conductivity increases to 130%[1] of the specific conductivity at the start of pumping.

**Receiver Water (SNP 3)**

- Weekly field physico-chemistry (i.e., specific conductivity, pH, temperature, DO; redox potential, turbidity/TSS) measurements (these measurements would be collected through the water column of the receiver pit).

[1] Relative to the hydrogeological testing and compatibility of source and receiver waters within this plan, reference to 110% or 130% in the context of comparison to an initial condition (e.g., specific conductivity, TDS concentrations, COPC concentrations) means a value or concentration 10% or 30% higher, respectively, than the initial value or concentration.

- Laboratory analysis of water quality parameters (refer to constituent list in Section 4.2.1) in a pit or a well sample three to four days after water transfer is complete or if the specific conductivity in the source water increases to 130% of the specific conductivity at the start of pumping.

These data will be provided in the monthly SNP reports to be submitted to the MVLWB (i.e., source water representing SNP 2, receiving water representing SNP 3, and constructed ditch representing SNP 7).

Compatibility testing during and after pumping for the source and receiver waters will be as listed in Table 3.3:

**Table 3.3 Compatibility Testing Schedule During and After Pumping Between the Source Waters (SNP2) and Receiver Waters (SNP3)**

| | **During Pumping** | | **After Pumping** | |
|---|---|---|---|---|
| | **SNP 2** | **SNP 3** | **SNP 2** | **SNP 3** |
| TDS derived from field measurements of specific conductivity (using the site-specific TDS/specific conductivity relationship) | **Daily** | **Weekly** | **-** | **Three to four days after completion of pumping** |
| | Compatibility testing to be completed against pre-pumping measurement at SNP 2 | Compatibility testing to be completed against pre-pumping measurement at SNP 3, where practical | - | Compatibility testing to be completed against pre-pumping measurement at SNP 3 |
| Laboratory measured COPCs | **Every three days during pumping** | **-** | - | **Three to four days after completion of pumping** |
| | Compatibility testing to be completed against pre-pumping measurement at SNP 2 | | - | Compatibility testing to be completed against pre-pumping measurement at SNP 3 |

Specifically for constructed ditches that are used for indirect water transfers (where water in the ditches is present), monitoring of physio-chemical water quality and sample collection for water chemistry, including total suspended solids (TSS), as described above, will be undertaken at selected locations along the constructed ditch, including the inlet and outlet locations of the ditch, where flow monitoring will occur (i.e., the points of entry and release to the receiver location). The frequency of water quality monitoring will be consistent with that described for the source water locations (i.e., daily physio-chemical measurements and water sample collection for laboratory analysis every three days). At the point of release where the receiver location has been identified as having fish, continuous monitoring of turbidity and/or TSS will be conducted.

For TSS monitoring, a TSS threshold has been proposed to manage potential increases in turbidity and TSS in the receiving location where fish are present (refer to Table 4.1). Since the constructed ditches are expected to be devoid of fish (due to the exclusion measures implemented by PPML prior to water transfer), turbidity or TSS thresholds will not apply as any increase will not pose a risk to fish and fish habitat. However, the threshold would apply at the point of release from the constructed ditch to the receiving location where fish are present in the receiver water. If fish are found in the constructed ditch, the TSS and turbidity thresholds will also apply where water is pumped or directed from the source to the constructed ditch.

#### *3.5.2.1 Quality Assurance and Quality Control*

Quality assurance and quality control (QA/QC) processes that would apply to the water quantity monitoring component, include field, laboratory, and office procedures. Field QA/QC procedures pertain to the maintenance and operation of equipment and instrumentation, sampling methods, sample handling, and shipping. Laboratory QA/QC procedures incorporate protocols developed by analytical laboratories. Office QA/QC procedures include validation of field measurements and analytical results provided by analytical laboratories. The following measures will be implemented:

- Field staff will be trained to be proficient in standardized procedures, data recording, and equipment operations applicable to field sampling. PPML will use qualified field scientists or technicians with Indigenous assistants, as available, for water quality compliance sampling at source and receiver locations during operations.
- Field multi-meter, sampling, and filtration equipment will be maintained regularly. The results of the calibration and any required maintenance will be recorded in the field data sheets or notebooks. Supplemental field water quality monitoring equipment will be available as a contingency should the primary field monitoring equipment malfunction.
- Detailed field notes will be recorded in waterproof field books and on pre-printed waterproof field data sheets in pencil. Data sheets and sample labels will be checked at the end of each field day for completeness and accuracy.
- Bottle labels will be used with clearly coded station location names that refer to the source and receiver pit or wells, station, sampling depth, and sampling event.
- Samples will be labelled, preserved, and shipped according to standard protocols provided by laboratories. Each sample will be given a name and unique sample control identification number. Project-specific chain-of-custody forms will be used to track the shipment and analyses of samples.
- Water samples will be submitted only to laboratories accredited by the Canadian Association for Laboratory Accreditation (CALA).
- Water sampling will include the collection of quality control samples to detect and reduce systematic and random errors that may occur during field sampling and laboratory procedures. The QC samples will represent at least 10% of the total number of samples to be analyzed for each category of blank samples and duplicate samples based on Environment Canada's recommendations (Environment

Canada 1983, 2012). The QC samples will consist of duplicate samples, equipment blanks, field blanks, and travel blanks.

## 3.6 Response Framework

Once compatibility between the source and receiver has been established, the water transfer can be conducted. PPML has proposed the following response framework based on field physico-chemical monitoring and water chemistry sampling of the source and receiver water quality during the water transfer process (Table 3.3). The framework uses a colour-coded adaptive management level (i.e., green through red) identifying action levels and corresponding management responses associated with those action levels. The basis of the response framework to track and manage potential risk is the 30% acceptability threshold used in the compatibility assessment for TDS and the CoPCs in the source and receiver waters.

For the green and yellow management levels, the emphasis is on TDS concentrations in the source water, which will be determined from the field-measured specific conductivity measurements. The preference for use of field physico-chemical monitoring data (i.e., field specific conductivity measurements to derive TDS) to inform the transfer and identify a shift to non-compatibility is because water transfers associated with the groundwater tests are short-term (less than a maximum duration of 14 days) and laboratory test results from any collected water samples would take several days (for rapid turnaround requests) to several weeks (standard turnaround period). However, if water samples are collected to evaluate the CoPC concentrations (e.g., a Yellow management level response), sample collection and analysis would confirm the status of the CoPCs (i.e., fluoride, sulphate, aluminum, cadmium, chromium, copper, iron, lead, thallium, uranium, and vanadium). Determination of a Red management Level incorporates the source and receiver waters and includes the condition where TDS or any of the CoPCs being measured are greater than 130% of the averaged TDS or respective CoPC concentration for the source or receiver water prior to the transfer.

**Table 3.3: Response Framework for the Water Transfer Monitoring Component**

| Adaptive Management Level | Action Level | Response |
|---|---|---|
| Green | TDS concentrations in source water derived from daily field specific conductivity measurements at the discharge point remain below 110% of the averaged TDS concentrations for the source water prior to the transfer. | Maintain pumping from the source.<br>Maintain scheduled field physico-chemical monitoring and sample collection schedule. |
| | Averaged TDS concentrations in the receiver derived from weekly water column specific conductivity measurements remain below 130% of the averaged TDS concentrations for the receiver water prior to the transfer. | |

**Table 3.3: Response Framework for the Water Transfer Monitoring Component**

<table>
<tr><th>Adaptive Management Level</th><th>Action Level</th><th>Response</th></tr>
<tr><td>Yellow</td><td>TDS concentrations in source water derived from daily field specific conductivity measurements at the discharge point are between 110% and 130% of the averaged TDS concentrations for the source water prior to the transfer.</td><td>Maintain pumping from the source.<br>Increase field physico-chemical monitoring of the source to twice daily.<br>Collect a water sample from the source for CoPC analysis while TDS concentrations in this range and request a rush order with the analytical laboratory to make sure sample results can be received and reviewed within 3 to 5 days of submission.<br>Evaluate results from the rush laboratory analysis to discern potential trends in COPCs.</td></tr>
<tr><td rowspan="2">Red</td><td>TDS concentrations in source water derived from field specific conductivity measurements are greater than 130% of the averaged TDS concentrations for the respective source or receiver prior to the transfer.<br>OR<br>A CoPC concentration in the source water is greater than 130% of its corresponding CoPC concentration in the source prior to the transfer.</td><td rowspan="2">Cease pumping.<br>Continue field physico-chemical monitoring and water sampling in source or receiver per the Yellow Action Level.<br>Determine cause of elevated TDS or CoPCs in source and evaluate risk, and mitigate if possible.<br>Report to Inspector.</td></tr>
<tr><td>Averaged TDS concentrations in the receiver derived from weekly water column specific conductivity measurements are greater than 130% of the averaged TDS concentrations for the receiver water prior to the transfer.<br>OR<br>A CoPC concentration in the receiver is greater than 130% of its corresponding CoPC concentration for the receiver prior to the transfer.</td></tr>
</table>

(a) mitigations may include delays to pumping or reduced pumping rates.

# 4.0 Contingencies

In addition to the adaptive management response framework that applies to the transfer of water from the three groundwater testing methods (i.e., pit to pit, well to well, and pit to well), PPML has developed contingencies to cover off other potential issues associated with the groundwater testing and on-site water management. These are listed in Table 4.1, and include the management component, the potential issue, the criteria, trigger, and response action.

**Table 4.1: Water Management Contingencies for the Hydrogeological Testing Program**

| Management Component | Issue | Criteria | Trigger | Response Action |
|---|---|---|---|---|
| Compatibility Assessment | Water quality testing prior to groundwater testing indicates source and receiver waters are not compatible for TDS, or one focus CoPC. | TDS or a focus CoPC in the source water exceeds the acceptability tolerance for transfer. | TDS or a CoPC concentration in the source water exceeds 130% of the same constituent concentration in the receiver. | Evaluate level of risk associated with exceeding TDS or the CoPC.<br>Where risk is rationalized, PPML to seek Inspector approval to initiate water transfer.<br>If risk is determined unacceptable, find an alternate receiver, or source water is unable to be transferred. |
| | Water quality testing prior to groundwater testing indicates source and receiver waters are compatible for TDS, but not for any of the CoPCs. | CoPCs in the source water do not exceed the acceptability tolerance for transfer. | A CoPC concentration in the source water exceeds 130% of the same constituent concentration in the receiver. | Find an alternate receiver, or source water is unable to be transferred. |
| Water transfer to the receiver locations | Water levels at the receiver location within 1 m from the pit crest (bank/berm) or surface of the well and have the potential to overflow from the receiver location, indicating that the receiver is not absorbing the transfer. | Water level to remain below 1 m of the pit crest (bank/berm) surface of the well. | Water level at the receiver location reaches or broaches 1 m from the pit crest (bank/berm) or surface of the well. | Cease water transfer from the source.<br>Continue to monitor water level in the receiver.<br>When the water level falls below the 1 m from the pit crest (bank/berm) or surface of the well, resume water transfer.<br>If the water level remains within 1 m of the surface of the pit or surface of the well, find an alternate receiver. |

### Table 4.1: Water Management Contingencies for the Hydrogeological Testing Program

| Management Component | Issue | Criteria | Trigger | Response Action |
|---|---|---|---|---|
| | Increased turbidity and TSS in water transfers when constructed ditches are being used and fish have been identified in the constructed ditch and/or the receiver pit. | Consistent with CCME (2022), the TSS[2] concentration (or turbidity) in the water flow at the point of discharge to the receiver pit or constructed ditch where fish have been identified is to remain below a maximum increase of 25 mg/L (or 8 NTU) above the source concentration/value for the first 24 hours of discharge, after which it is to remain below a maximum average increase of 5 mg/L (or 2 NTU) of the source pit concentration/value. | The TSS concentration (or turbidity) at the point of discharge exceeds 25 mg/L (or 8 NTU) above the source concentration/value for 4 hours during the first 24 hours of water transfer.<br>**OR**<br>The TSS concentration (or turbidity) at the point of discharge is above a maximum average increase of 5 mg/L [or 2 NTU] of the source concentration/value for 4 hours after the first 24 hours of water transfer). | Cease water transfer from the source.<br>Continue to monitor TSS concentrations (or turbidity) in the constructed ditch at the monitoring location at the point of discharge to the receiver pit.<br>When the TSS concentration (or turbidity) drops below a maximum increase of 25 mg/L (or 8 NTU) above the source concentration in the first 24 hours of water transfer or 5 mg/L (or 2 NTU) above the source concentration/value after 24 hours, PPML will resume water transfer. |

[2] If turbidity is used to monitoring suspended particulate matter, the alternate criteria would also be consistent with CCME (2022): the turbidity in the water flow at the point of discharge to the receiver pit is to remain below a maximum increase of 8 nephelometric turbidity units (NTU) above the source value for the first 24 hours of discharge, after which it is to remain below a maximum average increase of 2 NTU above the source value.

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**Table 4.1: Water Management Contingencies for the Hydrogeological Testing Program**

| Management Component | Issue | Criteria | Trigger | Response Action |
|---|---|---|---|---|
| | Fish are observed in a constructed ditch being used to transfer water from a source to a receiver during water transfer pumping. | Fish observed in the constructed ditch during water transfer pumping. | Fish are observed entrained at the outlet screen at the end of ditch. | Increase the frequency of monitoring at the downstream end of the constructed ditch, and enhance visual monitoring and assessment of entrainment at the fish screen at the overflow end of the ditch.<br>If fish are observed near or at the downstream screen then a fish rescue would be completed, and flows would be reduced. If necessary, fish rescue would be attempted using standard fish capture techniques appropriate for the habitat conditions at the site (e.g., dip nets, seine nets). Per DFO's Letter of Advice (Appendix H), PPML would safely relocate these fish to an appropriate location within the same watercourse or waterbody. |
| Natural watercourses and waterbodies immediately adjacent to the testing location (i.e., 100 m or less). | Nearby natural watercourses and waterbody(ies) subject to flooding or drying out during water transfer activities. | Water levels or flows in nearby natural watercourses and waterbody(ies) remain within normal condition. | Observations of overbank flooding or drying out of watercourses or waterbodies in the near vicinity of the receiver. | Cease water transfer from the source.<br>Observe water level in the watercourse or waterbody and compare to initial condition, as well as taking into account weather and precipitation over the 24-hour period.<br>If the water level does not recover in a period applicable to the activity, assess if water transfer can continue. |
| Monitoring wells affected during water transfers. | Water quality in the monitoring wells change during water transfers. | TDS and focus CoPC concentrations remain below 130% of concentrations determined prior to water transfers. | TDS or one CoPC concentration in the monitoring well exceeds 130% of the same constituent in the receiver. | Evaluate level of risk associated exceeding TDS or the CoPC.<br>If risk can be rationalized, PPML to seek Inspector or MVLWB to continue water transfer.<br>If risk is determined too great, cease water transfer. |

**Table 4.1: Water Management Contingencies for the Hydrogeological Testing Program**

| Management Component | Issue | Criteria | Trigger | Response Action |
|---|---|---|---|---|
| Water transfer pathway. | Rupture of the temporary piping used for water transfer. | Flooding along the piping is observed or reported. | Observation or assumption that the transfer piping is ruptured or damaged. | Cease pumping.<br>Confirm the rupture. Repair piping and resume pumping. |
| | Pumped transfer water in the constructed ditch approaching the surface of the ditch channel with the potential to overtop the ditch. | Water levels in the constructed ditch during water conveyance to remain below 0.3 m from the top of the ditch channel. | Water level in the constructed ditch is within 0.3 m from the top of the ditch channel. | Cease pumping.<br>Continue to monitor water level in the constructed ditch.<br>Prepare sandbags to mitigate spill extent.<br>Once water level is greater than 0.3 m from the top of the ditch channel, resume pumping at lower rate and monitor water level in ditch.<br>Increase pump rate as possible and continue to monitor water level. |
| | Breach of ditch banks. | Flooding alongside the ditch is observed or reported. | Observation or assumption that the transfer ditch is breached. | Cease pumping.<br>Confirm the breach.<br>Repair breach.<br>Confirm the effectiveness of repairs prior to resuming pumping.<br>Resume pumping.<br>Continue to monitor to confirm the effectiveness of repairs. |
| | Pumped transfer water overtops the ditch bank. | | Observation or assumption that the pumped transfer water has overtopped the ditch bank. | Cease pumping.<br>Confirm the overtopping.<br>Resume pumping at lower rate and monitor water level in ditch.<br>Increase pump rate as possible, and continue to monitor to confirm the effectiveness of repairs. |

**Table 4.1: Water Management Contingencies for the Hydrogeological Testing Program**

| Management Component | Issue | Criteria | Trigger | Response Action |
|---|---|---|---|---|
| | Slumping banks, sediment build-up, channel blockage, and/or imminent failure of erosion control structures in constructed ditch. | | Observation or assumption of bank slumping, sediment build-up, channel blockage, and/or imminent failure of erosion control structures during water transfer. | Cease pumping.<br>Confirm the location of ditch erosion or failed erosion control.<br>Implement appropriate Erosion Control BMP (Appendix C of the Erosion and Sedimentation Management Plan Version 1.1).<br>Confirm the effectiveness of repair / erosion control prior to resuming pumping.<br>Resume pumping.<br>Continue to monitor (e.g., TSS / turbidity) to confirm the effectiveness of repairs.<br>Observe water level in the ditch and compare to expected condition, accounting for precipitation events over the preceding 24 h period. |

The approach to risk management for the pumping tests is based on monitoring through observation to identify any occurrence of, or potential for, flooding of waterbodies (i.e., overtopping banks) or the drying up of waterbodies or watercourses within close proximity (100 m) of the testing locations beyond what occurs naturally. PPML acknowledges that for watercourses in the area of the Project, there is seasonal variability in water level that incorporates high flow rates following freshet to periods of zero flow in late fall and winter (EBA 2007). For waterbodies and wetlands in the area of the Project, water levels also are expected to fluctuate seasonally; however, they are not expected to dry out in open water conditions (when not covered by ice and snow) due their anticipated connections with the groundwater regime.

The "normal condition" for any nearby waterbody and watercourse in the water management plan during water transfers means that during pump testing, water levels or flow conditions of any nearby waterbody and/or watercourse remained within the seasonal range. Establishing an explicit threshold for these observations is, however, challenging. Existing seasonal hydrological data are only available for each of the main rivers and creeks in the area of the Project (i.e., Birch Creek, Twin Creek, Buffalo River, Little Buffalo River, Paulette Creek), and hydrological data for small waterbodies and watercourses that are more likely to be in close proximity to groundwater testing locations are negligible or non-existent. Monitoring by PPML during pumping tests to identify if water levels in nearby waterbodies and/or watercourses are changing to the extent that flooding or recession towards drying out may occur, will be completed specifically through observations.

In considering the challenges associated with monitoring the water levels of nearby waterbodies and watercourses during water transfers and the lack of baseline data for any nearby waterbodies or watercourses, PPML proposes to conduct regular observations at identified natural waterbodies (ponds or wetlands) or watercourses near the source and receiver locations using a graduated marker staff (with marker elevation intervals) that has been inserted in the waterbody or watercourse. Observations of water level by field staff will include recording marker staff measurements of water level twice daily and include photographs for field verification, which will commence prior to the pumping tests being initiated. These measurements will be compared to a water level threshold that will be estimated based on allowable water level change, which will be calculated to make sure no more than 10% of the water volume in the waterbody or watercourse is removed. Changes in water level measurements will also be used to derive a rate of change in water level to provide an indication of whether the pumping tests have the potential to result in the water level threshold being reached during the groundwater pumping tests. Observational monitoring in the nearby natural waterbodies and/or watercourses will be extended for up to two days after the pumping tests are complete to identify if there are lag effects to water level.

PPML note that during pumping tests, monitoring wells in the vicinity of the source and receiver locations will be used (see Section 2.1); monitoring data from these wells will be used to supplement the understanding on the effects of the pumping tests to the surrounding groundwater regime, and by association, the nearby surface water environment.

Per the Water Withdrawal Plan (v2.3; PPML 2024), but adjusted to apply to open water conditions, indirect water use from a waterbody (i.e., a water level reduction resulting from groundwater pump testing activities) will be limited to 10% of the volume of that waterbody, which will be determined by available bathymetry and surface area measurements, if available. If bathymetric data are not available, the threshold of the maximum volume of water than can be removed will be calculated by estimation of the volume from the multiplication of the surface area ($m^2$) by 0.1 m, which assumes a water depth of 1 m. This information will be used to set a water level change threshold (i.e., the maximum level of water level reduction that can occur) in the nearby waterbody during the pumping tests and an estimate of rate of water level change.

Should a pumping test be stopped due to the water level in a nearby natural waterbody reaching its withdrawal threshold (i.e., the 10% withdrawal volume limit), PPML would continue to monitor the water level through the recovery period; if the recovery period was limited to three days or less, pumping could resume. Should the recovery take longer than three days, water transfer from the source location would be no longer be considered viable.

# 5.0 Dust Suppression

If required, water for dust suppression on access roads and pads in the area of the Project will be sourced from approved natural waterbodies as permitted for water withdrawal under the Type A Water Licence, including pit waters, listed in the Water Withdrawal Plan (v2.3; PPML 2024). When dust suppression is applied, PPML would adhere to the GNWT's Guidelines for Dust Suppression (GNWT 2013) to make sure that any pit water used for dust suppression does not enter and potentially contaminate waterbodies, including surface and groundwater, and is applied in a manner so that it is retained on the roadway surface.

However, PPML does not consider that site activities in the area of the Project associated with this Type A Water Licence have the potential to generate substantial fugitive dust for a sustained period of time that may present a potential risk to adjacent waterbodies or affect vegetation and wildlife as compared to active mining operations. For example, a substantial portion of the drilling activities and temporary pipeline construction in the area of the Project are planned to be completed during winter conditions. Dust suppression will not be required during winter and spring periods when access roads and distu rbed access areas are snow-covered or wet.

## 5.1 Use of Water for Dust Suppression

When dust suppression is determined to be required in hot, dry summer periods, water remains the most readily available means of controlling dust in the area of the Project. Water sources for dust suppression include natural waters as approved for water withdrawal under the Type A Water Licence or from pit waters around the area of the Project. Water will be applied along roadways and runways through fantail sprayers or spray bars attached to a haul truck or equivalent fitted with a large tank. If water is selected to suppress dust, PPML will use it with a greater frequency near critical areas along the roads (where potential for dust generation is greatest) and will prioritize the use of pit waters over natural sources in less environmentally sensitive areas.

## 5.2 Use of Pit Waters for Dust Control

If pit waters are used as a dust suppression source, PPML would adhere to the GNWT's Guidelines for Dust Suppression (GNWT 2013) to make sure that any pit water used for dust suppression does not enter and potentially contaminate waterbodies. To further mitigate the potential for pit water used for dust suppression to result in environmental impacts, PPML will use available water quality data for pit waters in the area of the Project to identify potential sources of pit waters for dust suppress ion applications. These pit waters will be identified on the basis that their water chemistry remains within CCME acute water quality guidelines for the protection of aquatic life (CCME 2022). Where pit waters are identified for use, PPML will undertake field measurements and sampling for water quality analysis as required for SNP Station 6 in the Type A Water Licence (pit water sources for use in dust suppression) prior to use to confirm the water quality of the pit waters conforms to guidelines; the list of field measurements and water chemistry data required under the SNP for this station is consistent with the list described in Section 3.2.1 and listed in Table 3.2. Measures outlined in the Spill Contingency Plan will be followed with respect to the use of pit waters for dust suppression.

## 5.3 Environmental Mitigations

Watering roads and other Project areas would be limited to ice- and snow free periods (i.e., summer) and only possible during frost-free days. In late spring, considerable sublimation can be expected when the temperatures remain below freezing, which can lead to dry roads and dust potential. If water is applied while the temperature is below freezing, it will turn to ice on the road and pose a safety hazard for travel. Dust suppression using water, or even though use of chemical suppressants, will not be possible at this time of the year.

The volume used for the dust suppression will be recorded based on the number of trucked watered loads and summarized in the annual water licence report.

Specific mitigations to prevent potential environmental harm when using pit water for dust suppression include:

- Application will be avoided (i.e., zero rate of application) along roadways or areas of the project within 20 m of a waterbody (natural or pit water) or sensitive environments (such as wetlands).
- Application will be suspended if precipitation is imminent.
- Application will avoid areas of road that may be subject to flooding or application when precipitation is imminent.
- Where application results in pooling (i.e., a pool of water greater than 1 $m^3$ that is not being immediately absorbed into the vegetation or soils), and drainage from the roadway or other area of the Project, application will cease immediately, and the migration of the drainage observed and reported as per the Spill Contingency Plan. As required, responses and mitigation appropriate to manage the pooling or runoff will be applied (refer to the Spill Contingency Plan).

# 6.0 Reporting

The Water Licence (MV2020L8-0012) reporting tasks associated with the Water Management Plan include:

- The Compatibility Assessment Report
- The monthly SNP Reports
- The Annual Water Licence Report

PPML has developed a reporting template for use in the compatibility assessment, that will include the source and receiver physico-chemical measurements and CoPC concentrations that will include a compatibility evaluation (Appendix G). This report will be issued on completion to the Inspector ten (10) days in advance of the hydrogeological testing for notification of intent to transfer water and as a request for water transfer approval, and to Indigenous Communities.

PPML committed to providing the source water and receiving water locations in SNP reporting (and subsequent Annual Water Licence Report) related to the hydrogeological testing and will provide a unique identifier for each source and receiver location. Monitoring data will be reported based on the unique identifier. Per the Water Licence, PPML will submit data and information required by the SNP, including the results of the approved QA/QC program and any interpretive comments and calculations to the MVLWB and Inspector within thirty (30) days following the month being reported. The monthly SNP reports will include:

- Water volume from source waters used per Part D, Water Use, Condition 3, which is not to exceed 15,000 $m^3$/day.
- Water level measurements in pits and wells during hydrogeological testing per Annex A, Part B, Condition 2(a).

As required under Part B, Condition 19, an Annual Water Licence Report will be submitted to the MVLWB no later than 31 March each year, commencing in 2023. The reporting requirements for the Annual Water Licence Report are provided in Schedule 1, Condition 1 of the Water Licence. These requirements will include reporting on the volumes of water transferred via constructed ditches or pipes, including the volumes moved indirectly through constructed ditches, the estimated volume of water loss during ditch transfer, and any related to maintenance or environmental concerns. Additionally, reporting will cover activities carried out under the proposed Sediment and Erosion Control Plan. PPML will also include in the annual report, as available, a schedule outlining the hydrogeological testing to be completed in the following reporting year (i.e., 1 April to 31 March).

As required under Part B, Conditions 9 and 10, PPML will conduct an annual review of this plan and make any revisions necessary to reflect changes in operations, contact information, or other details. No later than March 31 each year, PPML will send a notification letter to the MVLWB, confirming that this plan has been reviewed and does not require revisions. PPML may propose changes to this plan at any time by submitting a revised plan to the MVLWB, for approval, a minimum of 90 days prior to the proposed implementation date for the changes. PPML will not implement the changes to this plan until approved by the MVLWB.

If the ditch seepage test is conducted to support the ditch usage for the hydrogeological test, as described in Section 3.5, the test results will be included in the subsequent Water Licence Annual Report.

# 7.0 Closure

The intent of this document is to describe the approach to the groundwater testing program and associated monitoring. This version of the plan has been submitted to the MVLWB for approval. Andrew Williams, Environment Manager, PPML, is the main contact for this plan. This exploratory data collection program is intended to close data gaps and further the understanding of the Pine Point Project.

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# APPENDIX A: Conformity Table

## Appendix A

**Table A-1: Conformity Table for Schedule 4 of MV2020L8-0012 (amended July 12, 2024)**

| Conditions | Section in WMP |
|---|---|
| 1. The Water Management Plan referred to in Part F, Condition WATER MANAGEMENT PLAN of this Licence shall include, but not be limited to the following information: | |
| a) Information regarding hydrological conditions: | |
| i. A description of the underlying and surrounding hydrogeology, including appropriate maps and flow diagrams that depict seasonal variations and/or interactions between Groundwater and surface Water; | 1.7.2, future updates of the plan |
| ii. A summary of baseline data including baseline data collected to date, identification of baseline data gaps and a description of methods for filling in baseline data gaps or methods for approximating baseline conditions if necessary; and | 1.7.2 and 1.7.3 |
| iii. A summary of new baseline data collected prior to hydrogeological testing. | Future updates of the plan |
| b) Information regarding using pit water for dust suppression: | 5 |
| i. A description of water quality parameters monitored including physio-chemical parameters, conventional parameters, major ions, nutrients, and total and dissolved metals prior to using pit Water for dust suppression; | 5 |
| ii. A description of how the monitored water quality parameters will be evaluated prior to using the Water for dust suppression; | 5.2 |
| iii. A description of management and mitigation measure used to minimize environmental impact of using pit Water for dust suppression considering the following conditions: | |
| a) Proximity to Water; | 5.3 |
| b) Application rate near sensitive environments; | 5.3 |
| c) Areas of road that may be subject to flooding; | 5.3 |
| d) Application when precipitation is imminent; and | 5.3 |
| e) Response to the Spill if any dust suppressant migrates off the road. | 5.3, Spill Contingency Response Plan |
| c) Information regarding the hydrogeological testing methods: | |
| i. A description, including detailed rationale, of the site-specific hydrogeological testing activities required; | 2.1, 2.1.1, 2.1.2, and 2.1.3 |
| ii. A schedule for the hydrogeological testing, including duration and flow rate; | 2.2 |
| iii. A description of how it will be determined if Drawdown Water will be discharged to the same aquifer or a nearby aquifer; | 2.1 and 3.5 |

**Table A-1: Conformity Table for Schedule 4 of MV2020L8-0012 (amended July 12, 2024)**

| Conditions | | Section in WMP |
|---|---|---|
| iv. | A description of how shutdown periods (e.g., intermittent, seasonal) will impact hydrogeological testing; | 2.1 |
| v. | The method for developing and validating the total dissolved solid concentration and specific conductivity relationship; | 3.2.5 |
| vi. | The method for developing depth-average total dissolved solid concentrations, including the number and depth of samples at the Drawdown and Discharge pits; | 3.2.6 |
| vii. | A description of each hydrogeological testing method including Drawdown and Discharge locations and equipment required; | 2.1, 2.1.1, 2.1.2, and 2.1.3 |
| viii. | Detailed description of the water quality compatibility assessment for each testing method, including the following: | |
| a) | The method for developing the water quality compatibility criteria; | 3.4 |
| b) | The Water compatibility assessment process including flow charts; and | 3.4, Appendices B, C, D and E |
| c) | Rationale that the pit compatibility assessment process meets the objectives listed in Part F, Condition OBJECTIVE – WASTE AND WATER MANAGEMENT. | 3.4 |
| d) Information regarding pits with chemocline: | | |
| i. | The method for identifying chemocline in the pits; | 3.2.3 |
| ii. | The method for developing and validating the total dissolved solid concentration and specific conductivity relationship; | 3.2.5 |
| iii. | The method for developing depth-average total dissolved solid concentrations, including the number and depth of samples at the Drawdown and Discharge pits; | 3.2.6 |
| iv. | The method for developing the water quality compatibility criteria; and | 3.4 |
| v. | The pit compatibility assessment process including flow charts. | 3.4, Appendices B, C, D and E |
| e) Information regarding open pits and constructed ditches: | | |
| i. | Description of the method for determining fish presence at Drawdown and Discharge locations; | 3.3 |
| ii. | Description of hydrogeological testing methods in fish bearing open pits and constructed ditches; | 3.2, 3.4.3, 3.5 |
| iii. | Description of toxicity test method and its associated compatibility criteria for discharging in fish-bearing open pits and constructed ditches; | 3.4.3 |
| iv. | The compatibility assessment process including flow charts in fish bearing open pits and constructed ditches; and | 3.4, Appendices B, C, D and E |
| v. | Description of inspection, maintenance, and operation of constructed ditches to prevent structural failure. | 2.1 and 4 |

**Table A-1: Conformity Table for Schedule 4 of MV2020L8-0012 (amended July 12, 2024)**

| Conditions | Section in WMP |
|---|---|
| f) Information regarding monitoring: | 3.5 |
| i. A description of Water quality parameters monitored at Drawdown and Discharge locations including physio-chemical parameters, conventional parameters, major ions, nutrients, and total and dissolved metals; | 3.2.1 |
| ii. Identification, with rationale, of parameters of concern that should be used as indicators of potential impacts from Project-related activities on the aquatic Receiving Environment; | 3.4.2 |
| iii. A description of monitoring protocols, methodologies, parameters, and frequencies specific to each type of monitoring identified prior to, during, and after the hydrogeological testing, including but not limited to, the use of constructed ditches; | 3.5 |
| iv. A description of monitoring to confirm and update, as necessary, the total dissolved solids and conductivity relationship; | 3.2.5 |
| v. A description of groundwater monitoring from a nearby existing groundwater well before and after hydrogeological testing via constructed ditches to detect and discuss any changes in water quality due to seepage from the constructed ditches. | 3.5 |
| vi. Monitoring to preventing overtopping of constructed ditches to enter any receiving water; | 3.5.1 |
| vii. A description of the quality assurance and quality control measures followed for each monitoring type; | 3.5 |
| viii. Linkages to other monitoring programs required under this Licence; and | 1.5 |
| ix. Any other information about the monitoring that will be performed to meet the objectives listed in Part F, Condition OBJECTIVE – WASTE AND WATER MANAGEMENT. | 3.2.4 and 3.6 |
| g) Information regarding contingency options including: | |
| i. A description of contingency options including, but not limited to the following: | 4 |
| a) for hydrogeological testing and the compatibility criteria assessment, should the compatibility criteria not be met for a proposed Water Discharge; and | 4 |
| b) contingencies and mitigations if a constructed ditch structurally fails; | 4 |
| ii. Any criteria and events triggering the use of each contingency option; | 4 |
| iii. A description of the series of events and sampling required to use the proposed contingency option; and | 4 |
| iv. Any other information required to describe the Water management of the contingency options. | 4 |
| h) Information regarding the Response Framework that will be implemented during the hydrogeological testing to link the monitoring results to those corrective actions necessary to ensure that the objectives referred in Part F, Condition OBJECTIVE – WASTE AND WATER MANAGEMENT of this Licence are met, including: | 3.6 |

**Table A-1: Conformity Table for Schedule 4 of MV2020L8-0012 (amended July 12, 2024)**

| Conditions | Section in WMP |
|---|---|
| i. Definition, with rationale for Action Levels applicable to the hydrogeological testing; and | 3.6 |
| ii. For each Action Level, a description of how exceedance of the Action Level will be assessed, and which types of actions may be taken if the Action Level is exceeded. | 3.6 |

**Table A-2: Conformity Table for MVLWB Reasons for Decision from May 30, 2022**

| Item | Section in WMP-1.2 |
|---|---|
| Include the narrower depth intervals (e.g., 0.3 m) if the pit Water is less than 5 m, especially if any thermal or chemical stratification is observed in a revised Water Management Plan. | 3.2.1 |
| Provide the appropriate maps to illustrate the direction of groundwater movement, seasonal variation, and interaction with surface water in the next iteration of the Plan. The update shall include pressure sensor data collection to evaluate seasonal variability in Groundwater levels. | 1.7.2 |
| Update the Spill Contingency Plan to specially reference the dust suppressant water and reference section 6.2 of the Water Management Plan. | Not specific to the Water Management Plan |
| Revise the Water Management Plan to cross reference the Spill Contingency Plan regarding the dust suppression water. PPML shall include the details recommended by GNWT-ENR, including “the specific volume or observed drainage condition of dust suppressant needed to trigger a spill response or specific locations off the roadways or Project areas where dust suppressant is observed.” | 5 |
| Add the injection and receiver wells to the “Water transfer to the receiver pits” component in Table 5.1 | 4, Table 4.1 |
| Include the water level at the source pit approaching levels too low to support fish habitat, aka “10% change in pit water volume”. | 3.4.3 |
| Include the DFO protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories | 3.4.3 |
| Specify the Water level change to be less than 10% for fish bearing pits; and At least 2 m of water will remain in the pit and pits will not be dewatered | 3.4.3 |
| Revise Table 5.1 to state that pumping will be ceased as soon as the TDS concentration in the source Water is higher than 30% than the receiver Water | 3.6, Table 3.3 |
| Revise Table 4.3 to add “OR” between the TDS and COPC statement in the Red adaptive management. | 3.6, Table 3.3 |
| Revise Table 5.1 where it states “if risk is deemed acceptable” to “if risk can be rationalized” per the compatibility assessment. | 4, Table 4.1 |

| Item | Section in WMP-1.2 |
|---|---|
| Provide a map showing the pit lake locations and any existing wells (if any) in a revised Water Management Plan in order to provide an idea where the tests may be and easy reference to the selected test location when the report required by the Licence prior to the test. | 2, Figure 2 |
| Provide an update on the schedule of hydrogeological testing when submitting the Annual Report that is due by March 31st each year | 6 |
| Include commitment to provide the compatibility assessment results 30 days prior to the hydrogeological testing in a revised Water Management Plan. | Modified to ten (10) days; 3.4.4, and 6 |
| Include the SNP requirements to monitor for three to four days after the hydrogeological testing is completed. | 3.5.2 |
| Provide the maximum flow rate in a revised Water Management Plan, and then state that the measured flow rate will be reported in the SNP Report. | 2.1.1, 2.1.3, and 6 |
| Include the requirement of Licence MV2020L8-0012 Part F, Condition TESTING BEFORE DISCHARGE – HYDROGEOLOGICAL TESTING, the SNP report, and Water Licence Annual Report requirements, and the annual update submission as per Licence MV2020L8-0012, Part B, Condition REVISION. | 6 |
| Explicitly state that the bathymetry measurement on pits prior to the hydrogeological testing. | 3.2.1 |
| Include the maximum authorized volume in accordance with Licence MV2020L8-0012 Part D, Condition WATER SOURCE AND MAXIMUM VOLUME. | 2.1.1, 2.1.3, and 6 |
| Revise Table 5.1 to state that only Inspector authorization is required when implementing contingency. PPML to remove text from Table 5.1 to require MVLWB approval as a response action. | 4, Table 4.1 |
| Clarify that the cessation of pumping activity will immediately halt the Water level increase, and the cessation of pump occurs the instant water reaches or broaches the 1 m threshold. | 4, Table 4.1 |
| Revise the Water Management Contingencies to better define notable change, the trigger, and the monitoring methods to access the criteria. This revision could be distributed for a focussed review. | 4, Table 4.1 |

**Table A-3: Conformity Table for MVLWB Reasons for Decision from August 8, 2022**

| Item | Section in WMP-1.2 |
|---|---|
| Revise Water Management Plan to include how they will differentiate a notable change in water levels and provide a clearer explanation when referring to “normal conditions”. | 4 |
| Revise their Water Management Plan to include how they will measure and document water levels to ensure extremes of flooding and drying of watercourses/waterbodies does not occur, and to ensure that no more than 10% of the water body or water course is removed. | 4 |
| Revise their Water Management Plan to include their field methods for verifying that adjacent waterbodies will be limited to 10% water use. | 4 |

| Item | Section in WMP-1.2 |
|---|---|
| Revise their Water Management Plan to include the information stating that the monitoring and collection of data will be extended for up to two days after the pumping tests are complete to identify if there are lag effects to water level. | 4 |
| Revise their Water Management Plan to include what their procedure is if a pumping test is stopped due to water level in a nearby natural water body reaching its withdrawal threshold | 4 |

**Table A-4: Conformity Table for MVLWB Reasons for Decision from April 25, 2024**

| Item | Section in WMP-1.4 |
|---|---|
| Clarify fish rescue techniques and the proposed fishing method | 4 (Table 4.1) |
| Reference water transfer by piping as “direct transfer”<br>Reference water transfer by drainage ditches as an “indirect transfer” | 2.1 |
| Inspect ditches before hydrogeological testing to document habitat and describe mitigations if there are any obstructions or areas of erosion risk | 2.1 |
| Involve Indigenous Governments to:<br>– assess proposed water transfer locations, mitigations, and response framework<br>– Participate in monitoring, if necessary<br>– Relocate fish, if necessary | 2.1, 3.3, 3.5.2.1 |
| Notify Indigenous Governments when:<br>– proposing water transfers before conducting the compatibility testing<br>– Determining if fish are present | 2.1, 3.3 |
| Clarify the flow monitoring procedure described in Appendix A in response to GNWT Comment 13 during the public review of the Application | 6, Appendix A |
| Provide a response framework to include triggers and responses to prevent overtopping | 4 (Table 4.1) |
| Include the following response actions if yellow action levels are triggered:<br>– Require rush analysis for contaminants of potential concern<br>– Conduct trend analysis of contaminants of potential concern with follow-up monitoring data | 3.6 |
| Include in the following response actions if action levels for “breach of ditch banks” are triggered:<br>– Confirm the effectiveness of all repairs prior to resuming pumping<br>– Monitor the effectiveness of all repairs during pumping | 4 (Table 4.1) |
| Provide the median and mean of total dissolved solids concentrations in surface water | 3.4.1 |
| Define wet or saturated soils and use the Canadian Wetland Classification System to classify wetland habitats | 2.1 |
| Include turbidity and total suspended solids for all compatibility testing whether there is fish in the source and receiving locations (including constructed ditches) | 3.5.2 |

# APPENDIX B: CEP Hydrogeological Testing and Monitoring Protocols and Standard Operating Procedures and Monitoring Construction Ditches During Hydrogeological Pumping Tests to Prevent Overtopping SOP

# APPENDIX B – HYDROGEOLOGICAL TESTING AND MONITORING PROTOCOLS

## Protocol 1 - Constructed Ditch Flow Monitoring

### February 2025

### Details On Procedures

A member of Hydro-Resources Inc. (HRI) staff will be present full time during the pump tests. HRI staff will oversee associated monitoring as described for the groundwater pump testing. HRI will also monitor the associated water level and flow monitoring in constructed ditches where they are used to transfer water between the source and the receiver. Constructed ditches that have been extensively eroded, resulting in substantial hydrological connections to the surrounding environment, will not be selected for testing.

### Pump test:

At least 3 days prior to each pump test, HRI staff will monitor background water levels measured at the point of extraction (i.e., extraction pit or well) as well as at the receiving location (e.g., receiving pit or injection well). During the pump tests, the water level measurements will be done using manual measurements and/or pressure transducers, and at surrounding existing piezometers (as available). The piezometers included in the monitoring plan are currently being installed and will be utilized as available as drilling at Pine Point is ongoing.

Pressure transducers will be installed in the source and receiver and used to provide high frequency water level data. During the pump tests, water level measurements will be completed at a varying frequency. The measurement frequency at the source and receiver will be undertaken on a logarithmic time scale, meaning that measurements will be completed at a higher frequency at the beginning of each pump test and reducing in frequency as the pump test progresses. Generally, logarithmic scale measurements imply 10 measurements for every cycle of time, such as measurements every 10 minutes between 10 and 100 minutes after pumping has been initiated, every 100 minutes from 100 to 1,000 minutes afters pumping has been initiated, and so on as needed. Manual water level measurements will be completed periodically in the source and receiver over the duration of the pump test as a quality assurance (QA) check (i.e., approximately once or twice a day depending on access).

At the end of a pump test, water level recovery at the source will be measured by the pressure transducers (supplemented with manual QA measurements) over a period of one (1) to three (3) days, depending on field review of results. The frequency of the recovery measurements will be completed in a similar time scale as the pump test measurements (i.e., higher frequency immediately following the cessation of the pump tests and reducing the measurement frequency over time).

### Constructed Ditch Flow Measurements:

Surface water flow rates will be measured at a number of locations along the constructed ditch being used for water transfer between the extraction point (source pit or well) and receiving point (receiver pit or well; recognizing that a source pit will only be pumped to a receiver well) to establish potential water loss to the surrounding till formation during transfer. These measurements would also be used to verify and supplement the accuracy to the stage-discharge rating curve when water elevation varies during hydrological testing. The total number of stations will be dependent on the length of the constructed ditch being used but would include locations at the start and end of the constructed ditch, and mid-way along the ditch (if less than 3 km long); for ditches greater than 1.5 km long, there will be monitoring stations every 1.5 km. Due to potential uncertainty in the measuring process, the proposed criterion to end a pump test due to water loss will be if it is determined that 40% of water is lost along the total length of the constructed ditch during the pumping process once the water transfer reaches the discharge point along the constructed ditch.

Water transferred to a constructed ditch during the hydrogeological testing is not expected to experience substantial seepage losses along the length of the ditch. This expectation is supported by observations of standing water present in a large proportion of the constructed ditches across the Project area. While some minor seepage losses are anticipated during pumping/water transfer, a 40% volumetric loss relative to the initial pumped water volume at the start of the ditch is used as a trigger or threshold to identify ditch failure. This 40% loss threshold is considered appropriate for indicating substantial losses due to failure in the constructed ditch, whether through seepage or a breach in the ditch channel. It accounts for natural gains and losses in the ditch resulting from the pumped water transfers. Consequently, if a pumped water loss of 40% is detected, the pumping test is halted. This threshold is applied along the entire length of the constructed ditch used for water transfer.

The procedure to monitor surface water flow in constructed ditches is as follows:

1. Discharge measurement sections will be established along the length of each ditch: one at the upstream end of the reach, one at the downstream end of the reach. If the ditch is more than 3 km long, intermediary stations will be established every 1.5 km.

   At each location, a transverse cross section of the ditch will be surveyed prior to the commencement of the testing. A visual inspection of the ditches will be undertaken before use to determine if there is potential for leaks or erosion (e.g., identifying any low-lying ditch channels). The bank will be built up where necessary to prevent leaks, overtopping, or to direct the water along the required path. Where there is a fork in a ditch, the water will be directed on the desired path by placing earthen berms in ditch to direct the water. These berms will be removed after the test is completed.

   Where the ditch must be repaired to allow water transfer, monitoring will include these areas during pumping to confirm the effectiveness of the earthworks.

2. Flow will be measured using dilution gauging with a tracer.

   i. A sodium fluorescein tracer will be injected at constant flow rate over a defined period at the upstream end of the constructed ditch.

ii. The tracer concentration will be measured in a sequential series from upstream to downstream as close in time as reasonably practical in the field using a fluorescein detector.

The tracer test will allow for flow rate calculations at each monitoring station. PPML will generate a regression curve based on the surveyed transverse section, the tracer test flow rate, and mathematical equations of Manning and Strickler using a numerical approach. This approach will generate a flow rate/level curve where flow rate can be reliably estimated from the water level measurement. The tracer test is only required once since a rating curve can be interpolated based on the surveyed shape of the transverse section of the ditch at the monitoring location. Once the tracer test is completed, a pressure probe will be used at the monitoring location to measure the variation of the water elevation in real-time. The water elevation will be integrated into the equation of the regression curve to obtain the flow rate over time.

3. Any losses below 40% of the pumped volume during the water transfer through the constructed ditch will not impact the tracer test.

4. Corresponding water level measurements (manual and/or pressure transducer) will be collected at each monitoring location to estimate flow rates. Pressure transducers will be installed in the constructed ditch at least two (2) weeks ahead of the pump test to obtain a short-term background water level database. Water level measurements will be collected on 5-minute intervals.
5. A stage – discharge rating curve will be established for the constructed ditch using Computational Fluid Dynamics (CFD) software or analytical equations. Continuous flow rates will be estimated from continuous water level measurements at 5-minute intervals using the stage – discharge rating curve. .

Flow monitoring data derived from these methods and observations and measurements collected during direct or indirect water transfers using pipes or constructed ditches, respectively, will be reported in the Annual Water Licence Report.

## Supplemental Note:

- In advance of using the constructed ditch for water transfers during pump testing, PPML on-site personnel will visually monitor the ditch to determine if any fish are present. If fish are present in the constructed ditches prior to the water transfer activity, compatibility testing of the ditch water will be conducted to compare it with the source and receiving waters before hydrogeological testing begins.

Hydro-Ressources Inc.

Michael Verreault, ing., M.Sc.A.

Hydrogéologue - President


**LEGEND**

HIGHWAY

LOCAL ROAD

RAILROAD

TRANSMISSION LINE

GENERAL PROJECT LOCATION

**2022 PUMP TEST**

TEST01

TEST02

TEST03

TEST04

0 10 20

1:250,000 KILOMETRES

**REFERENCE(S)**

IMAGERY COPYRIGHT © 20200622 ESRI AND ITS LICENSORS. SOURCE: VIVID, MAXAR. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 11N DATUM: NAD83

CLIENT
PINE POINT MINING LTD.

PINE POINT
MINING LIMITED

PROJECT
WATER MANAGMENT PLAN

TITLE
**LOCATION PLAN FOR PROPOSED PUMP TESTS**

CONSULTANT

wsp

| | |
|---|---|
| YYYY-MM-DD | 2023-07-11 |
| DESIGNED | HG |
| PREPARED | NO |
| REVIEWED | JF |
| APPROVED | AW |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 19125747 | | 0 | 1 |


**LEGEND**

HIGHWAY

RAILROAD

TRANSMISSION LINE

**2022 PUMP TEST**

TEST01

0 0.5 1

1:15,000 KILOMETRES

**REFERENCE(S)**

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PROJECTION: UTM ZONE 11N DATUM: NAD83

CLIENT
PINE POINT MINING LTD.

PROJECT
WATER MANAGMENT PLAN

TITLE
**PUMP TEST 01 FROM DITCH TO O556 AREA DRILL HOLE**

CONSULTANT

| | |
|---|---|
| YYYY-MM-DD | 2023-07-11 |
| DESIGNED | HG |
| PREPARED | AM |
| REVIEWED | JF |
| APPROVED | AW |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 19125747 | | 0 | 2 |

PATH: I:\2019\19125747\Mapping\Products\Hydrology\WaterManagmentPlan\19125747_Fig2_Pump_Test_01_from_Ditch_to_O556_Area_Drill_Hole_2022_Rev0.mxd PRINTED ON: 2023-07-11 AT: 1:19:22 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0


**LEGEND**

HIGHWAY

RAILROAD

TRANSMISSION LINE

**2022 PUMP TEST**

TEST02

0 0.5 1

1:15,000 KILOMETRES

**REFERENCE(S)**

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PROJECTION: UTM ZONE 11N DATUM: NAD83

CLIENT

PINE POINT MINING LTD.

PROJECT

WATER MANAGMENT PLAN

TITLE

**PUMP TEST 02 N81 PIT TO N81 DRILL HOLE**

CONSULTANT

| | |
|---|---|
| YYYY-MM-DD | 2023-07-11 |
| DESIGNED | HG |
| PREPARED | AM |
| REVIEWED | JF |
| APPROVED | AW |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
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25mm


**LEGEND**

**2022 PUMP TEST**

TEST03

0 0.5 1

1:15,000 KILOMETRES

**REFERENCE(S)**

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PROJECTION: UTM ZONE 11N DATUM: NAD83

CLIENT

PINE POINT MINING LTD.

PINEPOINT MINING LIMITED

PROJECT

WATER MANAGMENT PLAN

TITLE

**PUMP TEST 03 PIT A55 TO PIT X56**

CONSULTANT

wsp

| | |
|---|---|
| YYYY-MM-DD | 2023-07-11 |
| DESIGNED | HG |
| PREPARED | AM |
| REVIEWED | JF |
| APPROVED | AW |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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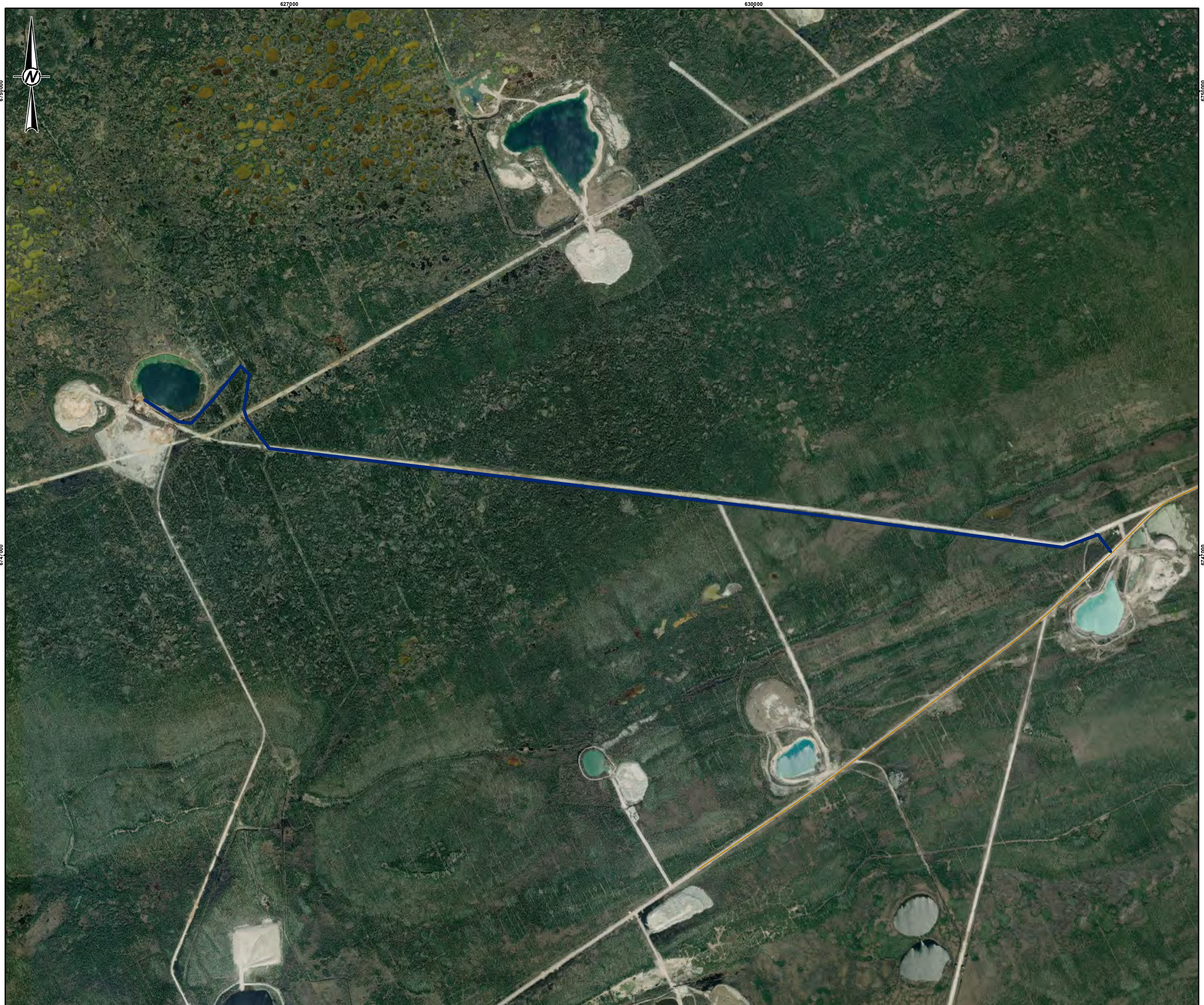


**LEGEND**

LOCAL ROAD

**2022 PUMP TEST**

Test04

0 0.5 1

1:25,000 KILOMETRES

**REFERENCE(S)**

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PROJECTION: UTM ZONE 11N DATUM: NAD83

CLIENT

PINE POINT MINING LTD.

PINEPOINT MINING LIMITED

PROJECT

WATER MANAGMENT PLAN

TITLE

**LOCATION PLAN FOR PROPOSED PUMP TESTS**

CONSULTANT

wsp

| | |
|---|---|
| YYYY-MM-DD | 2023-07-11 |
| DESIGNED | HG |
| PREPARED | AM |
| REVIEWED | JF |
| APPROVED | AW |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 19125747 | | 0 | 5 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

**Standard Operation Procedure**

Monitoring **Construction** Ditches During Hydrogeological Pumping Tests to Prevent Overtopping

## PURPOSE

This SOP outlines the procedures for monitoring constructed ditches when they are used for water conveyance between a source and receiver location during hydrogeological pumping tests to limit the potential for overtopping. Overtopping could result in erosion, damage to the ditch structure, and safety risks. This procedure will lead to early detection and prevention of potential overtopping by maintaining water levels within safe limits during the water transfer.

## SCOPE

This SOP applies to all personnel involved in the hydrogeological pumping tests in areas where constructed ditches are used to convey water between a source (pit or well) to a receiver (pit or well). This procedure is relevant for preventing overtopping of the constructed ditches, which could compromise test results, infrastructure integrity and surrounding environment, through use of observations and water flow controls and management, as needed.

## RESPONSIBILITIES

Site Supervisor: Ensures that the hydrogeological pump tests are conducted in compliance with this SOP and monitors personnel adherence, and the water management plan.

Technician/Field Engineer: Conducts regular checks of water levels, bank stability, and overtopping risks during the tests.

Health and Safety Officer: Ensures safety protocols are followed during monitoring to prevent hazards to personnel.

## EQUIPMENT AND MATERIALS

- Water level gauge/staff gauge (to be installed in the ditches prior to the pumping tests)
- Tape measure
- Markers or flags for critical water level thresholds
- Water pump (for emergency drainage)
- Sandbags or other temporary barrier materials (for immediate response)
- Personal Protective Equipment (PPE): hard hat, high-visibility vest, safety boots, and gloves

## Procedure

**Preparation and Setup**

1. **Initial Inspection**: Conduct a visual inspection of the ditch banks to identify any weak spots or erosion-prone areas.
2. Install Water Gauges: Position water level gauges at strategic points along the ditch, particularly at sections with known weaknesses or constriction points. Mark critical levels for early warning, precautionary, and maximum allowable water levels.
3. Determine Flow Rates: Set up equipment to measure the water flow rate entering the ditch, ensuring it does not exceed the bank's capacity.
4. **Establish Communication**: Set up a communication protocol between field teams and the control center for immediate reporting of water level changes.

Monitoring During Hydrogeological Pumping Tests

5. **Continuous Monitoring: Monitor** water levels at regular intervals using installed water gauges and visual observations.
6. **Document Observations**: Log water levels and any signs of bank instability or erosion.
7. **Critical Water Levels**: If water levels approach approximately 0.3 m of the ditch channel surface, alert the Site Supervisor and reduce water flow if necessary.
8. Bank Stability Check: During each monitoring interval, check for signs of erosion, cracks, or slumping along the ditch banks.
9. Adjust Water Flow: If water levels are rising rapidly or if instability is noted, adjust the water flow (pumping rates) to reduce the load on the ditch.

**Overtopping Prevention and Response**

10. Early Warning Response: If the water level exceeds the 0.3 m threshold, immediately halt the hydrogeological pumping test and monitor the water level response. Follow site-specific response actions and protocols as outlined in the Water Management Plan
11. Emergency Drainage: Immediately halt the pumping test. If overtopping is imminent, deploy sandbags or other barriers in the vicinity of the overtopping risk to limit spill. Follow site-specific response actions and protocols as outlined in the Spill Contingency Plan.
12. **Incident Reporting**: Immediately report any incidents of overtopping or bank failure to the Site Supervisor and if safety is compromised.

Post-**Test Actions**

13. **Final Inspection**: After the hydrogeological pumping test is complete, conduct a final inspection of the ditch banks for any signs of erosion, slumping, or damage.

14. **Documentation**: Prepare a detailed report documenting water levels, any observed bank instability, actions taken to prevent overtopping, and the overall condition of the ditch post-test.
15. **Restoration/Reclamation**: If necessary, initiate repairs to any damaged sections of the ditch to restore its integrity.

**Safety Considerations**

- Always wear PPE while monitoring or working near the ditch.
- Avoid standing directly on the edge of the ditch during the hydrogeological pumping tests, especially during periods of high-water flow.
- Be aware of weather conditions that may affect water levels (e.g., heavy rain).

References

Erosion and Sedimentation Plan

Spill Contingency Plan

Water Management Plan

Manufacturer Guidelines for Water Level Gauges and Pumps

Revision History

- Version 1.0 (Date: 3 February 2025)

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Téléphone : 760-619-6221
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# APPENDIX B – HYDROGEOLOGICAL TESTING AND MONITORING PROTOCOLS

## Protocol 2 – Seepage Evaluation Testing and Monitoring

December 2024

### Background and objectives

Pine Point Mining Limited (PPML) is currently preparing a Feasibility Study (FS) and Developers Assessment Report (DAR) for the Pine Point Project (PPP). Groundwater is an important part of the FS and DAR as the predicted flow rate from dewatering wells is substantial. For the current plan to be successful, ditches must be utilized to discharge water coming from dewatering wells.

PPML aims to determine the potential seepage from the ditches during construction and operation. Seepage could alter water quality in the surrounding area, and seepage tests are required to assess the amount of water reaching groundwater based on an increase in head conditions in some ditches.

The testing consists of isolating a defined length (150 m) of a constructed ditch with two temporary earth berms and filling it with water from the same ditch. Changes in water elevation will help determine the seepage rate and its effect on surrounding water levels.

Once field results are obtained, a small-scale numerical flow model will be prepared to assess the potential impact on the surrounding groundwater. This flow simulation is not part of the current protocol, which only aims to address the field testing.

### Protocol

The proposed protocol for assessing seepage and its impact on surrounding groundwater is the following:

- Selecting 10 locations to test section of ditches approximately 50 m long
    - Testing 5 locations out of those 10 selected locations.
    - The additional potential locations provide flexibility to accommodate field variable conditions.
    - Ideally, and depending on access, ditches to be tested should be distributed across the property to achieve better geographical representativeness.
    - Water level should allow for a minimum water increase of 50 cm without overflowing above the edge of the ditch.

  - Measured flow rate prior to testing must be under 250 usgpm to allow bypassing of the tested section.
  - Section of the ditch must be well defined with banks in place and with a U or a V shape to better contain water within the ditch during testing.
- Accessing site and installing overburden piezometers
  - Piezometers will allow for comparison of the piezometric elevation with the elevation of water in the ditch before and during testing.
  - Digging holes with a backhoe or a shovel.
  - 10 ft deep is the targeted depth.
  - Installing a PVC standpipe of 10 ft long with the 3 ft lower section screened
  - Fill the hole with regular sand (less than 10% fines) up to 1 ft from the top
    - If there is no sand available at site, a filter pack of 8'' diameter can be built, and natural soil can be utilized to fill the excavation. Sand would be supplied with bags.
  - Cap the upper section with clay, if available.
    - If clay is not available, install a 6-inch thick layer of cement to cap the hole then cover it with 6 inches of natural soil, forming a dome to avoid water seeping into the to avoid seepage into the piezometer area.
  - Measure the water table elevation in the piezometers and ensure stability with 3 measures taken within 1 hour.
  - Install 2 piezometers along the tested length of each ditch.
    - They should be positioned within 5 m of the ditch.
    - Location to be determined based on site access.
  - Install a pressure sensor in both piezometers to measure continuous variations of water table.
    - Program the sensor to log every 10 minutes, at least 2h before initiating the test, and continue for 72h after initiating the test.
    - Install an atmospheric pressure sensor with same programming setup as a control.
- Assess pretest average flow in the ditch
  - To assess feasibility of bypassing water during testing.
  - Mark a 30 m length along the ditch for time of travel measurement.
  - Inject 1 g of uranine into the ditch (pulse release).
  - Measure the average time required to travel the 30 m distance to calculate flow velocity with a fluorometer.
  - Measure the approximate cross-sectional area to calculate the flow rate.
  - If flow rate is calculated above 250 usgpm, the section of the ditch must be eliminated.
- Setup a surface engine driven pump to maintain flow downstream of the test berms.
  - The pump will be utilized to bypass the tested section but also to fill the tested area at the beginning.
  - Use a suction pipe and fish screen for suction upstream of the testing area.
  - Discharge 60 m downstream of the testing area (10 m from downstream berm).
  - The pump must be at least 250 usgpm capacity.

  - Use a 4’’ diameter flexible hose for the discharging line.
  - Suction pipe must be rigid.
  - Install a container under the pump to prevent spillage during gas/diesel filling. Ensure a spill kit and fire extinguisher are available at site, along with gas/diesel tank.
  - Equip the Pump with a ball valve at the outflow to adjust the flow as evaluated in the step above.
- Performing a local drone survey
  - Drone survey will allow for better geometry definition of the testing area.
  - Set the drone to generate 2 axis photo survey in Pix4d Capture for the area of interest.
  - Download photos
  - Align photos with Agisoft Metashape to confirm proper alignment.
- Closing ditch section to initiate testing
  - Use a Backhoe to build an earth dam with material (soil) from the surrounding area
    - The first dam must be the one located upstream.
  - Install a turbidity curtain 2 m downstream of the dam
    - The curtain must be a Type 1 according to the US Department of Transportation.
    - For example, RTTxPVC18PSE-L model from Terraquavie or equivalent would be suitable.
  - Building the dam
    - Dams should be at least 3 m wide, no more than 2.5 m high and at the same elevation as surrounding ground surface.
    - Slope should be 1:1.
    - The placement of material should be as quick as possible to avoid sediments from spreading.
    - Installing one pressure sensor into the testing area of the ditch, programed to log data every 10 minutes (same programming as the piezometers).
    - Install a solid ruler (staff gauge) to perform manual readings of water level changes.
  - Building a downstream dam 50 m away
    - Following same procedures as for the upstream dam.
    - Ensure the Turbidity curtains remain in place at all times.
- Initiate the test
  - Use the engine driven pump to fill the enclosed section of the ditch with water as high as possible without overflowing.
  - Once the enclosed section is full, divert water from upstream section to the downstream section bypassing the enclosed section.
    - Adjust flow rate to maintain original levels as much as possible outside of the enclosed section.
    - Maintaining pump running and supervising flow, oil change, gas level, etc.

    - The Test will last for 72 h, starting when the pump is filling the enclosed section.
  - During the Test:
    - measure water level in the piezometers and the ditch every 10 minutes over the first 8 h.
    - Measure every hour during daylight on the second and third day.
    - Run seepage meter measurements for both dams 3 times a day to calibrate seepage rate within the ditch section.
- Ending test
  - Recover the probes in the ditch and piezometers plus the atmospheric probe.
  - Remove the downstream dam.
  - Remove the upstream dam.
  - 24 h after removing both dams, remove the turbidity curtains.
  - Download data and save data in proper folder.
  - Move to next testing location.

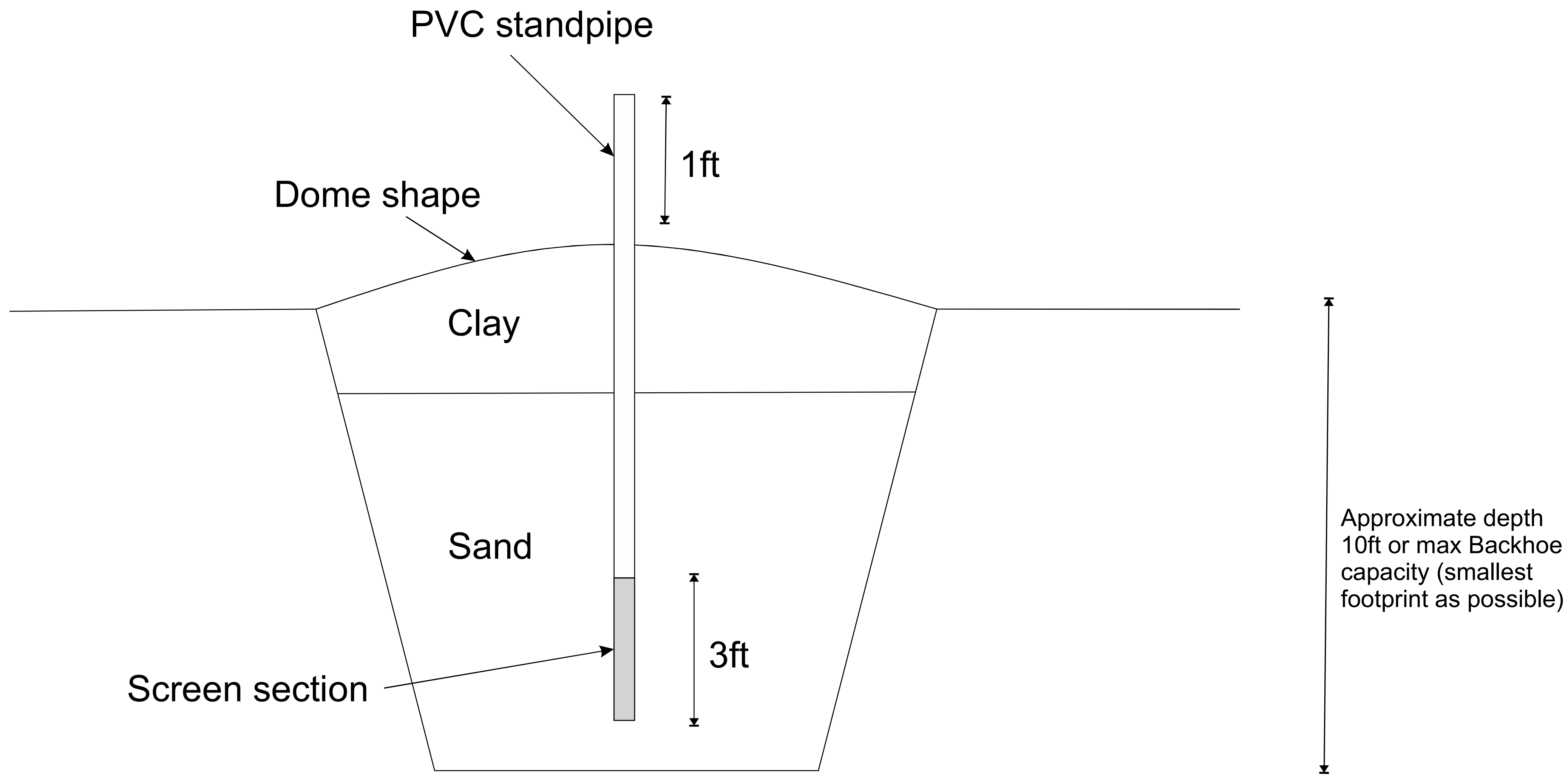
The following figures are in support of this protocol:

- Figure 1: Piezo Installation
- Figure 2: Ditch sketch
- Figure 3: Proposed locations

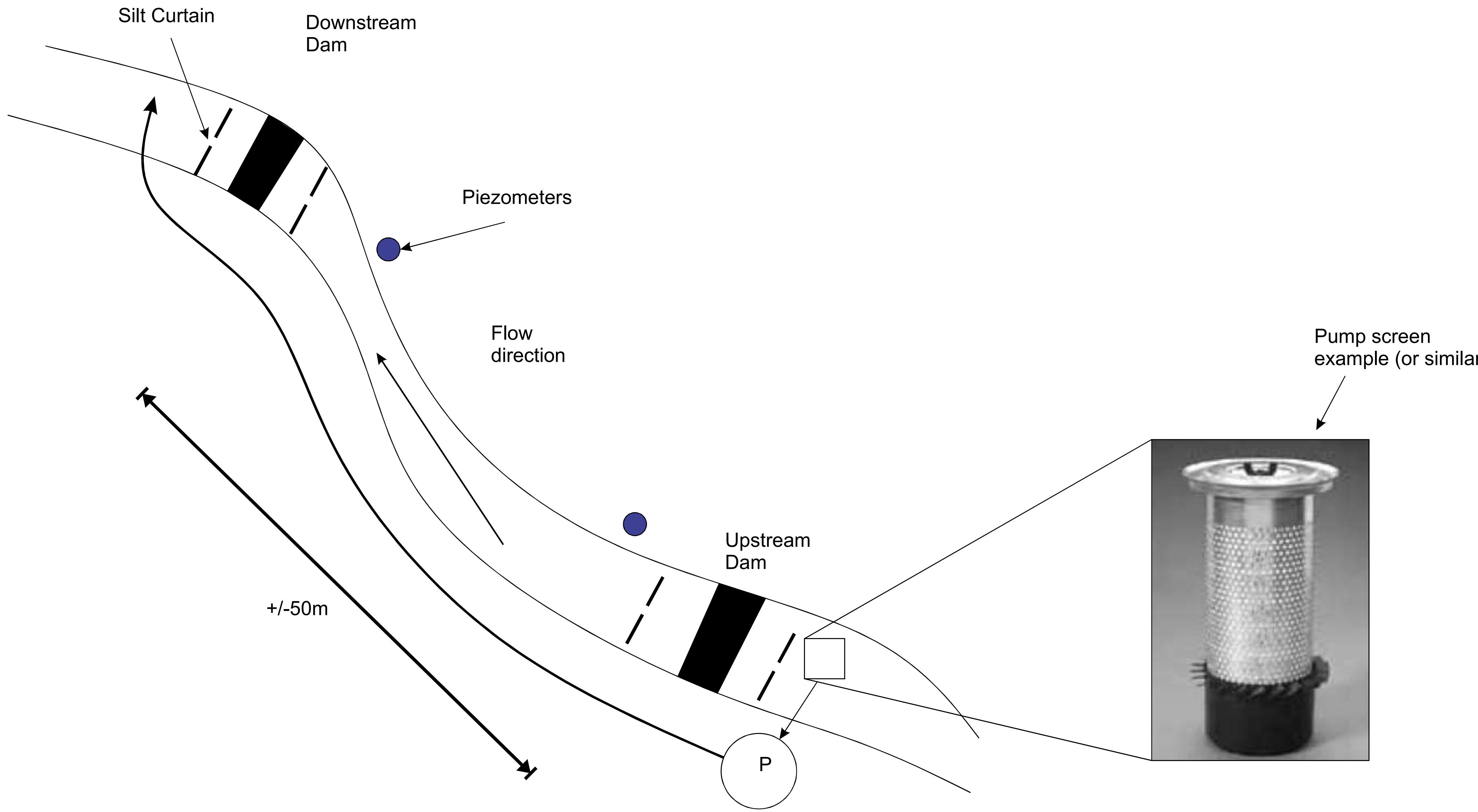
Please note that the duration of the test is set to a maximum of 7 2h. Therefore, if the water level within the enclosed section reaches an initial elevation in less than 72h, this will end up the test.

Hydro-Ressources Inc.

Michael Verreault, ing., M.Sc.A.
Hydrogéologue - Président

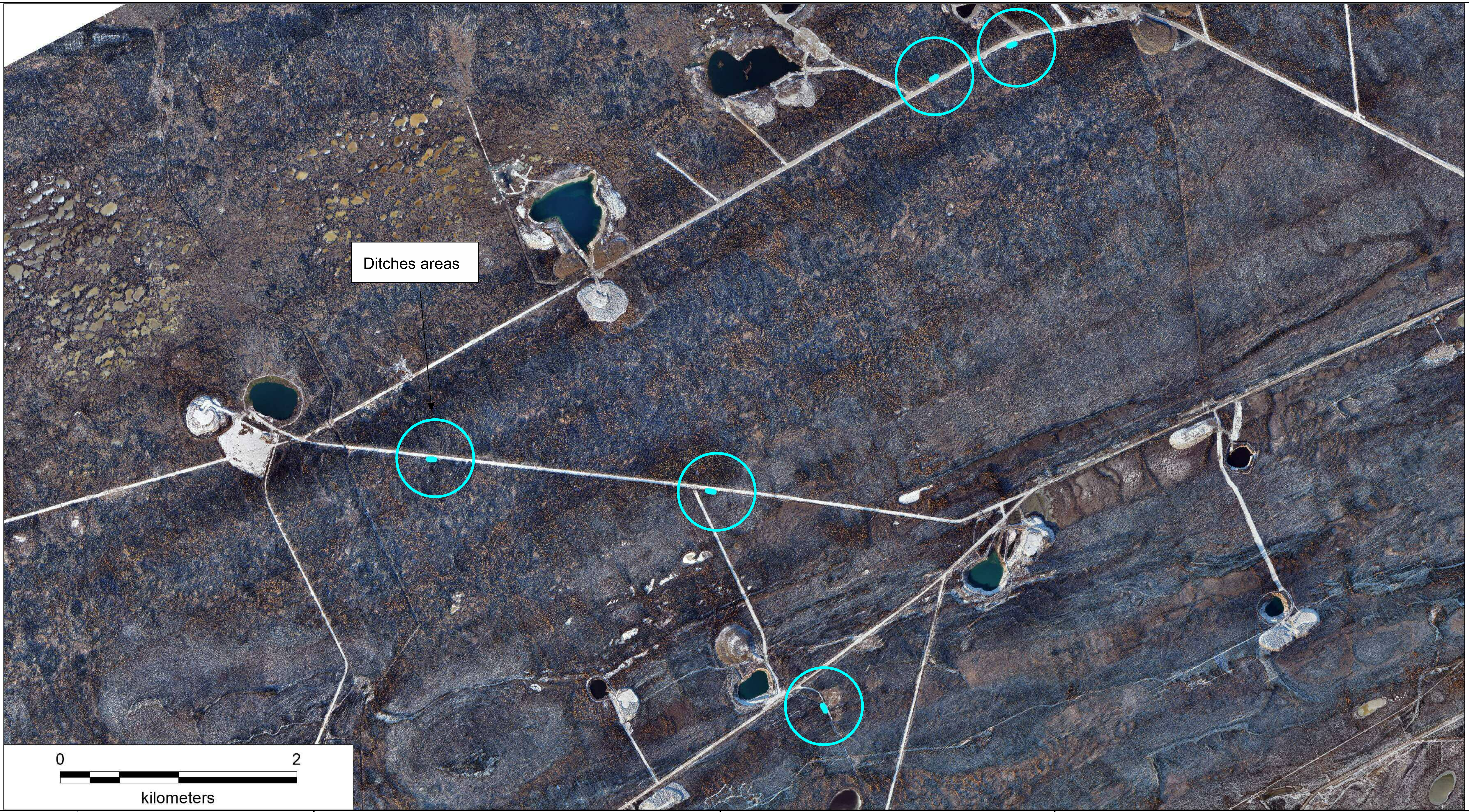



| | | | |
|---|---|---|---|
| Mining Hydrogeology | Figure no : 1 | Scale: none | Title: Schematic of piezometer installation |
| | Prepared by; Michael Verreault | Client: Pine Point Mining Limited | Project no: P23-107 |



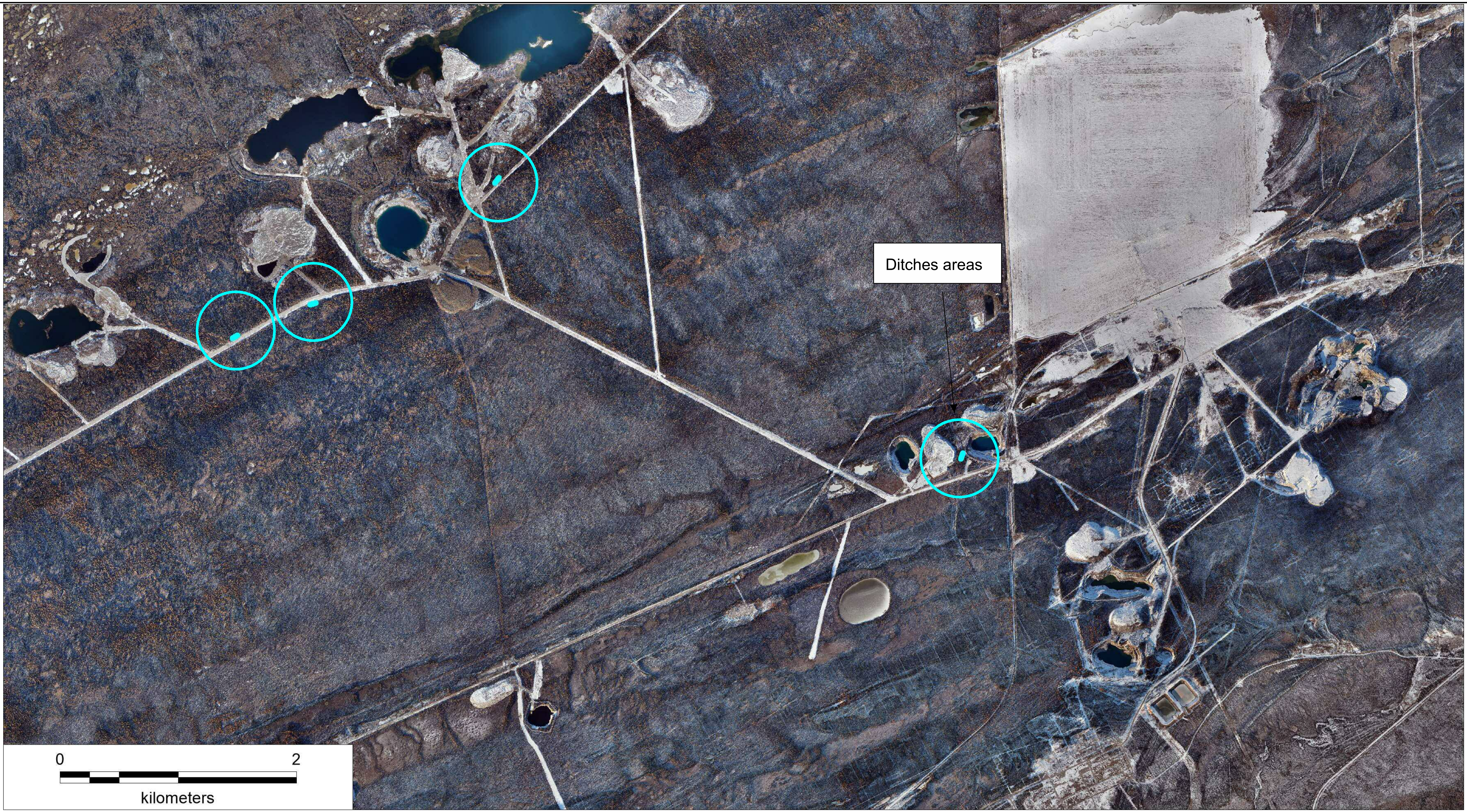

| | | | |
|---|---|---|---|
| Mining Hydrogeology | Figure no : 2 | Scale: none | Title: Schematic of testing setup. |
| | Prepared by; Michael Verreault | Client: Pine Point Mining Limited | Project no: P23-107 |


| | | | |
|---|---|---|---|
| Mining Hydrogeology | Figure no : 3a | Scale: none | Title: Proposed testing locations - west area |
| | Prepared by; Michael Verreault | Client: Pine Point Mining Limited | Project no: P23-107 |




| | | |
|---|---|---|
| Figure no : 3b | Scale: none | Title: Proposed testing locations - central area. |
| Prepared by; Michael Verreault | Client: Pine Point Mining Limited | Project no: P23-107 |

Mining Hydrogeology

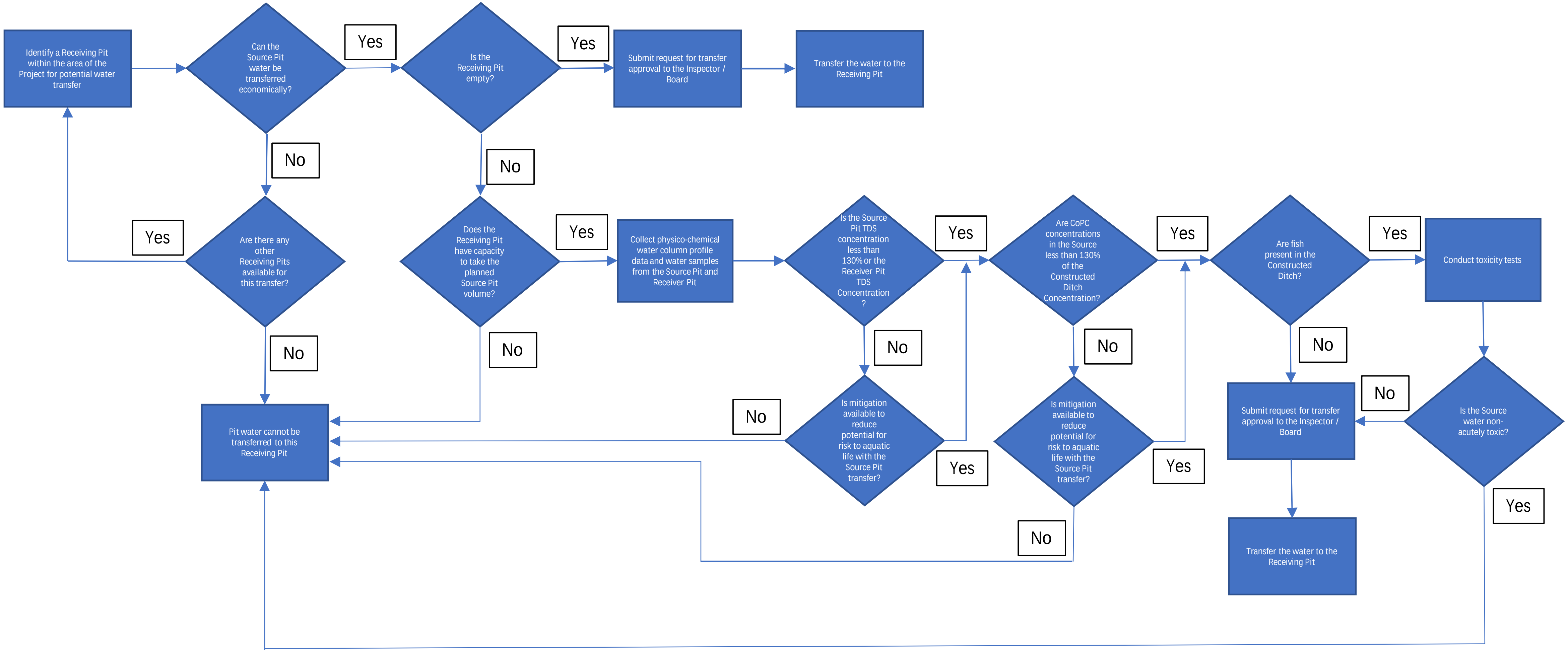



Mining Hydrogeology

| | | |
|---|---|---|
| Figure no : 3c | Scale: none | Title: Proposed testing locations - East area. |
| Prepared by; Michael Verreault | Client: Pine Point Mining Limited | Project no: P23-107 |

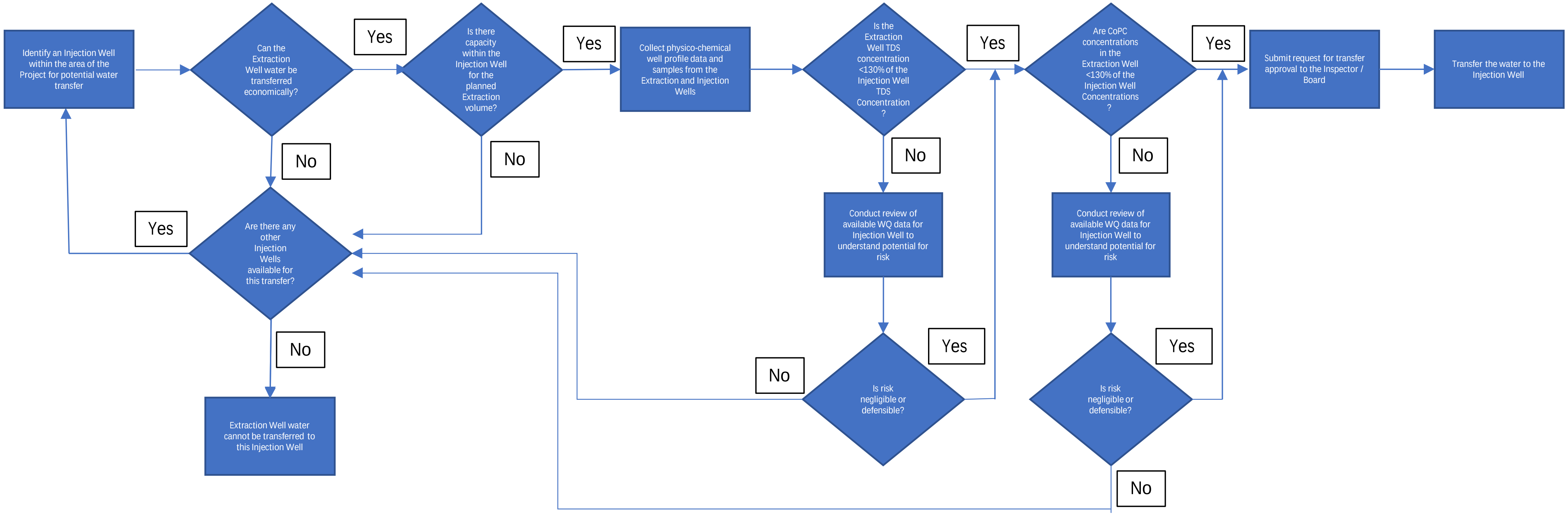
# APPENDIX C: CEP Groundwater Testing Pit to Pit Compatibility for Water Transfers

# Appendix C - Pine Point – CEP Groundwater Testing Pit to Pit Compatibility for Water Transfers



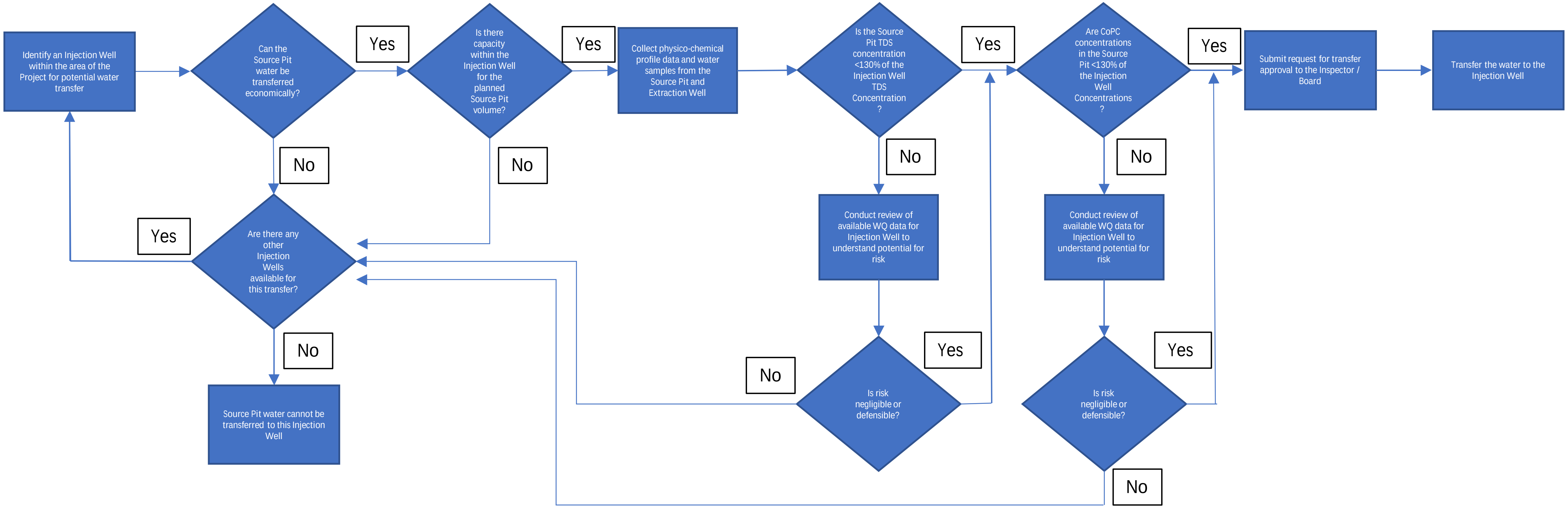
# APPENDIX D: CEP Groundwater Testing Well to Well Compatibility for Water Transfers

# Appendix D - Pine Point – CEP Groundwater Testing Well to Well Compatibility for Water Transfers



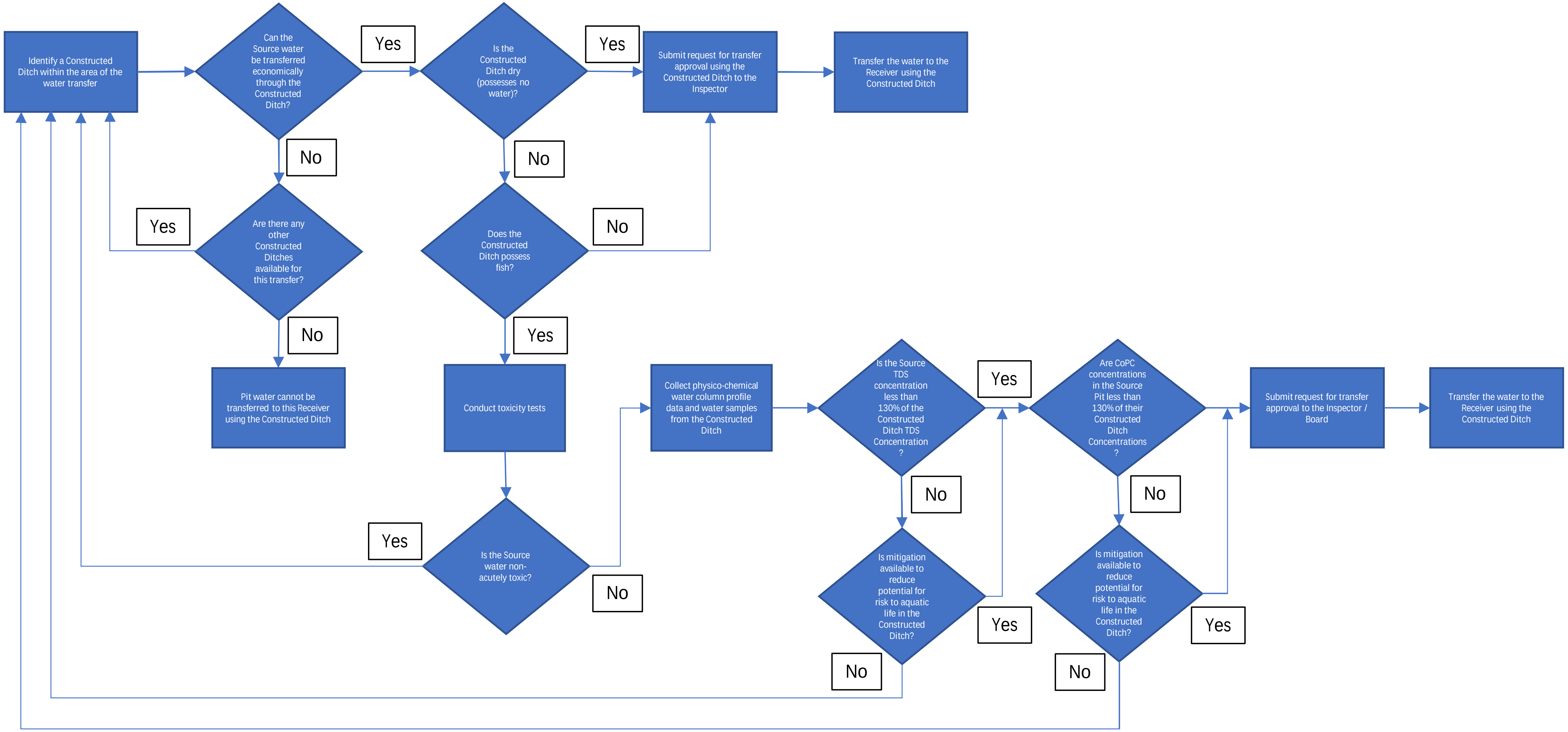
# APPENDIX E: CEP Groundwater Testing Pit to Well Compatibility for Water Transfers

# Appendix E - Pine Point – CEP Groundwater Testing Pit to Well Compatibility for Water Transfers



# APPENDIX F: CEP Groundwater Testing Source to Ditch Compatibility for Water Transfers

# Appendix F - Pine Point – CEP Groundwater Testing Source to Ditch Compatibility for Water Transfers[1]




[1] – assumes that the source to receiver compatibility assessment permits water transfer

# APPENDIX G: Example of Compatibility Report for Water Transfer Authorization

**Screening Step 1. TDS Concentrations Derived from Field Spcific Conductivity Measurements**

**Source Water (the following table allows for water column or extraction well data)**

| Depth (m) | pH | Temperature (°C) | Specific Conductivity (µS/cm) | Dissolved Oxygen (mg/L) | TDS Calculated (mg/L) | Pit Averaged TDS (mg/L) |
|---|---|---|---|---|---|---|
| 0.2 | 7 | 8.2 | 895 | 10.5 | 720 | |
| 1 | 7 | 8.2 | 910 | 10.5 | 733 | |
| 2 | 7 | 8.2 | 899 | 10.5 | 723 | |
| 3 | 7 | 8.2 | 925 | 10.3 | 747 | |
| 4 | 7 | 8.2 | 1,087 | 9.8 | 895 | |
| 5 | 7 | 8.2 | 1,120 | 9.5 | 926 | |
| 6 | 7 | 8.2 | 1,250 | 9.5 | 1,045 | |
| 7 | - | - | - | - | - | |
| 8 | - | - | - | - | - | |
| 9 | - | - | - | - | - | |
| 10 | - | - | - | - | - | **827** |

**Receiver Water (the following table allows for water column or injection well data)**

| Depth (m) | pH | Temperature (°C) | Specific Conductivity (µS/cm) | Dissolved Oxygen (mg/L) | TDS Calculated (mg/L) | Pit Averaged TDS (mg/L) |
|---|---|---|---|---|---|---|
| 0.2 | 7.5 | 7.8 | 750 | 10.5 | 587 | |
| 1 | 7.5 | 7.8 | 776 | 10.5 | 611 | |
| 2 | 7.5 | 7.8 | 800 | 10.5 | 633 | |
| 3 | 7.5 | 7.8 | 810 | 10.3 | 642 | |
| 4 | 7.5 | 7.8 | 990 | 9.8 | 807 | |
| 5 | 7.5 | 7.8 | 1,030 | 9.5 | 843 | |
| 6 | 7.5 | 7.8 | 1,100 | 9.5 | 907 | |
| 7 | - | - | - | - | - | |
| 8 | - | - | - | - | - | |
| 9 | - | - | - | - | - | |
| 10 | - | - | - | - | - | **718** |
| | | | | **Pit Averaged TDS +30% (mg/L)** | | **934** |

**Question: Is the Source Water TDS (Calculated) less than the Receiver Water TDS (Calculated) + 30%?**

**Yes, the Source water TDS is compatible with the Receiver**

**Screening Step 2. Constituents of Potential Concern Concentrations**

| Parameter | Units | Guideline | Source Pit Concentration | Are Concentrations above Chronic WQ Guideline? | Receiver Pit Concentration | Are Concentrations above Guidelines? | Are Concentrations Compatible? |
|---|---|---|---|---|---|---|---|
| Fluoride | mg/L | 0.12 | 0.1 | No | 0.2 | Yes | **Yes** |
| Sulphate[(a)] | mg/L | 429 | 500 | Yes | 400 | No | **Yes** |
| Aluminum | mg/L | 0.1 | 0.2 | Yes | 0.25 | Yes | **Yes** |
| Cadmium[(b)] | mg/L | 0.00029 | 0.0004 | Yes | 0.0004 | Yes | **Yes** |
| Chromium | mg/L | 0.001 | 0.005 | Yes | 0.004 | Yes | **Yes** |
| Copper[(b)] | mg/L | 0.004 | 0.003 | No | 0.002 | No | **Yes** |
| Iron | mg/L | 0.3 | 0.4 | Yes | 0.4 | Yes | **Yes** |
| Lead[(b)] | mg/L | 0.007 | 0.005 | No | 0.005 | No | **Yes** |
| Thallium | mg/L | 0.0008 | 0.0003 | No | 0.0003 | No | **Yes** |
| Uranium | mg/L | 0.015 | 0.004 | No | 0.004 | No | **Yes** |
| Zinc (Diss)[(c)] | mg/L | 0.0263 | 0.033 | Yes | 0.033 | Yes | **Yes** |
| | | | | | | | |
| Hardness | mg/L | 207 | | | 200 | **Compatibility Score** | **100%** |
| pH | | 8.2 | | | 7.8 | | |
| DOC | mg/L | 2 | | | 3 | | |

**Question: Are the CoPCs in the Source compatible with those in the Receiver?**

**Yes, CoPCs are compatible; if any CoPCs are determined non-compatible, refer to any available data and acute toxicity data to understand risk**

**3. Acute Toxicity Tests (to be conducted if fish have been identified in the Receiver Pit)**

| Test | Source Pit Result (Pass/Fail) |
|---|---|
| Rainbow Trout | Pass |
| *Daphnia magna* | Pass |

**Question: If fish are present in the Reciever Pit, is the water in the source pit acutely toxic?**
**No, pit waters should not be acutely toxic**

**PPML Recommendation (circle):** Source Compatible with Receiver / Source Incompatible with Receiver

**Authorization:**

| | |
|---|---|
| **PPML Signatory** **Date** | **GNWT Inspector** **Date** |

**Notes:**

**Screening Step 1. Physico-chemical Field Measurements**

**Process** - Collect field physico-chemical water quality data from the Source and Receiver. Insert these data into the template. The tool will use the site-specific TDS(calculated) v. specific conductivity relationship (Sheet 2, "SpCond_v_TDSCalc") to estimate an average pit TDS(calculated) concentration for the source and receiver. The tool will then compare the Source TDS(calculated) concentration to that of the Receiver to determine if the TDS(calculated) of the Source lies within the Receiver TDS(calculated)+30% threshold to confirm a water transfer based on the TDS(calculated) screening.

**QA Step** - Once the analytical laboratory data become available, the field specific measurements should be cross-checked against the laboratory specific conductivity. If there is agreement within 20%, the field specific data can be considered valid, and the field specific conductivity and laboratory TDS(calculated) data added to the data set in Sheet 2 to supplement the site-specific TDS(calculated) v. specific conductivity relationship. As a final validation step, the resulting plot of the relationship should be reviewed to make sure the data specific to the Source and Receiver as part of this compatibility assessment lie within reasonable bounds of the full dataset, and that the coefficient of determination ($R^2$) is greater than 0.8.

**Screening Step 2. Constituents of Potential Concern Concentrations**

**Process** - Once the analytical data are available from the lab for the Source and Receiver, the CoPC concentrations (i.e., those constituents that have WQG, which have previously been measured above guidelines in site waters) should be added to the template, as well as available hardness, pH, and dissolved organic carbon (DOC) data. For each CoPC, the Source concentration is compared to the Receiver concentration. The CoPCs are considered compatible if the Source concentration is below the Receiver concentration +30% threshold or if the Source concentration is below guidelines.

**Step 2** - The tool calculates overall compatibility if all of the focus parameters have been determined to be compatible. If any focus parameters are determined to not be compatible, some professional judgment may be applied to evaluate the influence of the non-compatible focus parameter may have on aquatic biota. Review suggestiuons include evaluating the relative concentration of the non-compatible focus parameter, its magnitude of deviation from their compatibility threshold, the status of the thresholde (i.e., is it an interim guideline), and the supplemental results of the acute toxicity tests (where fish have been identified in the Receiver Pit). This judgement can also be supported by any available exisiting water quality data for the Source and Receiver under assessment.

(a) the sulphate guideline is from the BC ENV. The guideline is hardness dependent. The guideline range shown is based on the hardness range observed in

(b) WQG are hardness dependent

(c) the chronic dissolved zinc guideline is pH, hardness and dissolved organic carbon dependent. The guideline that results in the minimum chronic zinc

# APPENDIX H: Letter of Advice from Fisheries and Oceans Canada

Fisheries and Oceans Canada | Pêches et Océans Canada

Arctic / Ontario and Prairie Region
Fish and Fish Habitat Protection Program
301 – 5204 50th Ave. (Franklin)
Yellowknife, Northwest Territories
X1A 1E2

Régions de l'Arctique / Ontario et Prairies
Programme de protection du poisson et de son habitat
301 – 5204 50th Ave. (Franklin)
Yellowknife, Territoires du Nord-Ouest
X1A 1E2

April 24, 2023

*Our file* *Notre référence*

23-HCAA-00661

Pine Point Mining Limited
Attention: Andrew Williams
1100 Avenue des Canadiens-de-Montréal
Montréal, QC
H3B 2S2

**Subject: Fish Exclusion Pine Point Mine – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat**

Dear Andrew Williams:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your request for review on April 3, 2023. We understand that you propose to conduct the following works at the Pine Point Mine, NT, between June 1 and August 31, 2023:

- Temporarily install fish exclusion barriers in the surrounding ditches and at the inflow and outflow of each of the four pits (X56, A55, A70, and K62).
- Use fish exclusion strategies using mesh netting, fish fencing, and block nets.
- Use fish salvage techniques to assess fish barrier effectiveness.
- Use a pump equipped with fish protection screens to withdraw/discharge and transfer water pit-to-pit.

Our review considered the following information:

- Request for Review form and associated documents received on April 3, 2023.
- Email communications between Barbra Fortin (WSP) and Anna-Maija Laflamme (DFO), April 13, 2023.

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*; and

…/3

- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*.

The aforementioned outcomes are prohibited unless authorized under their respective legislation and regulations.

To avoid and mitigate the potential for prohibited effects to fish and fish habitat (as listed above), we recommend implementing the measures listed below:

- Plan in-water works, undertakings and activities to respect timing windows to protect fish and fish habitat.
- Screen intake pipes to prevent entrainment or impingement of fish.
    - Use the code of practice for water intake screens.
- Capture and relocate any fish trapped within an isolated/enclosed work area and safely relocate them to an appropriate location in the same waterbody.
- Limit impacts on riparian vegetation to those approved for the works, undertakings or activities.
- Install effective erosion and sediment control measures prior to beginning works, undertakings and activities.
- Develop and immediately implement a response plan to prevent deleterious substances from entering a water body.

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal is not likely to result in the contravention of the above mentioned prohibitions and requirements.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, and the *Species at Risk Act*.

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption or destruction of fish habitat. Such notifications should be directed to http://www.dfo-mpo.gc.ca/pnw-ppe/contact-eng.html.

**Please notify this office at least 10 days before starting any in-water works**. Send your notification to the assessor (contact information below) and the DFO 10 notification mailbox: DFO.OP.10DayNotification-Notification10Jours.OP.MPO@dfo-mpo.gc.ca. We recommend that a copy of this letter be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

…/3

If you have any questions with the content of this letter, please contact Anna-Maija LaFlamme directly by telephone at (867) 445-3238, or by email at Anna-Maija.LaFlamme@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

T. Leclerc

Tatiana Leclerc-Beaulieu
Senior Biologist
Fish and Fish Habitat Protection Program
Fisheries and Oceans Canada

CC: Alasdair Beattie (DFO; Alasdair.Beatte@dfo-mpo.gc.ca)
Barbra Fortin (WSP Canada; barbra.fortin@wsp.com)