REPORT

Troilus Project Operational Site-Wide Water Management Plan

Feasibility Study

Submitted to:

Ian Pritchard

Troilus Gold Corp
26 Lombard Street, Floor 4
Toronto, Ontario
M5C 2X3

Submitted by:

WSP Canada Inc.

237 – 4 Avenue SW, Suite 3300, 33rd Floor Calgary, Alberta, T2P 4K3 Canada

+1 403 299 5600

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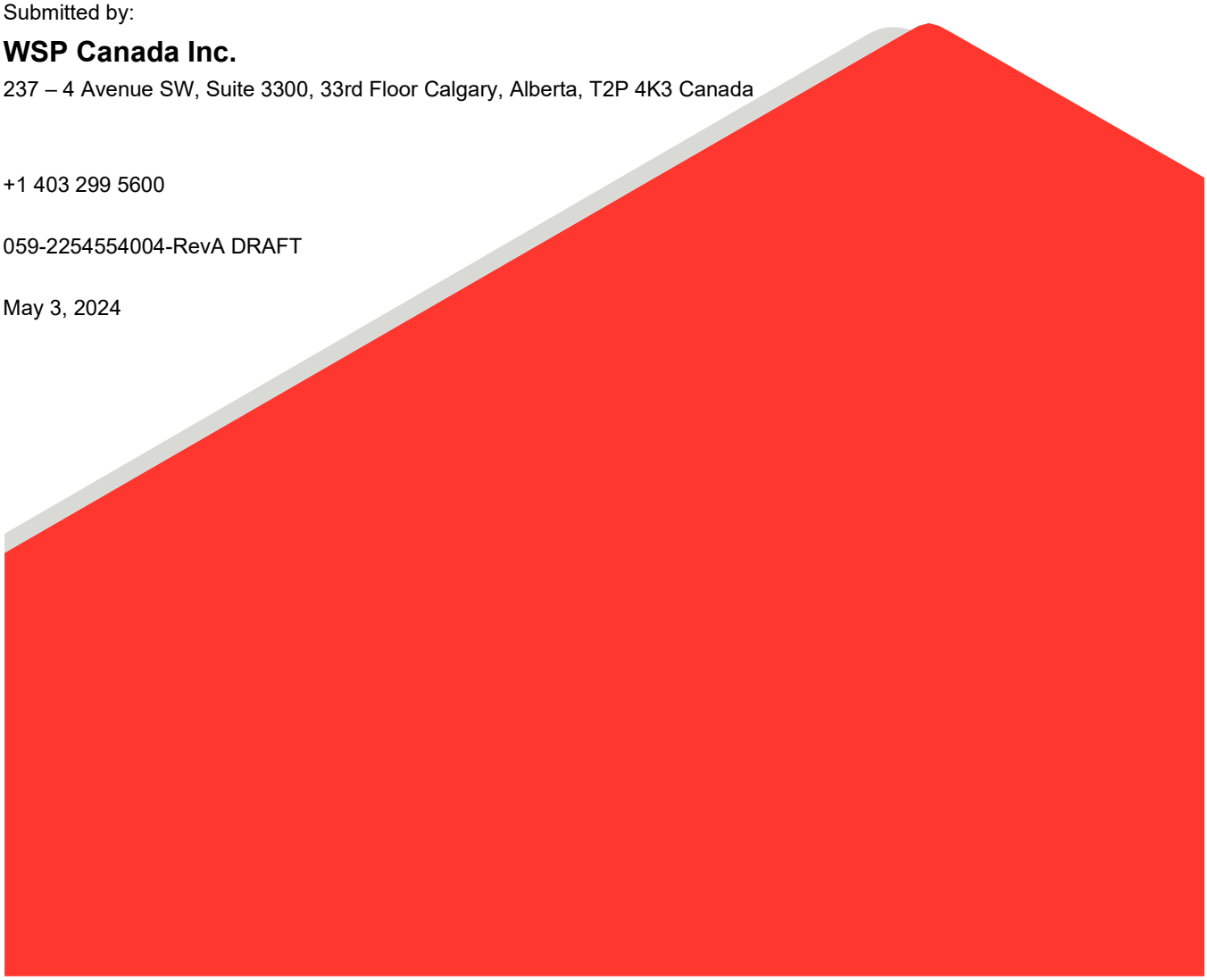

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1.0 INTRODUCTION

1.1 Background

WSP (WSP Canada Inc.) has been retained by Troilus Gold Corp. (Troilus) to prepare a feasibility-level site-wide water management plan (WMP) for their Troilus Gold Project (Project) in northwestern Québec. Operations at the currently inactive open-pit gold and copper Troilus Mine Site (Site) stopped in 2009. Troilus is undertaking a feasibility level assessment to recommence mining operations.

1.2 Scope

Troilus commissioned WSP to prepare the feasibility site-wide Water Management Plan (WMP) for the Troilus Gold Project. The conceptual water management layouts were developed for key years using mine sequence plans provided by AGP Mining Consultants Inc. (AGP 2024), which are included in Appendix A.

The developed WMP includes the following main components:

- Natural (non-contact) water management – This will be achieved by diverting natural streams around the disturbed footprint.
- Contact water management – Contact water refers to water that will be collected within the development footprint, and that may contact waste rock or ore, mine tailings, access roads, or other site infrastructure.
- Pit dewatering and pit water management – This item was outside of the scope of this study. The water management plan did account for the impact of pit water management on other facilities and its role in the overall site-wide water balance.
- Tailings water management – This includes collecting water released from the tailings after their deposition in the tailings storage facility and returning it to the ore processing plant.
- Fresh water supply – This item was outside of the scope of this study. Fresh water supply was considered in the site-water mine water balance.
- Surface and groundwater monitoring – Only the surface monitoring plan was part of the scope of the current report.

WSP's work scope involved the preparation of plans, construction sequencing, and feasibility level design for the items listed above, minus the indicated exceptions, as well as the estimation of construction quantities for the designed water management structures. The preparation of a site-wide, operational water balance and closure considerations were also included in the work scope.

Contact water quality assessment was not in WSP's scope. Troilus indicated the following (Troilus, 2022 and 2024):

- Historical monitoring of runoff and seepage water quality from the existing waste rock dumps and the tailings storage facility (TSF), which were developed during the previous Troilus site operation ending in 2009, indicated no water quality issues that would prevent the water's release to the environment.
- As an exception to the previous statement, there are elevated iron concentrations in the seepage water collection at the toe of the TSF, which Troilus has been managing by returning small volumes of water to the TSF water pond. Also, certain current effluents exceed specific surface water quality criteria for the protection of aquatic life (chronic effect) for aluminum, cadmium, copper and zinc (Troilus 2022), but the concentrations remain below applicable effluent guidelines.

- Based on their understanding that future waste rock and tailings characteristics will resemble those of the previous operation, Troilus instructed WSP Golder to consider that contact water quality would comply with release water quality guidelines. Total suspended solids (TSS) concentration was the only water quality parameter that WSP considered in the preparation of the water management plan.

This report documents the basis, methods and results of the water management planning and design work scope mentioned above, as well as the opportunities, risks and risk mitigation operations identified during the planning and design process. Construction quantities estimates were provided to Troilus in a separate deliverable. The limitations listed in Appendix N are an integral part of this report.

2.0 GENERAL SETTING AND PROJECT DEFINITION

2.1 Physical Setting and Topography

As presented by Troilus (2022), "*the Troilus project site is part of the Eastmain Lowlands, Division of the James Region Physiographic Unit. To the south of the project site, there are rocky hills aligned in a northeast / southwest axis with a maximum altitude of 520 m, while to the north, there is a rocky ridge-oriented northeast / southwest with a maximum altitude of 430 m. Between these two reliefs, the sector forms a valley whose altitude varies between 365 and 400 m with an undulating and irregular topography given the presence of rocky outcrops that intersect the unconsolidated deposits*".

Figure 1, Figure 2, and Figure 3, all extracted from Troilus (2022), present the hydrological setting of the Troilus Site from the regional level (Figure 1) to the local level (Figure 2 and Figure 3):

- On the regional level, the Troilus Site is located in the Rupert River watershed, at the boundary with the Broadback River watershed. Both rivers flow west to Rupert Bay and James Bay.
- The site drains via Bibou Creek, and its diversion channel to Lac A. Lac A drains 12 km further downstream via a series of small lakes and water courses to Boisfort Lake. Lac A has a total watershed area of approximately 58 km^2.
- The topography used for site layout planning and design is from the Government of Quebec (Ministère des Ressources Naturelles et des Forêts 2019). The LiDAR with 1 meter resolution was collected in 2019 and downloaded by WSP in 2022.

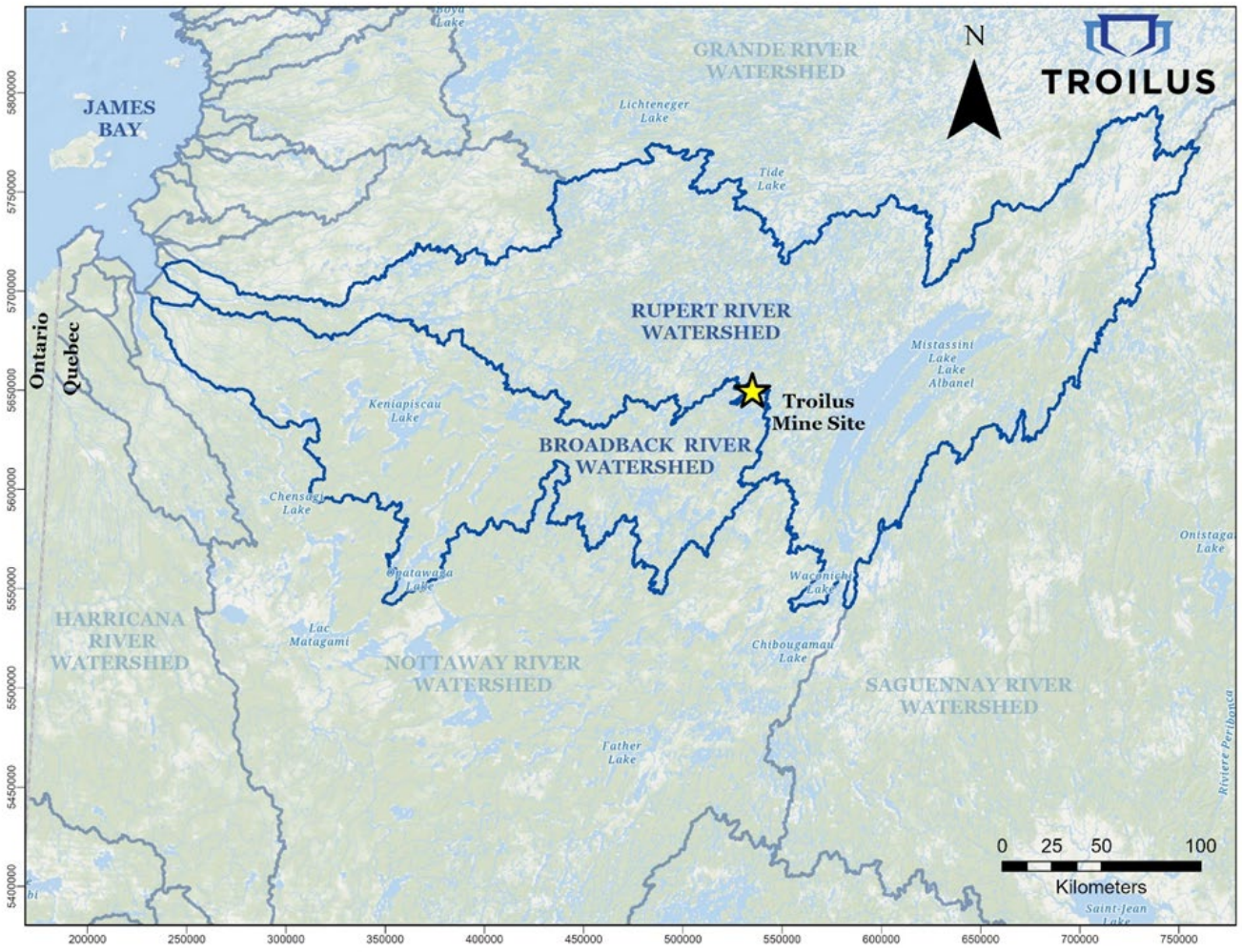


Figure 1: Regional Watersheds around the Troilus Site (from Troilus 2022)

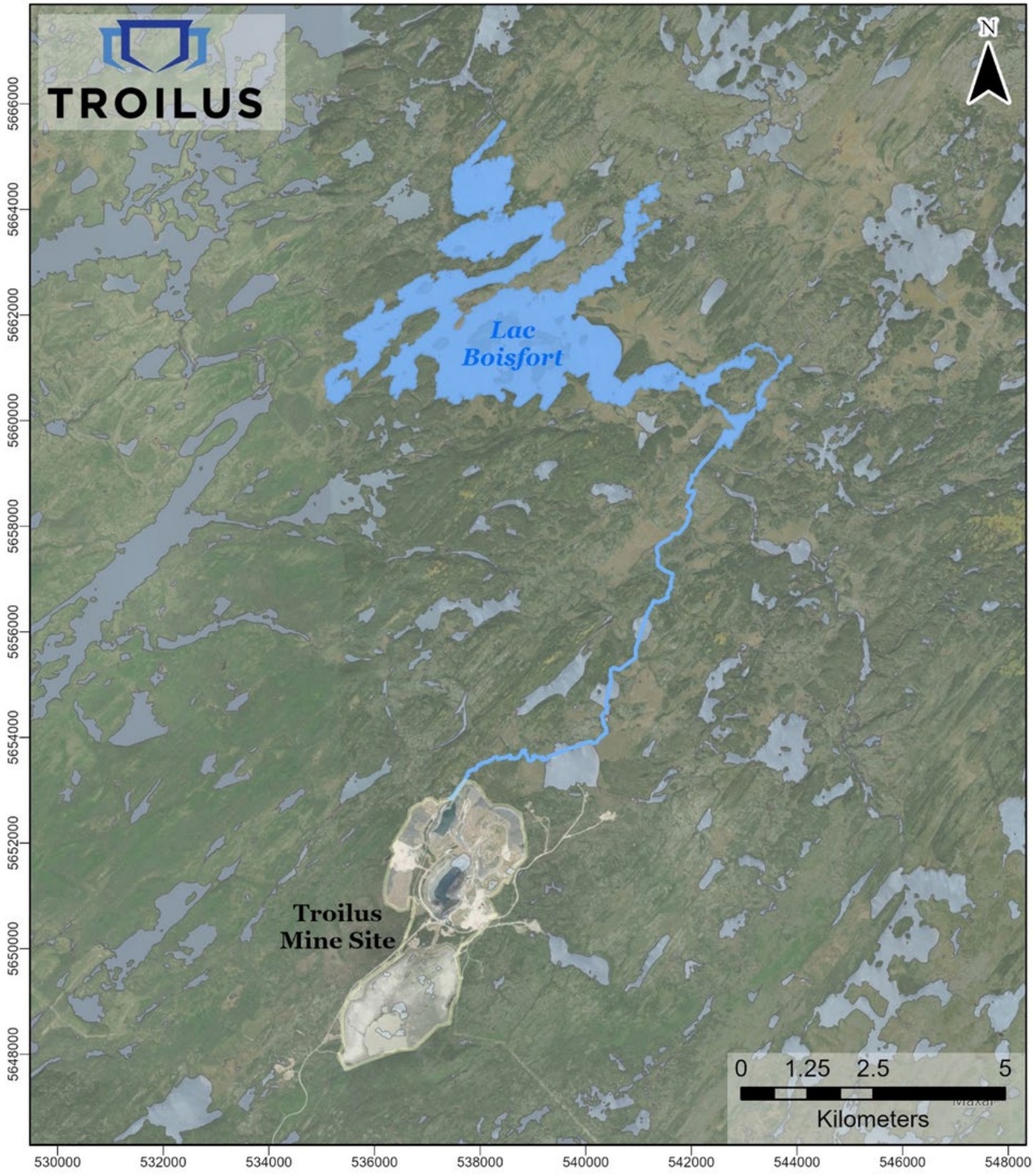


Figure 2: Natural Watercourses Downstream of the Troilus Site (from Troilus 2022)

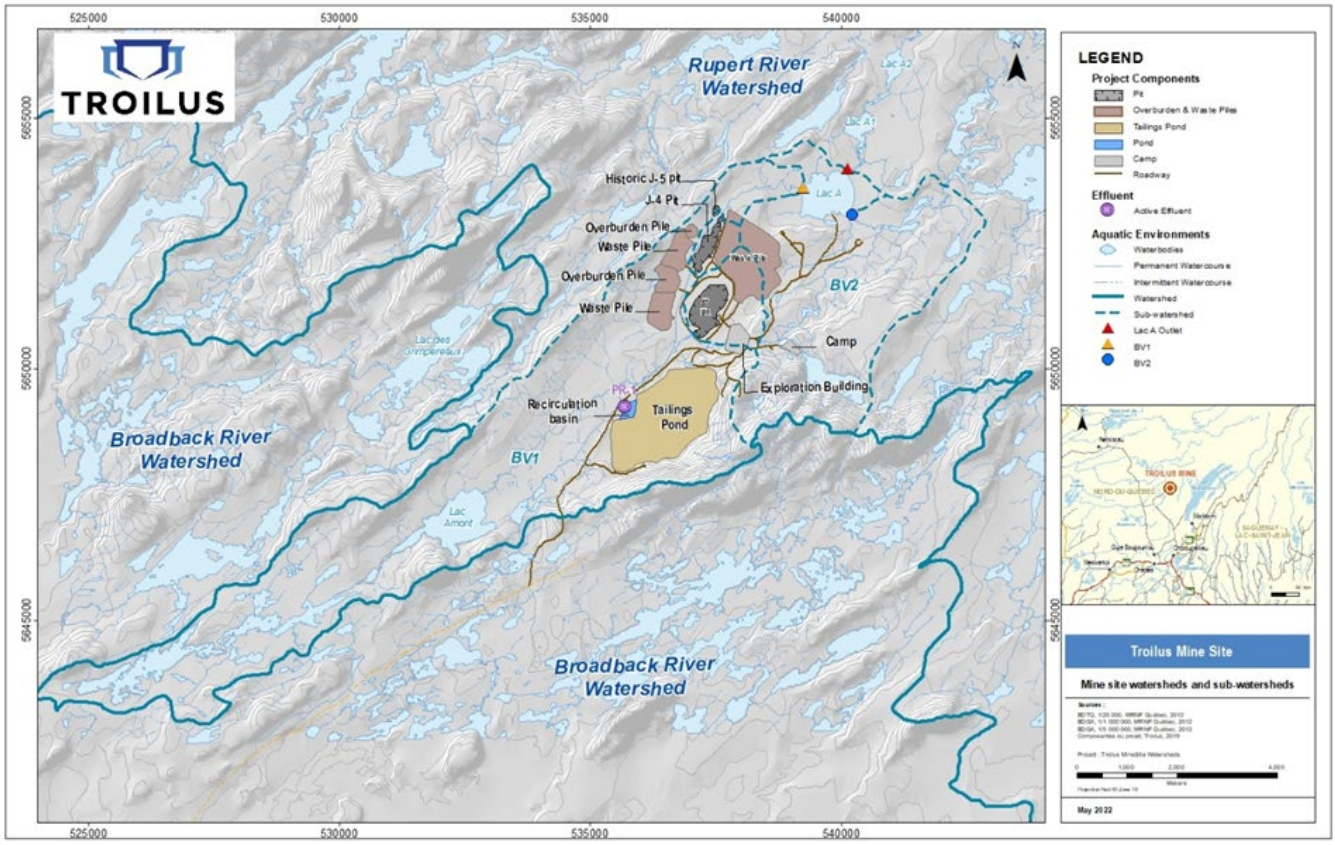


Figure 3: Current Watershed Limits and Infrastructure at the Troilus Site (from Troilus 2022)

2.2 Climate Baseline

The Troilus Mine Site climate baseline conditions, including both historical climate statistics and statistics considering climate change projections, are presented in detail in Appendix C. This section includes a high-level summary.

As a basis for the analysis, WSP used mainly historical records at two climate stations located approximately 140 km to the south, around the towns of Chibougamau and Chapais:

- The historical observations at the Environment and Climate Change Canada (ECCC) climate stations around Chibougamau and Chapais provide a reasonable estimate for extracting extreme wet climate statistics as input to the design of the Project surface water management structures. Furthermore, the approach is considered mostly conservative as short-term strong precipitation events are expected to be somewhat less intense at the Troilus Site than at the ECCC climate stations (Ouranos 2024).
- The historical observations at the ECCC climate stations around Chibougamau and Chapais provide a reasonable basis for the Project's site-wide water balance model. Before their application, the historical observations were adjusted using multi-annual average, seasonally based differences between the stations' location and the Site; the differences were extracted from the regional 1981–2010 climate normal maps published by Ouranos (2024). Ouranos (2024) regional climate maps suggest that, on average, the climate at the Troilus Site is colder (approximately 1.2 °C in mean annual temperature), with drier winter (approximately 16% less precipitation) and spring (approximately 4% less) seasons, but wetter summer seasons (13% more precipitation) than at the locations of the ECCC climate stations in Chibougamau and Chapais.

Figure 4, Figure 5, and Table 1 present average temperature and precipitation statistics:

- The mean annual temperature is -1.0°C, varying between 16.6 °C in July and -20.6 °C in January (mean monthly daily temperatures). Temperatures stay below zero, on average, between mid-October to mid-April.
- The mean annual precipitation is 960 mm. July and September are the wettest months (130 mm and 120 mm, respectively, mean precipitation), and January and February are the driest months (42 mm and 38 mm, respectively, mean precipitation).

Table 1: Average Monthly Climate Statistics for the Troilus Site after Adjustment of Values at Chibougamau-Chapais A, 1982 to 2023

Month	Mean Temperature (°C)	Precipitation (mm)
Jan	-20.6	42
Feb	-18.7	38
Mar	-11.6	50
Apr	-2.1	52
May	5.8	69
Jun	13.9	104
Jul	16.6	130
Aug	15.3	114
Sep	9.0	120
Oct	2.3	95
Nov	-5.9	84
Dec	-16.0	61
Year	*-1.0*	*960*

Note: See Appendix C for a discussion of the data sources and the methodology used to extract these statistics.

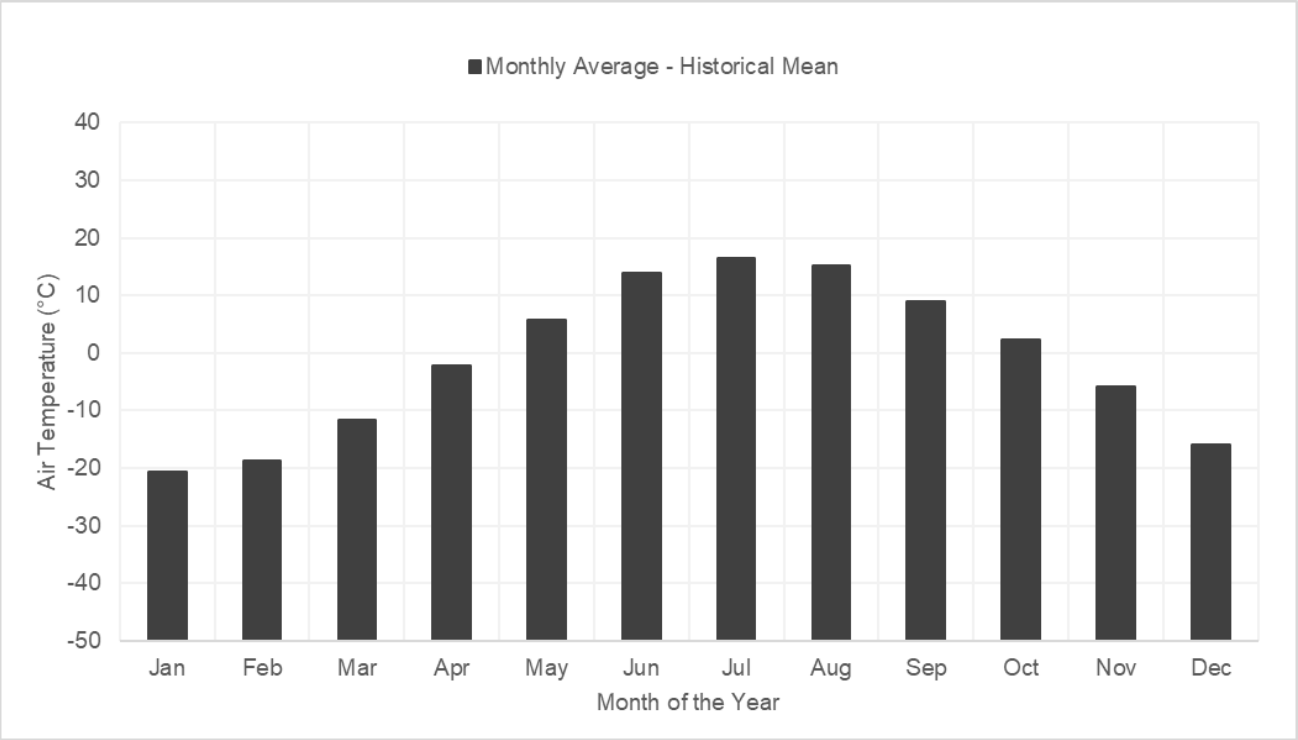


Figure 4: Air Temperature Statistics for Troilus Site after Adjustment of Values at Chibougamau-Chapais A, 1982 – 2023

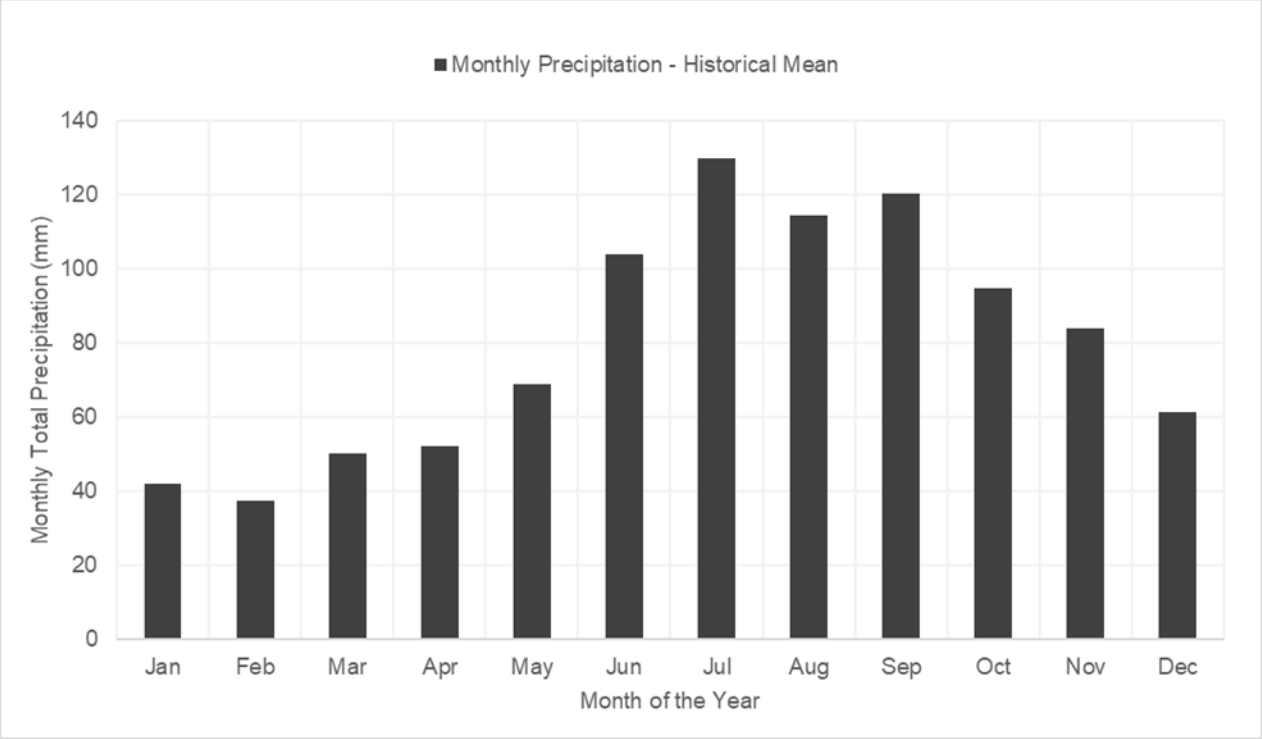


Figure 5: Total Precipitation Statistics for Troilus Site after Adjustment of Values at Chibougamau-Chapais A, 1982 – 2023

Ouranos (2024) summarises the projected climate change impact to the average climate conditions. For the current overview, WSP extracted statistics for one greenhouse gas emission scenario (SSP2-4.5 – moderate emissions) and for the 2021-to-2050 time horizon, which includes the Troilus Project's operational life. Generally, scenarios including more emissions cause larger changes relative to historical data, and scenarios including fewer emissions cause smaller changes. Table 2 and the paragraphs below highlight the main points.

- The mean air temperature increases for all scenarios and for all seasons. The changes are largest over the winter months. The median annual projected temperature increase is 1.4 °C.
- The total precipitation is expected to increase over the next decades. The median annual increase is 6%, with the increase over the winter being much larger than those over the summer (11% vs. 4%).
- Even for the same emission scenarios, there is a considerable variability of results among the different projections. The absolute difference between the 10th and the 90th percentile projections is as large as 40% to over 100% of the absolute 50th percentile change to the air temperature and total precipitation. Nevertheless, the overall projected trends – warmer and wetter weather, especially during the winter – appear robust despite the large uncertainty of the projections.

Table 2: Projected Climate Change Impact to Seasonal Average Precipitation and Temperature for the Troilus Site Region (from Ouranos 2024)

	Changes for the 2021–2050 Period Relative to 1991–2020 *					
	Change to Average Daily Temperature (°C)			Change to Total Precipitation (mm)		
	10%	50%	90%	10%	50%	90%
Dec. to Feb.	1.5	1.9	2.8	10%	11%	15%
Mar. to May	0.6	1.2	1.8	0%	7%	13%
Jun. to Aug.	0.7	1.2	1.7	-1%	4%	4%
Sep. to Nov.	1.1	1.2	1.6	4%	5%	9%
Annual	1.1	1.4	1.8	4%	6%	8%

Notes: *The presented changes are statistics (10, 50, and 90 percentiles) over multiple climate projections, they are average over the simulation periods, and they are applicable for one greenhouse gas emission scenario (SSP2-4.5 – moderate emissions). The values are calculated using data extracted from Ouranos (2024).

Table 3 summarises extreme rainfall, rain-on-snow, and maximum snow cover as they were extracted from the historical climate records; Appendix C provides the details on the data sources and the methodology. 24-hour, 100-year rainfall and rain-on-snow amounts were estimated to 90 mm and 70 mm, respectively. The 100-year maximum snow cover was estimated to 375 mm snow water equivalent.

To account for climate change, based on analysis of Ouranos (2024) and ECCC (2023) data, WSP selected an 18% increase of extreme event rainfall and short-term rain-on snow amounts as a reasonable adjustment in support of the water management plant for the Troilus Project feasibility study. The value corresponds approximately to the 50th percentile of the projections for a high greenhouse emission scenario. No adjustment was done for snow cover amounts.

Table 3: Extreme Rainfall, Rain-on-Snow, and Maximum Snow Cover Based on Historical Climate Records

Return Period (Years)	Summer-Fall Extreme 24 Hour Rainfall (mm)	Spring Rain on Snow Extreme 24 hr Event (mm)	Maximum Snow Cover (mm Snow Water Equivalent)
2	456	36	225
5	59	45	270
10	68	51	298
20	75	59	331
50	84	64	354
100	90	70	375
1,000	109	87	440
2,000	114	92	457
10,000	125	103	494
PMP/PMS	335	180 (spring rainfall only)	750

Note: See Appendix C for a discussion of the data sources and the methodology used to extract these statistics. PMP = Probable Maximum Precipitation. PMS = Probable Maximum Snow Accumulation.

Table 4 presents historical monthly means for lake evaporation and potential evapotranspiration for the Troilus Site based on 1982 to 2023 climate records. Maximum monthly values were estimated to 116 mm and 144 mm for July for lake evaporation and potential evapotranspiration, respectively. Mean annual values were estimated to 515 mm and 661 mm, respectively.

Table 4: Estimated Historical Monthly Means for Lake Evaporation and Potential Evapotranspiration for the Troilus Site for the Period 1982 to 2023

Month	Lake Evaporation (mm)	Potential Evapotranspiration (mm/month)
Jan	0	1
Feb	0	3
Mar	0	16
Apr	2	47
May	97	97
Jun	113	139
Jul	116	144
Aug	94	112
Sep	56	62
Oct	36	27
Nov	0	9
Dec	0	2
Annual	515	661

Note: See Appendix C for a discussion of the data sources and the methodology used to extract these statistics

Appendix C also presents an analysis of historical wind data. 2-year hourly extreme wind velocities were estimated to vary between 23.3 km/h (wind from the East) to 42.6 km/h (wind from the South or Southwest). 100-year hourly velocities vary between 48.3 km/h (wind from the North) to 69.6 km/h (wind from the South).

2.3 Hydrology Baseline

The Troilus Mine Site hydrology conditions and data are presented in Appendix C. The same appendix lists hydrological modelling parameters used for the design of water management structures and the site-wide water balance model. The following paragraphs include points:

- The Troilus Site, including the TSF, is located within the Bibou Creek valley between Lac Amont (upstream and to the south) and Lac A (downstream and to the north). Lac Amont has a drainage area of 16.5 km^2, the existing Bibou Creek has a drainage area of 31.2 km^2 at its confluence to Lac A, and Lac A has a total drainage area of 58.2 km^2. The TSF, J Pit, 87 Pit and Plant site, which are all part or Lac A's drainage area, have an approximate combined drainage area of 8.1 km^2. Runoff from this area and groundwater seepage to the existing pits is released to the Lac A watershed following treatment when required. Other significant water bodies in the vicinity of the site include Lac B, Lac C1, and Lac C2, all within Lac A's watershed. Downstream of Lac A, water flows through Lac A1 and Lac A2 to Lac Boisfort, which has a drainage area of approximately 290 km^2. Further downstream, the area drains west to the Rupert River and to James Bay.
- Based on available regional records (historical streamflow measurement at regional gauging stations), the mean annual runoff for a large natural area over the 1980 to 2010 period was estimated to be 567 m. Mean monthly values varied between 16 mm in March, before the freshet, and 101 mm in May, the main freshet month.
- Based on available literature and professional judgment, WSP selected hydrological design parameters.

In support of the water management structure design, the Soil Conservation Service Curve Number (SCS CN) method was used.

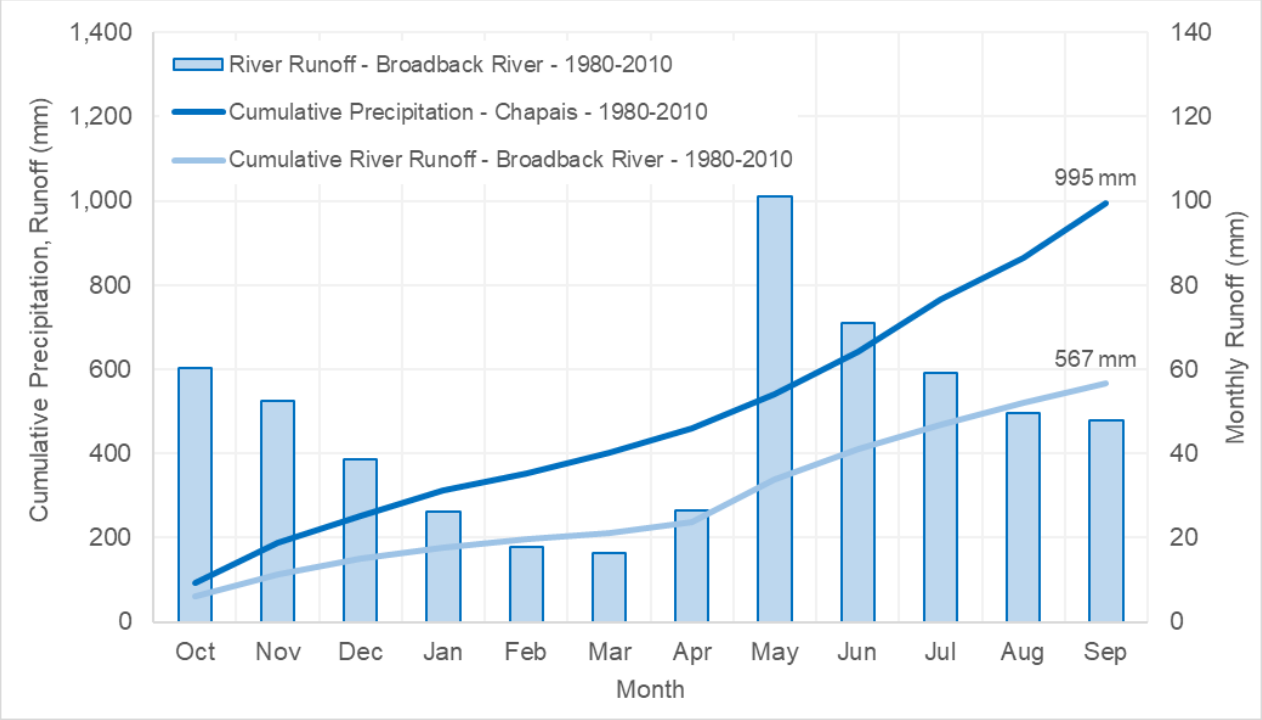


Figure 6: 1972 to 2021 Mean River Runoff at the Broadback River Station (CEHQ 080809, CEHQ 2024)

- Table 5 below presents the land type-dependent selected CN values.
- For the site-wide water balance, a precipitation-runoff model was developed. Table 6 below presents the resulting mean annual runoff coefficients (ratio between average annual runoff and total precipitation) as they were calculated by the model.

Table 5: Hydrological Design Parameters – Selected SCS CN Values

Land Type	Selected CN Value
Natural area, wooded	60
Natural Area, vegetated	71
Cleared area of the mine site	86
Overburden (OB) dumps and built areas (includes plant site)	91
Waste rock dump	72
Tailings Beach	94
Mine Pit Area	93
Pond area (including wetland)	100 (no losses during the short-term events)

Note: Selected CN values account for the material and soil type properties, available literature, and WSP's professional experience.

Table 6: Estimated Annual Runoff Coefficients for the Land Types Used in the Water Balance Model

Land Type	Annual Runoff Coefficient (% of Total Precipitation) [(a)]
Overburden dumps, built areas	68
Cleared area of the mine site	68
Waste rock dumps	60
Natural area, wooded	58
Natural Area, vegetated	58
Tailings Beach	77
Mine Pit Area	86
Pond area (including wetland)	100 – not including evaporation or sublimation losses

Notes:

(a) The annual runoff coefficients are summary results of daily calculations that include evapotranspiration and infiltration losses and that account for antecedent moisture conditions near the surface. The daily effective runoff coefficients vary with the intensity of the rain and snowmelt event.

2.4 Geology and Hydrogeology

2.4.1 Geology

The bedrock consists mainly of felsic and intermediate metavolcanic rocks in the southern part of the project site, while the central and western parts are composed of intermediate to mafic basalt-type metavolcanic rocks. The eastern part of the project site is crossed by a granitic pluton. This magma thrust introduced dykes into the fractures of the metamorphic rocks and caused alteration of the surrounding rock walls (GEOCON 1993).

The unconsolidated deposits that cover the bedrock over most of the project site are essentially Quaternary of glacial, fluvio-glacial and alluvial origin. On the bedrock, there is till up to 30 m thick. It is composed of boulders, pebbles, gravel, and sand, with variable proportions of silt and clay. In the central portion of the project site, a layer of sand and gravel and fluvio-glacial deposits is found, which is generally loose and up to 15 m thick (GEOCON 1993).

In the lower parts, under the peat bogs and around the lakes, 2 m thick sand deposits are present. Organic deposits a few meters thick can also sometimes be observed (GEOCON 1993).

2.4.2 Hydrostratigraphy

A conceptual hydrogeological model was developed at the site scale (WSP 2024a). The structure of the stratigraphic horizons of the conceptual model is based on all the information obtained during the investigation campaigns. The hydrogeological characterization works, as well as the distribution of surface deposits, made it possible to define five natural hydrostratigraphic units and two anthropogenic units:

- Rock outcrop zone.
- Till zone (calibrated hydraulic conductivity of 1×10^{-5} m/s and recharge of 128 mm/year).
- Peat zone overlying on till (calibrated hydraulic conductivity of 1×10^{-7} m/s and recharge of 35 mm/year).
- Zone of fluvioglacial and juxta-glacial deposits (calibrated hydraulic conductivity of 9×10^{-5} m/s and recharge of 219 mm/year).
- Zone of waste rock piles overlying on till (calibrated hydraulic conductivity of 1×10^{-3} m/s and recharge of 219 mm/year).
- Mine tailings zone overlying on till (calibrated hydraulic conductivity of 3×10^{-6} m/s and recharge of 55 mm/year).
- Rock (calibrated hydraulic conductivity variable from 2×10^{-9} m/s to 2×10^{-5} m/s which generally decreases with depth and a surface recharge of 55 mm/year).

Groundwater levels are generally near the ground surface and range from -0.6 m (artesian) to 16 m depth. A piezometric map, defined by the measurement of groundwater levels carried out in rock drilling as well as in observation wells screened in sedimentary deposits, is presented in Figure 7. In general, the direction of groundwater flow is controlled by topography and locally influenced by Pit 87. The well area southeast of the tailings pond shows the highest piezometric levels in the region. From this topographic high, the flows head northwest toward the mining site. In the area of the southwest projected pit, underground flows follow the direction of Bibou Creek toward the northeast. The current levels of Pit 87 create a local drawdown of nearly 70 m compared to the surrounding piezometric level, while Pit J4 has much less local influence on the groundwater table.

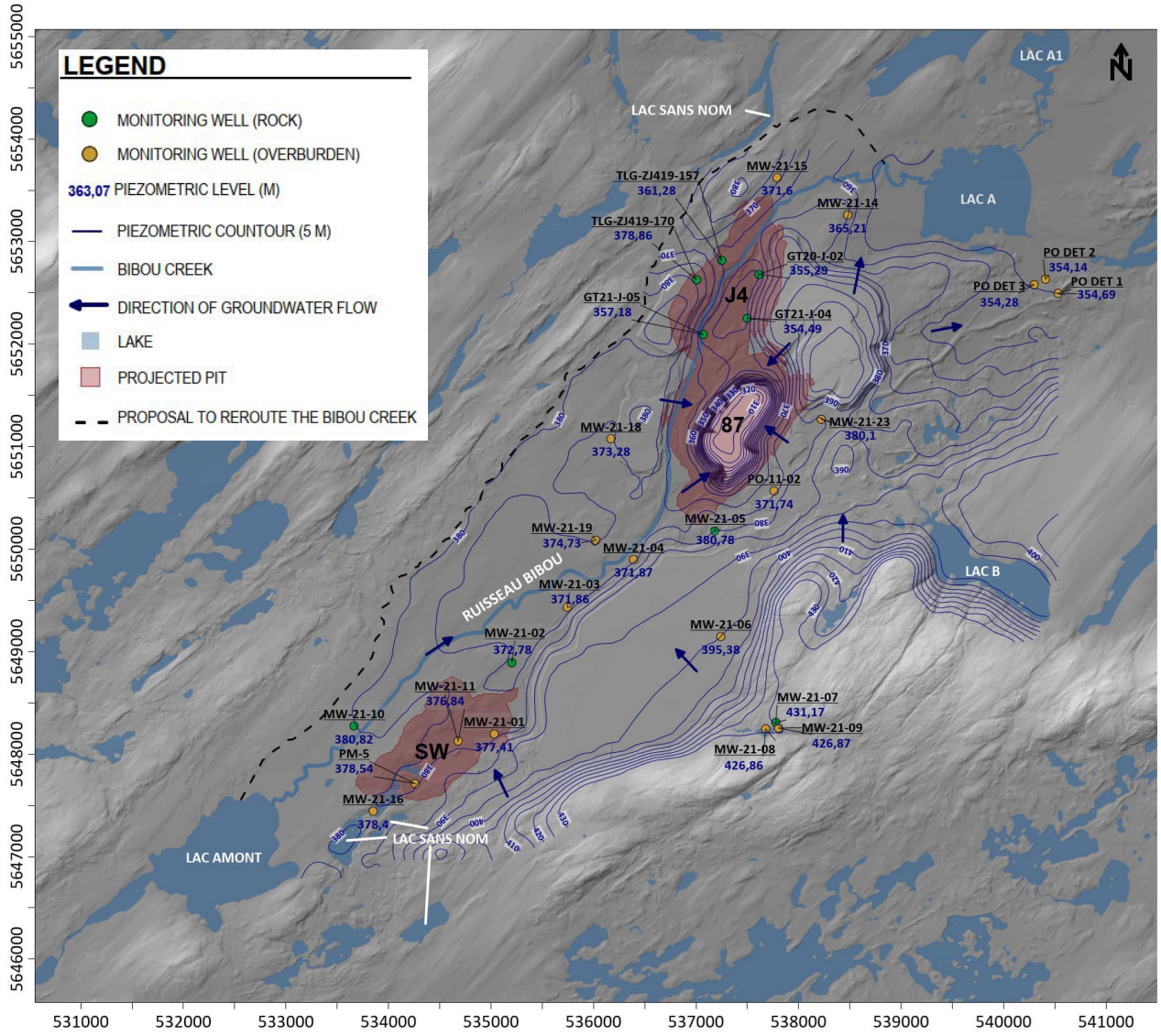


Figure 7: Piezometric Contours and Flow Direction (after WSP 2024a)

2.5 Troilus Project Mine and Site Development Plan

WSP developed the water management plan to facilitate the Troilus Project mine plant. The Troilus Project mine site development figures (AGP 2024) and the Plant Site layout (Lycopodium 2024) are included in Appendix A.

- **Year -3:** Construction begins on the main stream diversion, secondary diversions, and sedimentation ponds to ensure they are commissioned and online for the Year -2 freshet.
- **Year -2**: Beginning of site development two years before ore processing begins. A new ore processing plant (OPP) will be constructed with a processing capacity of 50,000 tonnes per day. Water management infrastructure will be constructed in and around the processing area to manage contact water. A small pit offshoot southwest of the existing 87 Pit will be mined to provide space for Sedimentation Pond SP02. A new site access road will be constructed to the south of the site.
- **Year -1**: Start of overburden removal in the existing 87 Pit footprint. The waste dump and overburden dump for the 87 Pit expansion will begin in the northeast of the site, on top of the existing waste rock dump. The TSF footprint will expand toward the northwest through the construction of the buttress.
- **Year 1**: In the first year of ore processing, 87 Pit expands, and mining begins in the Southwest Pit. The waste dump and overburden dump for the 87 Pit expansion are started southwest of the site.
- **Year 2**: Mining will continue in the 87 Pit and Southwest Pit. The development of the West Waste Dump will begin. A replacement to the 161 kV powerline will be constructed to the south of the TSF, as the TSF footprint will expand over the existing powerline.
- **Year 3 – 5**: Active pits are Pit 87, J Pit (starting in Year 5), and the Southwest Pit.
- **Year 6 – 10**: Active Pits are Pit 87, Southwest Pit, and J Pit. The 87 Waste Dump expands on the north end of the site. Overburden material from the 87 OB dump is removed to make room for the 87 Waste Dump and will be used for progressive reclamation in other areas of the site.
- **Year 11 – 15**: Placement of tailings into the Southwest Pit begins. The Southwest Overburden Dump is removed to allow for the placement of waste rock, and the material is used for progressive reclamation in other areas of the site.
- **Year 16 – 20:** Active pits are 87 Pit and X22 Pit. X22 Pit development begins in year 18 on the west side of 87 Pit. Development of the Southwest Waste Dump over the Southwest Pit footprint. Progressive tailings placement in J Pit, then in 87 Pit.
- **Year 21**: Final year of mining (in X22 Pit).
- **Year 22**: Ore processing is completed on the remaining stockpiled material. The transition to closure begins.

3.0 WATER MANAGEMENT OVERVIEW

3.1 Operational Water Management Objectives, Approaches, and Systems

Water management system requirements for the Troilus Project are:

- Facilitate efficient mine and plant construction, operation, and closure by:
  - reducing on-site water handling requirements; and
  - providing a secure supply of water to meet the project water requirements for production.
- Reduce effects on downstream receiving waterbodies by:
  - optimizing the diversion of natural flows around the development area; and
  - managing contact water to meet the regulatory requirements for the water releases.

The above-mentioned water management objectives will be achieved through the design, construction, and operation of the following water management facilities:

- Stream diversion channels to divert runoff from upstream natural watersheds around the project development area;
- drainage ditches, sumps, pumps, and sedimentation ponds to manage the contact water and to intercept non-diverted natural runoff and groundwater seepage so that the water is of acceptable quality prior to release to the receiving environment;
- wells, pumps, and pipelines to dewater the pits;
- water ponds within the TSF and TSF emergency spillways;
- pump and pipelines to transfer the contact water within the site, to supply the Ore Processing Plant with process water, and to discharge water from the sedimentation ponds to the environment after verification of its water quality;
- pumps and pipelines from a natural lake to supply the freshwater demand at the plant. And
- surface water and groundwater monitoring stations to collect water quantity and quality data for regulatory compliance monitoring.

3.2 Operational Water Management System Layout Plan

Figure 1 to Figure 9 in Appendix B present the operational water management layout plans for the following Troilus Project phases:

- Existing (2023) conditions
- Year -2
- Year -1
- Year 1 of operation
- Year 2
- Year 6
- Year 9
- Last Year of Operation
- Closure

The Surface Water Management Schematics were developed based on mining and waste management plans provided by AGP (AGP 2024) and plant site and infrastructure provided by Lycopodium (Lycopodium 2024a, Lycopodium 2024b) at the time of preparation of the water management plan. Table 7 provides additional details regarding the construction sequence of the main water management structures.

- Existing (2023) conditions (Figure 1 in Appendix B):
  - Runoff on the TSF tailings beach and the upstream mountain slope is collected within the TSF Pond in the southern part of the TSF. Troilus controls the pond water level by pumping water to a mechanical water treatment plant and polishing pond, where TSS are removed before the water is discharged to Bibou Creek downstream of the TSF.
  - Toe ditches are collecting TSF seepage and TSF Dyke slope runoff and draining them to three effluent points. Water is discharged to Bibou Creek after water quality testing. If required, water is returned by pumping to the TSF Pond.
  - Unnamed Creek flows to a diversion channel that was constructed to convey natural runoff around J4 Pit and 87 Pit to Lac A, downstream of the two pits.
  - Runoff from the existing waste rock piles drains to the existing diversion channel or to the flooded J4 Pit and 87 Pit.
  - Water collected in the J4 Pit and 87 Pit is managed by pumping to the existing diversion channel.

Table 7: Water Management Structures Construction Sequence

Operation Year	Proposed Construction
Year -3	■ Construction begins on the main stream diversion, secondary diversions, and sedimentation ponds to ensure they are commissioned and online for the Year -2 freshet.
Year -2 (Figure 2 in Appendix B)	■ Existing Bibou Creek diversion is routed around the first phase of the 87 Pit expansion through the bypass diversion channel (DCB) temporary diversion channel. ■ Construction of the east diversion system (DC2a and DC2b) to divert the Lac B watershed around the stockpile footprints and back to the Lac A inlet channels. ■ Development of contact water management infrastructure in the north-east end of the site, including SP04 (pumping to Lac A) and associated contact water ditches around the stockpiles. ■ Development of the first phase of the 87 Pit expansion includes excavation of the basin for in-pit sedimentation pond SP02, which pumps release water to DC1. Construction of the pumping station within the pond is completed, which will direct water to both the main diversion and to the plant for process water. Ditches upstream of the 87 and J4 pits are also constructed and drain to the Sedimentation Pond SP02. ■ Plant site expansion and construction, including sump S06, which collects stockpile and plant site runoff and pumps it to SP02, and S09, which pumps contact water (including some plant site runoff) to SP04.
Year -1 (Figure 3 in Appendix B)	■ Construction of new stream diversion “DC1” (also called “Main Diversion Channel” in this report), which conveys flows from Lac Amont to Lac A and intercepts runoff from the west side of the valley. ■ Construction of SP01, which will pump release water to DC1, begins in Q3 / Q4 to ensure it is online for the freshet the following year. The existing diversion downstream of the construction footprint continues to collect local runoff, which is conveyed to SP02. ■ Development of water management on the south side of the Tailing Storage Facility as it expands, including S02 and S03 (both pumping contact water to the TSF) and associated contact water ditches.
Year 1 (Figure 4 in Appendix B)	■ Construction of water management infrastructure around the Southwest Pit. ■ Construction of Sedimentation Pond SP01 is completed to collect runoff and contact water from the Southwest Pit and associated overburden and waste rock dumps. Contact water ditches upstream of SP01 are also completed. ■ Construction of Sump S01 in the footprint of the existing Lac C2 and associated contact water ditches. This sump collects runoff from an overburden dump and from local drainage areas and pumps it to SP01.
Year 2 (Figure 5 in Appendix B)	■ Expansion of 87 Pit and Southwest Pit, and associated waste rock and overburden dumps ■ Additional contact water ditches are constructed adjacent to a new overburden dump near DC1 to intercept runoff from the dump. Runoff is diverted to 87 Pit and pumped to SP02. ■ Installation of a new water treatment plant for the TSF Pond surplus water. The new plant’s location is west of the SP01, near the DC1 channel.
Year 6 (Figure 6 in Appendix B)	■ Expansion and development of 87 Pit, J Pit, and the Southwest Pit, and associated waste dumps. ■ Construction of sedimentation pond SP03, which pumps release water to Lac A, and associated contact water ditches to manage runoff from the expanded 87 Waste Dump and the NW Overburden Dump. ■ Construction of sump S01b in the existing Lac C footprint to replace the S01 sump which is removed with the expansion of the Southwest Waste Dump. Construction or realignment of associated contact water ditches. Pumping infrastructure is moved from S01 to S01b, which now pumps contact water to SP01 via ditch D05.
Year 8 (Figure 7 in Appendix B)	■ Continued expansion of pits and associated waste rock and overburden dumps. ■ Expansion of the TSF required the construction of the TSF East Dyke across the saddle to the east of the existing TSF. ■ Construction of sump S07 to manage runoff into the existing water body east of the TSF. S07 pumps contact water into the TSF.

Operation Year	Proposed Construction
Year 22 (Figure 8 in Appendix B)	■ The site footprint is fully developed. Mining ends in Year 21, and processing of stockpiled ore is completed in Year 22. ■ The Southwest Waste Dump is expanded to cover the southwest pit and is integrated with the TSF dyke, covering S02, S03, and associated ditches.
Closure (Figure 9 in Appendix B)	■ Dumps and tailings are reprofiled and covered with reclamation material. ■ The combined 87 Pit, X22 Pit, and J Pit are allowed to fill using groundwater inflows and local runoff over a transition period. During this time the existing diversion is maintained. ■ Once the pit lake is full, the DC1 diversion channel is routed through the lake, and the downstream portion is decommissioned and reclaimed. ■ The pit lake is connected to the downstream existing channel to maintain a connection to Lac A. ■ Most collector ditches are decommissioned. Sumps and ponds are left in place as small lakes to collect natural runoff and groundwater inflows.

3.3 Operational Monitoring System

Surface water quantity and quality monitoring will be required as part of the Project's environmental management program and to meet anticipated regulatory requirements.

A surface water monitoring system is proposed to meet these requirements during the construction, operation, and closure periods by extending the existing monitoring network. The proposed water monitoring system consists of various station types for which descriptions are provided in Table 8; additional surface water monitoring points will be required during the construction period as part of the construction care of the water plan.

Table 8: Surface Water Monitoring Stations

Station Type	Monitoring Parameters	Regulatory Requirements	Monitoring Periods	Description of Monitoring Activities
Upstream water courses (Lac Amont and Lac B outlets)	WL, Q, and WQ	Directive 019 (MELCCFP, 2012)	CO and CL	Water level and discharge monitoring from all diversion channels use water level loggers (continuous) and established flow rating curves. WQ monitoring is continuous, composite, or grab in daily, weekly, monthly, bi-monthly, or tri-monthly intervals.
Sedimentation pond discharge (four sedimentation ponds and outlet from TSF Pond treatment plant)	WL, Q, and WQ	Directive 019 (MELCCFP, 2012)	CO	Water level and discharge monitoring for all sedimentation ponds use water level loggers (continuous) and established outflow rating curves. WQ monitoring is continuous, composite, or grab in daily, weekly, monthly, bi-monthly, or tri-monthly intervals.
Diversion channel discharges (main and secondary channels)	WL, Q, and WQ	Directive 019 (MELCCFP, 2012)	CO and CL	Water level and discharge monitoring from all diversion channels use water level loggers (continuous) and established flow rating curves. WQ monitoring is continuous, composite, or grab in daily, weekly, monthly, bi-monthly, or tri-monthly intervals.
Downstream water course (Lac A outlet)	WL, Q, and WQ	Provincial and federal environmental regulations	CO and CL	Water level and discharge monitoring at locations upstream and downstream of disturbance area uses water level loggers (continuous) and established flow rating curves. WQ samples are collected quarterly.

Notes: TSF = tailings storage facility; WL = water level; Q = discharge; WQ = water quality; CO = construction and operation; CL = closure.

An update of the existing groundwater monitoring plan was not part of the scope of the current document. The plan will include, at a minimum, monitoring wells upstream of Lac A along the eastern edge of the TSF and northwest of the J4 Pit and Main Diversion Channel. Section 5.0 provides additional comments.

4.0 SURFACE WATER MANAGEMENT

4.1 Design Criteria

Table 9 presents the adopted water management design criteria. They are based primarily on the provincial government's Directive 019 for the mining industry (MELCCFP, 2012) and on the Canadian Dam Association's dam safety recommendations (Canadian Dam Association [CDA] 2013, 2019). As indicated in Section 1.2, WSP assumed that TSS concentration was the only water quality parameter to require treatment.

Table 9: Design Criteria for Water Management Structures

Structure	Design Criteria	Source and Comments
Bibou Creek diversion	Manage the 100-year peak design flood without uncontrolled overtopping or significant structural damage	Directive 019 (MELCCFP, 2012)
	Allow 0.3 m freeboard between the top of the banks and the peak design flood water level	General practice to account for design and construction uncertainties, ice effects, debris accumulations, and waves
	Provide fish passage during the 7Q10 October low flow event and the 14Q2 spring freshet high flow event, with consideration of migration of walleye in the spring and passage for burbot during average annual open-water conditions	WSP based on current understanding of fish and fish habitat conditions
	Side slopes: ▪ 2.5H:1V in till ▪ 1H:1V in bedrock	Typical side slope for moderately competent soil and for excavation in bedrock. For excavation in bedrock, the slope includes the potential requirement for safety benches
	1 m minimum base width and 1 m minimum depth, with the exception of the low flow (fish passage) channel	Practical considerations for construction
	Provide adequate erosion protection riprap for all structures, with a maximum rock size of 500 mm	Limit structural damage due to erosion and mobilization of TSS, and make use of available on-site materials sourced from sorted blast rock
Collection ditches and secondary diversions	Manage the 100-year peak design flood without uncontrolled overtopping or significant structural damage	Directive 019 (MELCCFP, 2012).
	Allow 0.3 m freeboard between the top of the banks and the peak design flood water level	General practice to account for design and construction uncertainties, ice effects, debris accumulations, and waves
	Side slopes: ▪ 3H:1V in till ▪ 0.5H:1V in bedrock	Typical side slope for moderately competent soil and for excavation in bedrock
	1 m minimum base width and 1 m minimum depth	Practical considerations for construction
	Provide adequate erosion protection riprap for all structures, with a maximum rock size of 500 mm	Limit structural damage due to erosion and mobilization of TSS, and make use of available on-site materials sourced from sorted blast rock

Table 9: Design Criteria for Water Management Structures

Structure	Design Criteria	Source and Comments
Sumps and sedimentation ponds	0.5 m minimum depth allowance for sediment accumulation	Professional judgment to accommodate uncertainty in design, construction, and operation and to allow for practical frequency of pond cleaning. For some specific structures, sediment accumulation and freeboard allowances may be reduced
	0.5 m minimum freeboard above design water level	
	For sedimentation ponds, allow sufficient residence time for the settlement of a reference 10-micron particle during the design flood event	Directive 019 (MELCCFP, 2012) with respect to the discharge guidelines and the British Columbia sedimentation pond design manual (British Columbia Ministry of Environment 2015)
	3H:1V side slopes	Typical side slope for moderately competent soil
Pumping systems	Designed to operating flowrate with conservative pump selection	Professional experience and judgment to accommodate uncertainty in design, operation, and equipment performance
	Head loss safety factor of 10%	
	Pump efficiency of 60%	
	Factor of safety on installed pumping power of 15%	
TSF water pond and water treatment capacity	Manage the Directive 019 “project flood” associated with the 1,000-year 24-hour rainfall superimposed with the melt over 30 days of the 100-year snowpack Maintain a freeboard, relative to the crest of the dyke, of minimum 1 m during the “project flood”	Directive 019 (MELCCFP, 2012)
TSF emergency spillway	Convey the PMF peak design flow with a freeboard, relative to the crest of the dyke, equivalent to the 100-year extreme wind effect (wind set-up and run-up) Design the spillway channel to be non-erodible during the PMF event unless the channel erosion would not impact the dam (e.g., at sufficient distance downstream of the dam)	Directive 019 (MELCCFP, 2012) and Canadian Dam Association (2013, 2019) recommendations
General	Consider the impact of climate change on design storm events by using available median projections for the planned project LoM	Current standards including Global Industry Standard on Tailings Management (Global Tailings Review [GTR] 2020) and Strategic Assessment of Climate Change (ECCC 2020)
Road Crossings	Manage the 100-year peak design flow	Proposed for FS-level design
	2H:1H slopes on culvert ends	
	0.3 m maximum backwater	
	Assume 5 m of erosion protection is required upstream and downstream of crossing	

Notes: TSF = tailings storage facility; TSS = total suspended solids; PMF = probable maximum flood; LoM = life-of-mine; FS = feasibility study.

Geotechnical stability design criteria are not listed explicitly in the table above. WSP included a preliminary verification of the geotechnical stability during the design of the proposed water management structures. Further details are included in Appendix D, Appendix E, and Appendix F.

4.2 Hydrology

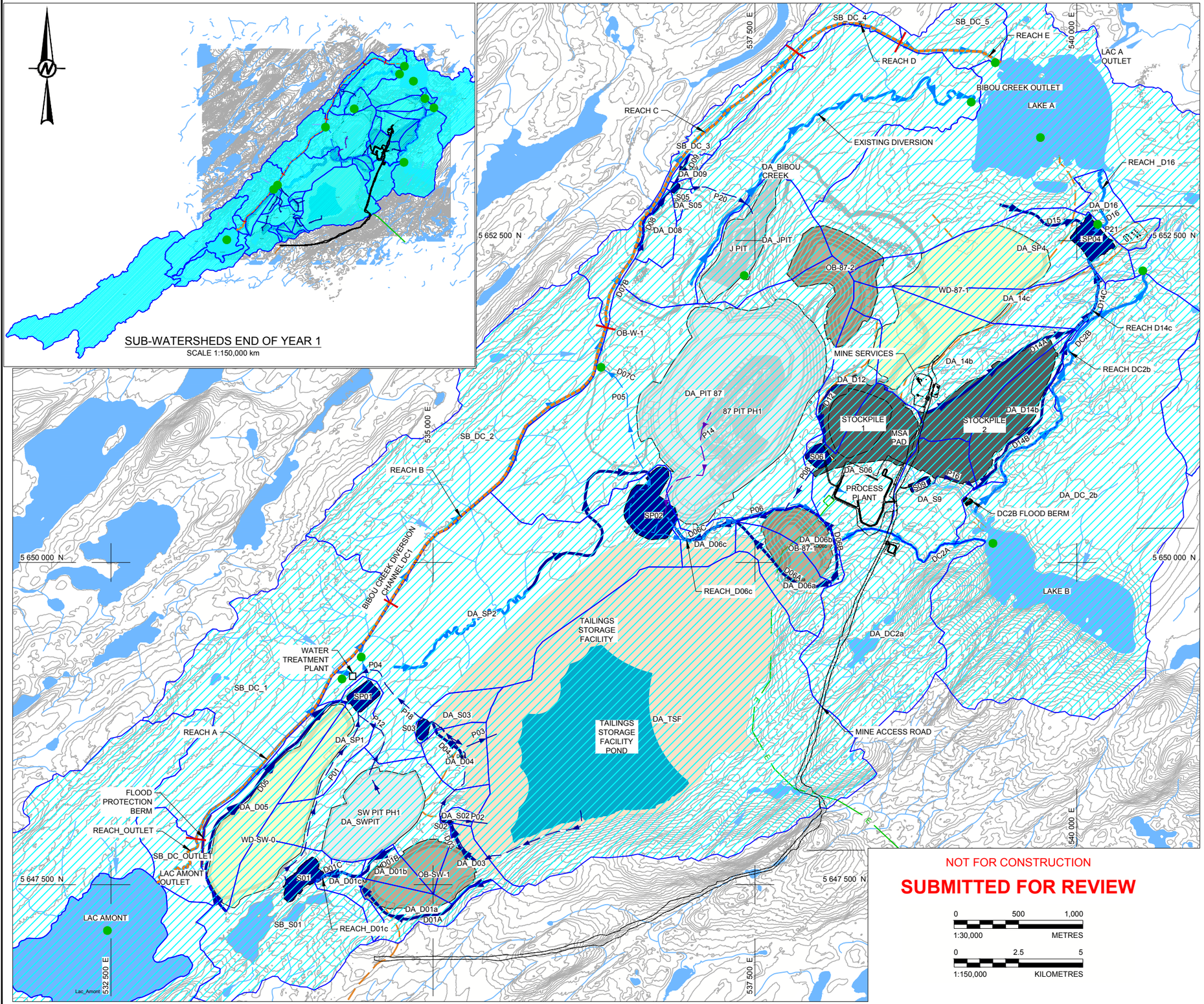
Design flows for the surface water management infrastructure were calculated using HEC-HMS (United States Army Corps of Engineers [USACE] 2021). Hydrologic calculations are described in detail for the DC1 diversion channel in Appendix D and for the rest of the SWMP infrastructure (secondary diversions, ditches, sumps and ponds) in Appendix E. Drainage areas for the primary surface water management infrastructure, including upstream pumping from other collection points, are summarized in Table 10.

Figure 8 and Figure 9 show the delineation of surface water drainage areas for each structure.

Table 10: Total Drainage Areas of Main Water Management Structures

Structure	Design Configuration [(a)]	Total Drainage Area – Gravity or by Pumping (km^2)
DC1 Diversion Channel	Year 22	21.4
DC2a Diversion Channel	Year 22	1.27
DC2b Diversion Channel	Year 22	5.50
Sedimentation Pond SP01	Year 22	2.37
Sedimentation Pond SP02	Year 2	3.77
Sedimentation Pond SP03	Year 22	1.70
Sedimentation Pond SP04	Year 22	2.76
Sump S01	Year 2	1.39
Sump S01b	Year 22	1.39
Sump S02	Year 2	0.11
Sump S03	Year 2	0.45
Sump S05	Year 22	0.15
Sump S06	Year 22	0.75
Sump S07	Year 22	0.51
Sump S09	Year 22	0.45
87 Pit	Year 22	2.30
J4 Pit	Year 22	2.00
Southwest Pit	Year 14	1.10
X22 Pit	Year 22	1.30
TSF Pond	Year 1 to Year 22	5.80

Note:
(a) The year of operation, for which the site configuration is considered critical in terms of the design.



LEGEND

- TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- NATURAL STREAMS
- DIVERSION CHANNEL (NON-CONTACT WATER)
- CONTACT WATER DITCH
- DRAINAGE THROUGH WASTE ROCK
- CLEAN WATER PIPELINE (PUMPING)
- CONTACT WATER PIPELINE (PUMPING)
- PIT DEWATERING
- FLOW DIRECTION
- NATURAL LAKES
- SEDIMENTATION POND (CONTACT WATER)
- SUMPS / PUMP STATION (CONTACT WATER)
- TSF POND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- WASTE DUMP
- PROCESS PLANT
- RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD
- WATERSHED AREAS
- DIVERSION REACHES FLOW PATH
- DITCH REACHES FLOW PATH

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, FEBRUARY10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END OF YEAR (2) SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

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1:150,000 KILOMETRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN
SUB-WATERSHEDS END OF YEAR 1

CONSULTANT

wsp

YYYY-MM-DD	2024-05-03
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO.	CONTROL	REV.	FIGURE
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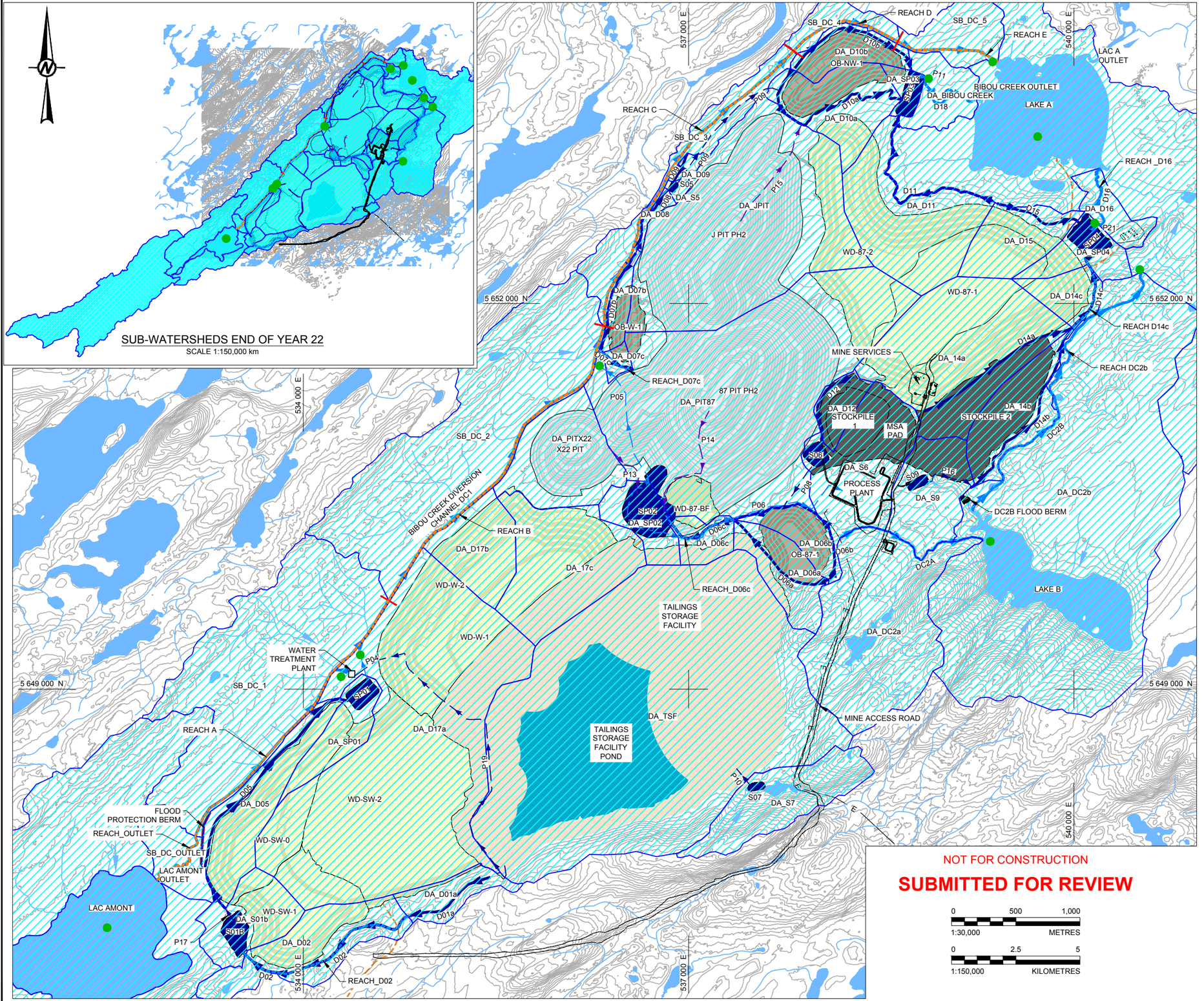

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

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1:150,000 KILOMETRES

WATER MANAGEMENT

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- P## — CLEAN WATER PIPELINE (PUMPING)
- P## — CONTACT WATER PIPELINE (PUMPING)
- P## — PIT DEWATERING
- FLOW DIRECTION
- NATURAL WATERCOURSES
- NATURAL LAKES
- TSF POND
- SP## — SEDIMENTATION POND (CONTACT WATER)
- S## — SUMPS / PUMP STATION (CONTACT WATER)
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- WASTE DUMP
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- PROCESS PLANT
- E — RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD
- WATERSHED AREAS
- DIVERSION REACHES FLOW PATH
- DITCH REACHES FLOW PATH

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END-OF-MINE-LIFE SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN
SUB-WATERSHEDS END OF YEAR 22

CONSULTANT

wsp

YYYY-MM-DD	2024-05-03
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO.	CONTROL	REV.	FIGURE
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4.3 Stream Diversion Systems

The Troilus Surface Water Management system is designed to divert natural flows around the site and maintain existing hydraulic and, where applicable, fish connectivity between upstream and downstream lakes.

There are three separate diversion systems.

1. The primary diversion system, DC1 (also referred to as Main Diversion Channel), conveys water around the west perimeter of the site between Lac Amont and Lac A. It replaces the existing Bibou Creek. It is designed to convey the 100-year flood flow without overtopping or erosion and to provide fish passage between the two lakes. The upstream 5.5 km of the channel is designed to be maintained at closure and will be integrated into the project closure plan.
2. The secondary diversion system, DC2, conveys water around the east perimeter of the site between Lac B and Lac A. There are two separate channels in the DC2 system. The upstream channel, DC2a, diverts runoff away from the plant site and conveys it to Lac B. The downstream channel, DC2b, conveys flow from the Lac B watershed around the east side of the future stockpile and connects to an existing channel, which flows to Lac A. It is designed to convey the 100-year flood flow without overtopping or erosion. Based on available information, WSP assumed that there is currently only limited fish passage connectivity between Lac B and Lac A. At the Feasibility Study level, WSP did not consider fish passage for this diversion system. Further details will need to be verified during the next engineering phase.
3. The temporary bypass channel, DCB, conveys water around the west side of the Phase 0 87 Pit development, which is required in Year -2 to provide space for sedimentation pond SP02. DCB is connected on the upstream and downstream ends to the existing Bibou Creek and existing diversion. It is expected to be in place for three years. It is designed with a similar geometry as the existing diversion and will provide fish passage through the existing channel.

4.3.1 Main Diversion Channel – DC1

The DC1 Main Diversion Channel is approximately 9.7 km long. The channel was designed to contain the 100-year design flow with a minimum 0.3 m freeboard and with erosion protection riprap that can withstand the design flow without damage. The proposed alignment is the result of an option analysis study, which included Stakeholder consultation (WSP, 2023).

The channel was designed using a 1D hydraulic numerical model in HEC-RAS (USACE 2021). Design flows were calculated using HEC-HMS (USACE 2021) and Quebec hydrologic data (Centre d'expertise hydrique du Québec [CEHQ] 2024) as described in Appendix C. Input flows are shown for the channel in Figure 10. The profile of the diversion channel, including channel invert, existing topography on the channel centerline, and the 2, 10, and 100-year design flow depths are shown in Figure 11.

The diversion includes a 0.5 km long section that is to be constructed in fill, above the natural terrain elevation. General waste rock is planned as fill material. The channel in this section will be lined with natural low-permeability material and bituminous geomembrane to limit exfiltration.

The design of the Bibou Creek diversion (DC1) is summarized in Table 11. Measures to accommodate fish passage are presented further down in this section. More design details are presented in Appendix D.

Table 11: Main Diversion Channel Design Summary

Segment Number	Segment Length (m)	100-Year Design Flow (m^3/s)	Longitudinal Slope (%)	Minimum Total Channel Depth [a] (m)	100-Year Design Velocity (m/s)	Width (m) [b]	Erosion Protection Riprap D_{50} (mm) [e]
1	100	17.4	1.0 %	2.12	0.71	11	300
2	600	17.4	0.1%	2.61	0.81	11	100
2	680	17.4	0.1%	2.5	0.97	11	100
4	440	17.4	0.7%	2.20	1.48	11	300
5	300	17.4	0.3%	2.77	0.89	11	100
6	620	25.1	0.1%	2.91	0.92	11	100
7	630	25.1	0.1%	3.24	0.73	11	100
8	1,880	25.6	0.05%	3.53	0.68	11	50
9	920	25.6	0.1%	3.43	1.49	2.5	50 [c]
10	500	25.6	0.05%	4.27	0.80	2	50
11	930	25.6	0.1%	3.40	1.54	2.5	50 [c]
12	390	25.6	0.1%	3.10	2.02	2.5	50 [c]
13	520	25.6	1.7% [d]	2.66	1.14	8	50
14	360	26.2	0.1%	2.56	1.72	2	100
15	430	26.2	1.7% [d]	2.08	1.29	8	50
16	354	26.2	0.1%	2.80	1.06	2	100

Notes:

(a) 100-year design flow depth plus 0.3 m freeboard. Note 1: see details in Appendix D for the location of the segments.

(b) Width of main channel (not low flow channel, where one is included in the design)

(c) Represents substrate placed for fish passage on top of bedrock

(d) The 1.70% slope represents an average slope through the segment, for hydraulic modelling of flood flows. The compound slope in these segments, which incorporates additional details for fish passage, is represented by the detailed schematic of the rock ramps shown in Appendix D.

(e) After the installation of the riprap layer, the channel surface can be smoothed out with a small quantity of gravel that is more favorable for fish passage and aquatic life. Additional specific measures to accommodate fish passage and aquatic life are presented in Appendix D and in the following paragraphs.

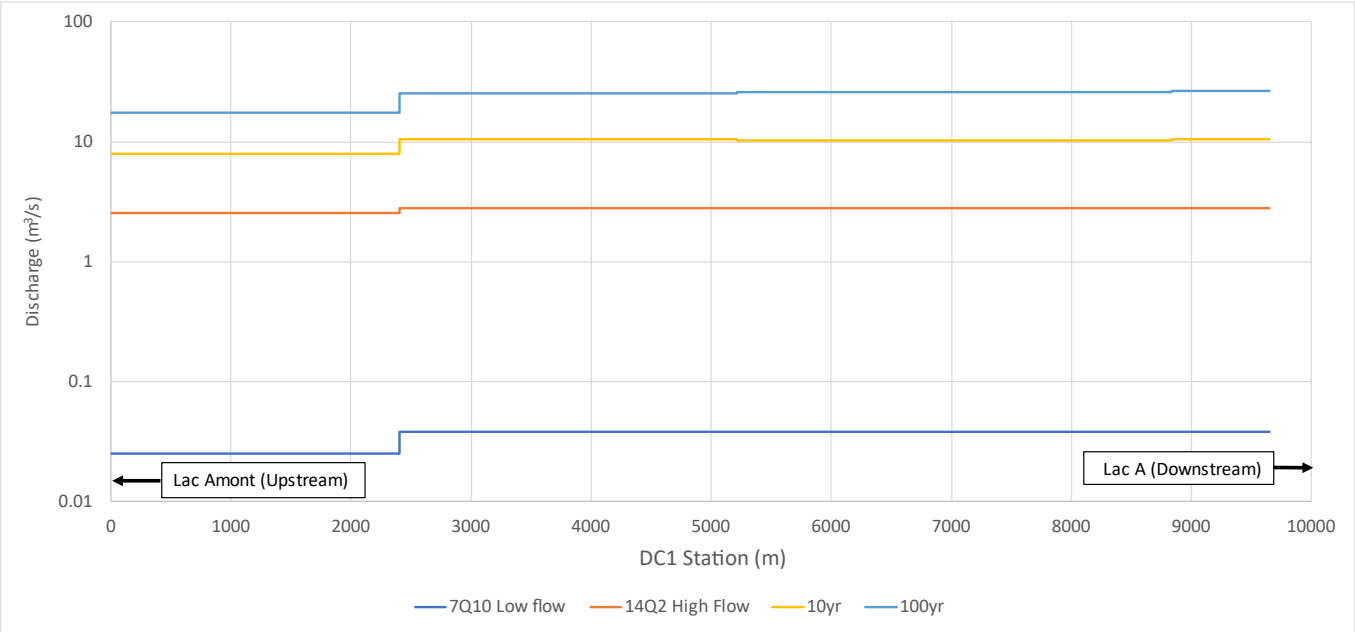


Figure 10: DC1 Significant Design Flows by Station

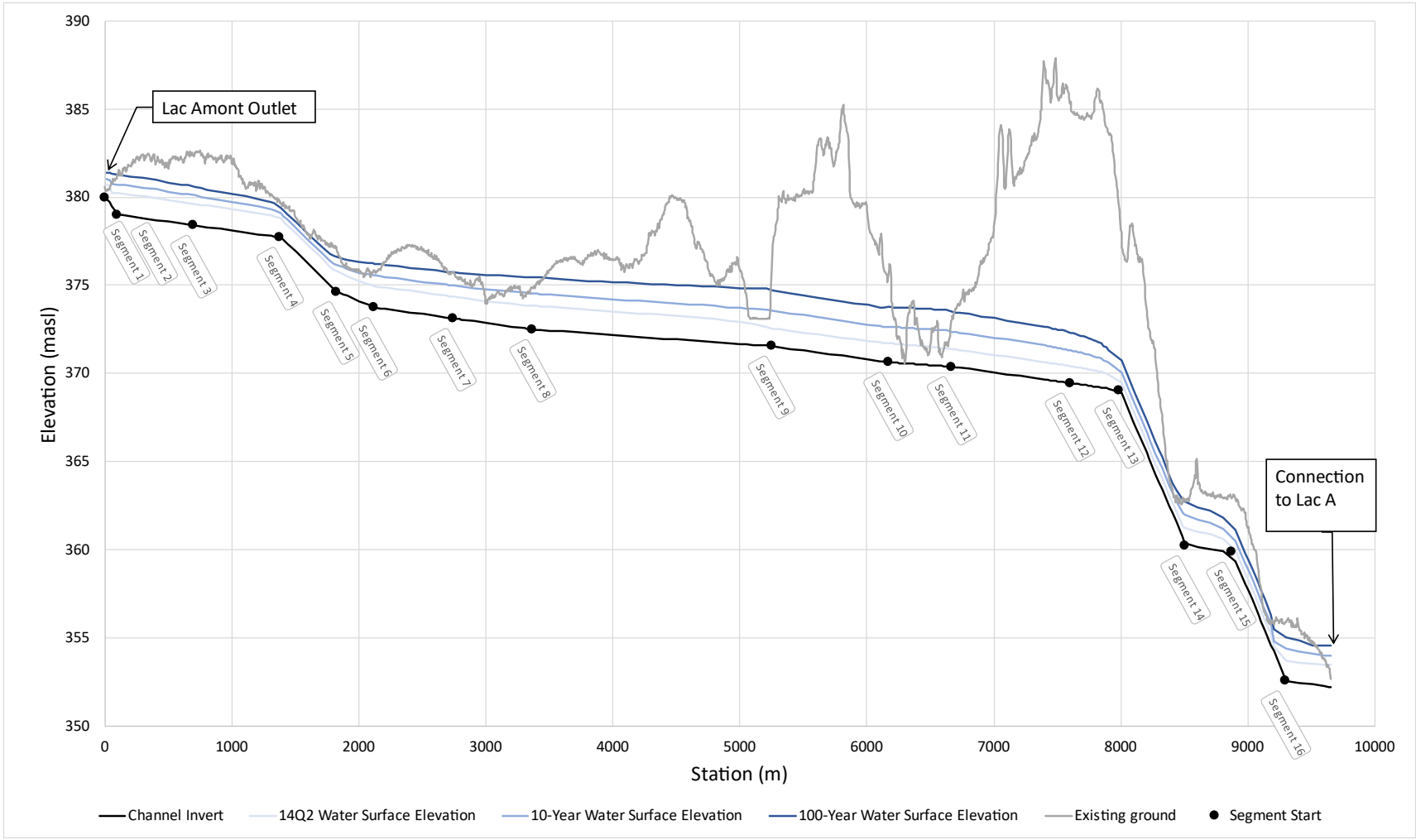


Figure 11: DC1 Diversion Channel Water Surface Elevations

The DC1 stream diversion channel must maintain fish passage between Lac Amont and Lac A. Analyses looked at maintaining connectivity in the hydrological interval between the 7Q10 low flow and 14Q2 high flow conditions.

- 7Q10 refers to the annual minimum 7-day average flow rate with a 10-year occurrence interval (May to October).
- 14Q2 refers to the annual maximum 14-day average flow rate with a 2-year occurrence interval.

Of the fish found in the existing Bibou creek, the Burbot was identified as the fish with the lowest swimming capabilities, and Walleye was identified as the fish most likely to use the channel during spring freshet. To maintain passage between the 7Q10 low flow event and 14Q2 high flow event, a minimum water depth of 0.1 to 0.2 m was targeted. The targeted maximum channel velocity to allow passage is outlined in Table 12 below; the Walleye velocities were used as guidelines at 14Q2 high flows. Consideration was given to the lower swimming ability of the Burbot by including frequent shelter places; the maximum flow velocities limits for Burbot were not imposed as design constrains for the entire 7Q10 – 14Q2 flow interval.

Table 12: Maximum Swim Distances and Velocities without Rest (Katopodis 2016)

Swim Distance (m)	Max. Velocity for Burbot (m/s)	Max. Velocity for Walleye (m/s)
3	1	2.2
25	-	1.0
100 – 300	0.1	0.4

The entire channel is designed to allow fish passage; however, special consideration was given for the upstream channel segments, which are meant to be integrated with the closure landscape.

The DC1 channel is composed of 16 different segments which each have one of three design types:

- Type 1 – Meandering Channel
  - Design Type 1 is used in segments 1 through 8 in the upstream portion of the channel. A sinuous, low flow channel is located within a larger flood flow channel. The low flow channel can contain flow up to the 14Q2 flood event. The flood flow channel will have boulders placed in strategic locations to create shelter during periods of high flow. Woody debris will also be placed approximately every 20 m to increase water depth in the low flow channel. The channel is lined with an upper layer of erosion protection sized to the design 100-year flow velocity. Transition layers below the erosion protection will be either a layer of cobble and a layer of sandy gravel (for erosion protection with D_{50} > 300 mm) or a layer of sandy gravel, where the erosion protection is in the D_{50} = 300mm range (cobble). All erosion protection is blended with sandy gravel to serve as interstitial fill in the rock voids, which will increase flow depth in the low flow channel during periods of lower flow, and will improve the quality of fish habitat substrate.
- Type 2 – Flat Segments with Small Weirs
  - Design Type 2 is used in segments 9 through 12 and segments 14 and 16. Design Type 2 is implemented in the operational portion of the channel (that is, the segments that are planned to be dismantled for closure and where active maintenance is available), where the slope of the channel is shallow. The channel is lined with gravel and cobble to act as a natural analogue substrate for fish passage. A check weir is placed every 100 m to create a backwater effect and increase the water depth during periods of low flow.

- Type 3 – Rock Ramps
  - Design Type 3 is implemented in the steep operational channel segments 13 and 15. It is composed of a series of rock ramps with a 3.5 % slope and pools to achieve a compound slope of 1.7%. Rock ramps are nature-like fishways which provide fish passage and aquatic habitat through simulation of a natural stream environment. An example of a rock ramp is shown below in Figure 12. Rocks and boulders are placed in strategic locations to decrease velocity and increase flow depth. The placement of the rocks and boulders mimics a natural stream and allows fish to move from one pool to another. In addition, in this design type, A low flow channel is located within the main channel in the rock ramp sections. The low flow channel is narrow and shallow and can only contain the 7Q10 low flow. Channel bedding and transition layers are similar to the Type 1 channel.

Figure 12: Rock Ramp Fishway Example (Queensland 2021)

Table 13 below outlines the design type required for each segment of the DC1 diversion channel. The detailed design of the diversion channel fish passage can be found in Appendix D.

Table 13: Fish Passage Design Types Required for Diversion Channel Segment

Segment [(a)]	Design Type
1	Type 1 – Meandering Channel
2	Type 1 – Meandering Channel
3	Type 1 – Meandering Channel
4	Type 1 – Meandering Channel
5	Type 1 – Meandering Channel
6	Type 1 – Meandering Channel
7	Type 1 – Meandering Channel
8	Type 1 – Meandering Channel
9	Type 2 – Flat Segments with Small Weirs
10	Type 2 – Flat Segments with Small Weirs
11	Type 2 – Flat Segments with Small Weirs
12	Type 2 – Flat Segments with Small Weirs
13	Type 3 – Rock Ramps
14	Type 2 – Flat Segments with Small Weirs
15	Type 3 – Rock Ramps
16	Type 2 – Flat Segments with Small Weirs

Notes:

(a) See design details in Appendix D for the location of the segments.

4.3.2 Main Diversion Channel – Southwest Diversion Berm

The Southwest Diversion Berm, which supports diverting runoff from an approximately 16 km^2 large watershed around the mine site and into DC1, is approximately 400 m long and has a maximum height above ground elevation of 2.4 meters (at the existing Bibou Creek thalweg). The purpose is to divert flows up to the 100-year flood event to the DC1 stream diversion. The berm is designed to safely overtop the PMF along the 400 m length. The berm will be integrated into the adjacent waste rock dump at closure. The berm has a 3H:1V slope on the upstream face, a 10 m crest width, and a 10H:1V slope on the downstream face. The berm is covered with run-of-mine rock over a sandy gravel transition layer, covering a low permeability core. Organic material is over-excavated below the berm to a depth of 1.2 m based on available bore hole data, and is keyed in 1.0 m into the underlying till. There is a 5 m wide rock apron on the downstream side to provide energy dissipation.

The design of the flood protection berm is described in Appendix D.

4.3.3 Other Diversion Channels

The East Diversion Channels, DC2a and DC2b, are designed to convey flow from the Lac B watershed area around the mine development to the downstream Lac A inflow channels, as shown in the SWMP figures in Appendix B. The total length of the East Diversion Channels is 4.0 km. Fish passage was not considered in the design of the East Diversion as WSP understands that passage is not occurring under existing conditions.

The channels are built by excavation into the natural ground and are designed to contain the 100-year design flow with a minimum 0.3 m freeboard and with erosion protection riprap that can withstand the design flow without damage. Table 14 summarizes the design of the east diversion channels DC2a and DC2b. The design of the East Diversion Channels is described in detail in Appendix E.

Table 14: Diversion Channel DC2a and DC2b – Design Summary

Reach Length (m)	100-Year Design Flow (m3/s)	Longitudinal Slope (%)	Side Slope (X:H1V)	Bottom Width (m)	Minimum Channel Depth (m)	Rock Protection D50 (mm)
Diversion Channel DC2a						
50	6.8	1.00	3	2	1.13	100
200	6.8	0.50	3	2	1.21	100
140	6.8	1.30	1	3	1.10	300
720	6.8	0.15	1	3	1.76	100
170	6.8	4.00	1	4	0.78	300
40	6.8	0.15	1	2	1.89	100
37	6.8	5.50	3	5	0.70	300
Diversion Channel DC2b						
380	13.0	0.50	3	3	1.41	300
240	13.0	0.15	1	3	2.20	100
95	13.0	2.50	1	5	1.02	300
110	13.0	0.20	1	3	2.06	100
100	13.0	0.80	1	2	1.86	100
230	13.0	1.50	1	2	1.63	300
250	13.0	4.60	3	6	0.85	500
210	13.0	2.70	1	5	1.00	300
45	13.0	1.30	1	4	1.29	300

Table 14: Diversion Channel DC2a and DC2b – Design Summary

Reach Length (m)	100-Year Design Flow (m3/s)	Longitudinal Slope (%)	Side Slope (X:H1V)	Bottom Width (m)	Minimum Channel Depth (m)	Rock Protection D50 (mm)
60	13.0	2.00	1	5	1.07	300
275	13.0	0.50	3	3	1.41	100
560	13.0	0.50	3	3	1.49	100
65	13.0	9.00	3	6	0.78	500
49	13.0	0.50	3	3	1.41	100

The temporary DCB is designed to convey flow within the existing Bibou Creek diversion around the first phase of mine development in Year -2 and Year -1 to allow time for the DC1 diversion channel to be constructed and to allow the in-pit sedimentation pond SP02 to become operational, as shown in the SWMP figures in Appendix B. The total length of the DCB channel is 1.9 km. The DCB channel slope and dimensions are similar to the existing Bibou Creek diversion; it follows that fish passage properties of the existing channel would be maintained.

The channel is built by excavation into the natural ground and is designed to contain the 100-year design flow with a minimum 0.3 m freeboard and with erosion protection riprap that can withstand the design flow without damage. Table 15 summarizes the design of the DCB channel. The design of the DCB channel is described in more detail in Appendix E.

Table 15: Diversion Channel DCB – Design Summary

Length(m)	100-Year Design Flow (m^3/s)	Longitudinal Slope (%)	Side Slope (X:H1V)	Bottom Width (m)	Minimum Channel Depth (m)	Rock Protection D50 (mm)
1,901	25.1	0.2	2.5	2	2.8	100

4.4 Contact Water Management Structures

The contact water management system consists of collection ditches, sedimentation ponds, and sumps. It is designed to manage mine contact water (water that has contacted active mining areas including pits, dumps, roads, the process plant, and tailings) to:

- Maximize recycling for process water use and provide a secure process water supply;
- Meet regulatory requirements for water releases to the environment; and
- Reduce on-site water handling requirements.

This section presents the design of the contact water system. Design flows and pond volumes were calculated using the HEC-HMS software (USACE 2021) and the SCS CN and SCS Unit Hydrograph methods (USDA 1986). Ditch and channel hydraulics were analyzed using the Manning's equation. Riprap rock sizes were calculated using USACE (1994).

4.4.1 Collection Ditches

A total of 22 contact water collection ditches were designed. The total ditch length is 19.9 km (see Appendix B for locations and alignments). Appendix E provides details on the design and geometry of each ditch. A summary is provided in the next paragraphs.

Mine Plan and Time of Construction

The construction schedule of the ditches is distributed across the operational periods and is aligned with the mine plan development (See Appendix B and Table 16). Collection ditches are assumed to constructed in Q1 of the year they are shown in the SWMP figures, so that they are operational prior to the spring freshet.

Hydraulic Design

The hydraulic design of the ditches is based on the detailed channel design sheets for individual segments of the collection ditches. The riprap calculation for each segment is based on the USACE stone size relations (USACE, 1994), where individual segment slopes are considered. The D_{50} riprap requirement was calculated for shallow slopes (<2%) and steep slopes (>2%) segments. The Manning's uniform flow equation was used to calculate the normal water depth for various return periods (2-year, 10-year, and 100-year). Channels were designed to keep the estimated riprap D_{50} less than 500 mm for the 100-year flows and below 300 mm wherever possible. Borehole information from the site was used to determine peat thickness and bedrock depth for each segment of the ditch and assess requirements for material salvage and channel side slopes. The estimated peat thickness was used to keep the 100-year design flow within at least 0.5 m of competent mineral soil. It was also confirmed that ditches discharging directly into the sumps were at least 1 m above the sump invert.

Erosion Protection

The channels are designed to contain the 100-year design flow with a minimum 0.3 m freeboard and erosion protection riprap capable of withstanding the design flow without damage. The ditches are primarily constructed by excavating into the natural ground. When necessary, general waste rock is planned as fill material. For the riprap size D_{50} >250 mm, a 300 mm thick filter layer is designed as an erosion protection. All sections of riprap with or without filter layer are assumed to be placed on non-woven geo-textile that lines channel to top of slope and keyed in 1 m on each side. If the channel excavation exceeds the depth of the 100-year plus freeboard, waste rock is assumed to be placed between the top of riprap and channel invert at the same thickness as the riprap and the filter.

Table 16: Contact Ditches Design Summary

Ditch ID	Year of Construction	Total Length (km)	100-year Design Flow (m^3/s)	Maximum 100-year Flow Depth (m)	Maximum 100-year Velocity (m/s)	Maximum 100-year Erosion Protection D50 (mm)
D06a	-2	0.95	5.60	1.39	3.93	500
D06b	-2	1.25	8.20	1.60	3.88	500
D06c	-2	0.56	15.10	1.52	3.25	500
D12	-2	0.68	1.10	0.55	2.83	300
D14a	-2	0.22	10.90	1.13	3.28	500
D14b	-2	1.56	12.70	1.82	2.95	500
D14c	-2	0.63	20.50	1.65	3.59	500
D03	-1	0.43	2.00	0.53	2.94	300

Table 16: Contact Ditches Design Summary

Ditch ID	Year of Construction	Total Length (km)	100-year Design Flow (m^3/s)	Maximum 100-year Flow Depth (m)	Maximum 100-year Velocity (m/s)	Maximum 100-year Erosion Protection D50 (mm)
D08	-1	0.57	1.90	0.72	2.83	300
D09	-1	0.27	0.40	0.24	1.56	100
D15	-1	0.72	5.50	1.02	3.68	500
D01a	1	1.38	7.60	1.38	3.32	500
D01b	1	0.44	4.50	0.88	2.94	500
D01c	1	0.30	12.50	1.71	2.41	300
D04	1	0.43	2.90	0.75	2.90	300
D05	1	2.19	7.40	1.36	2.43	300
D07b	5	0.84	3.20	0.93	3.03	300
D07c	5	0.57	5.50	1.19	3.15	500
D10a	5	0.55	9.60	0.83	2.59	300
D11	5	1.66	8.70	1.34	2.68	500
D02	6	1.52	15.84	1.52	3.52	500
D10b	6	1.19	6.00	1.06	2.84	300

4.4.2 Sedimentation Ponds

Four sedimentation ponds, SP01, SP02, SP03 and SP04, are included in the water management plan. Locations are shown in the SWMP figures in Appendix B. Water collected in the ponds is discharged by pumping to the environment after verification of the water quality conformity with applicable effluent quality requirements. Continuous turbidity sensors are installed on the outlet pipeline, such that discharge is stopped immediately if the TSS concentrations exceed regulatory discharge guidelines.

SP01 and SP02 discharge effluents are to the DC1 Diversion Channel. SP03 and SP03 pump release water to separate Lac A tributaries. For SP02, a pipeline was included in the design to allow pumping to the ore processing plant.

Table 17 below summarizes the designs for the four ponds. Design details are provided in Appendix E.

- The four ponds are to be operated dry to maximize the live storage capacity during a flood event.
- SP01, SP03 and SP04 are built by excavation into natural ground. A filter layer of 0.5 m thick sandy gravel over non-woven geotextile is proposed. An active groundwater management underdrain system is not considered based on available data.
- Sedimentation Pond SP02 is created by reserving the southern extremity of the 87 Pit for water management. This small, isolated pit section will be excavated in pre-stripping operations.

- The 100-year flood event criterion was applied for each structure, with an additional 0.5 m for freeboard and 0.5 m for dead storage. For SP01, however, minimal freeboard was included in the design capacity. Should SP01 overflow, the water would follow the terrain profile and seep through the J Waste Dump until the sedimentation pond SP02, which has sufficient capacity to accommodate the excess water from SP01.
- The provided pumping capacities for the four ponds do not consider water pumped from the open pits as part of the pit water management. WSP assumed that operational WMP would allow for a delay in dewatering the pits during peak flood events, such that the management of the external watershed flood event is not concurrent with the management of the in-pit flood event.
- The sedimentation ponds were assessed as dry ponds. The pump stations (see Section 4.6 and Appendix G for more details) were designed to be installed on floating barges and the intakes are designed to withdraw water from the top of the water column. The water intake to the pumps would be approximately over the top 0.3 m below the water surface. The pond design verified that the residence time is sufficient to allow for a minimum 0.3 m settling depth for the 10 µm critical (small) design particle; the verification was done at maximum pumping rate and at minimum water depth. Stoke's Law was used to calculate the settling velocity as a function of the particle size.
- To avoid flow short-circuiting in the ponds, the pump stations were positioned in the opposite pond corner from the pond inflows. For pond SP03, an internal berm was added for the same purpose.
- As a factor of safety, the pond design added a 4-hour pump stand-bye capacity to account for situations when additional residence time is required during an extreme event.
- Should water quality monitoring indicate higher than expected TSS concentrations, for example, because of a larger than expected clay and fine silt TSS fraction, Troilus would install pre-settling areas (deepened ditch segments upstream of the ponds) or would add flocculants at the pond inflows. The flocculation systems were not included in the current design as they are not expected to be required.

Table 17: Sedimentation Pond Design Details

Sedimentation Pond	Required Live Storage Volume (m^3) [(a)]	Dead Storage Allowance [(b)]	Freeboard Above Live Storage (m) [(c)]	Total Excavation Volume (m^3) [(c)]	Minimum Depth (m) [(d)]	Total Required Footprint (ha) [(e)]	Design Pumping Capacity (m^3/s)
SP01	63,000	0.5	0	192,107	5.5	4.3	0.4
SP02	150,000	5	Not Applicable - Created within mine pit				1.0
SP03	83,000	0.5	0.5	223,137	5.5	5.6	1.0
SP04	125,000	0.5	0.5	420,616	5.5	6.6	1.0

Notes:

(a) Required volume and pumping capacity to manage the 1:100-year flood event without overtopping. Does not consider pumping from the mine pits during the design event. Includes allowance for a 4-hour pump delay or interruption.

(b) Allowance for sediment accumulation.

(c) Allowance accounting for design, construction, and operation uncertainty.

(d) Including 1.0 m thick rock protection and filter layers.

(e) Including a 10 m wide band around the excavation perimeter.

4.4.3 Collection Sumps

There are eight sumps installed during the life of mine. Locations are shown in the SWMP figures in Appendix B. These sumps are designed to manage, either by storage or by pumping the 100-year design flood event. Table 18 summarized the design of the sumps. Additional design information is provided in Appendix E. Design information for the pumping and pipe systems for each sump is included in Section 4.6 and in Appendix G. The sumps are to be constructed by excavation in natural ground. Pumping capacities ranging from 0.2 m^3/s to 0.3 m^3/s were selected for each sump. The sumps are to be operated dry to maximize the live storage capacity during a flood event.

Table 18: Pumping Sumps Design Details

Sump	Required Live Storage Volume (m^3) [(a)]	Dead Storage Allowance (m) [(b)]	Freeboard Above Live Storage (m) [(c)]	Total Excavation Volume (m^3) [(d)]	Minimum Excavation Depth (m) [(d)]	Total Required Footprint (ha) [(e)]	Design Pumping Capacity (m^3/s) [(a)]
S01	74,800	uses existing bathymetry below excavation	0.5	109,000	6.0	5.1	0.25
S01b	74,800	uses existing bathymetry below excavation	0.5	142,500	3.5	5.3	0.25
S02	4,000	0.5	0.5	8,500	5.0	0.6	0.30
S03	15,000	0.5	0.5	63,000	5.5	1.7	0.30
S05	4,000	0.5	0.3	9,700	4.6	0.7	0.20
S06 [(f)]	53,000	0.5	0.5	103,400	4.6	2.6	0.20
S07	12,000	0.3	0	19,800	5.0	1.1	0.20
S09	23,000	0.5	0.5	73,500	5.0	1.8	0.30

Notes:

(a) Required volume and pumping capacity to manage the 1:100-year flood event without overtopping.

(b) Allowance for sediment accumulation.

(c) Allowance accounting for design, construction, and operation uncertainty.

(d) Including for a 1.0 m thick rock protection layer.

(e) Including a 10 m wide band around the excavation perimeter.

(f) The required 100-year live storage volume of Sump S06 is 53,000 m^3. Prior to the construction of Stockpile STK1 the maximum containment volume of S06 containment volume is 38,200 m^3. This volume is sufficient to contain the 10-year design event, which has a peak storage volume of 34,300 m^3. Overtopping of S06 prior to construction of STK1 will send runoff north through existing ditches toward the existing 87 Pit. The construction of STK1 later in Year -2 increases the total containment volume of S06 to approximately 106,000 m^3. To reduce risk of overtopping from the 100-year design flood, if construction of STK1 is delayed beyond Year -2, a 2 m high berm may be constructed on the east side of Sump S06 to increase total containment volume to approximately 71,160 m^3.

4.5 Road Crossings

Road crossings will be required to ensure continuous flow through diversion channels and collector ditches. At the current design level, the location of all required road crossings is unknown. For the purposes of this plan, crossing locations were assumed along existing roads or planned future roads, and at places where an access road is likely to be needed. Up to four additional culverts were assumed for years where a collector ditch or diversion channel may not be built, but new roads may be required. Table 19 summarizes the road crossing requirements by year. Design details for the proposed crossings are included in Appendix F.

Culvert Master (Bentley 2024) software was used to calculate the number and size of the culvert barrels, to reduce the maximum headwater increase to 0.3 m for most cases. To simplify design and construction, culvert sizes proposed were limited to four diameters: 1.05 m, 1.5 m, 2.4 m, and 3.3 m, in two- and three-barrel configurations. On the DC1 channel, arch culverts were used to improve fish passage conditions. At the FS design level, typical dimensions for the concrete footings were assumed. Specific geotechnical conditions for the footings were not assessed.

Table 19: Road Crossing Design Summary by Year

Mine Plan Year	Number of New Ditch Crossings	Number of Contingency Crossings [(a)]	Total Culvert Length Per Year
-3	2	0	116
-2	11	2	777
-1	6	2	367
1	7	2	410
2	6	6	528
3	0	2	88
4	0	4	176
5	4	4	409
6	3	4	281
7	0	4	176
8	0	6	264
9	0	4	176
10	0	4	176
11	0	4	176
12	0	4	176
13	0	4	176
14	0	4	176
15	0	4	176
16	0	4	176
17	0	4	176
18	0	4	176
19	0	4	176
20	0	4	176
21	0	4	176
22	0	4	176

Notes:

(a) Additional crossings assumed based WSP's experience that more access and service roads are required than initially planned.

4.6 Sumps and Ponds Pumping Systems

Appendix G includes the technical report for the feasibility study design for the following water pumping infrastructure:

- Seven sump pumping systems (with submersible pumps except for S03, which was designed to use a self-priming pump with the intake tethered to the pump cell location).
  - Sump 1 (S01), Sump 2 (S02), Sump 3 (S03), Sump 5 (S05), Sump 6 (S06), Sump 7 (S07) and Sump 9 (S09).
- Five sedimentation pond pumping systems with a vertical turbine or low-lift pumps installed on floating barges or shore-mounted pumping wells:
  - SP01, SP02A (from sedimentation pond SP02 to the environment – the Main Diversion Channel), SP02B (from SP02 to the Ore Processing Plant), SP03 and SP04.
- TSF Pond-to-Water Treatment Plan (WTP) pipeline: the design of the pump and barge at the TSF Pond was outside WSP's scope.
- WTP overflow pipeline to the Main Diversion Channel (see Section 4.7 and Appendix H for design details on the WTP).

The technical report includes the design basis, the selected technologies, the design methods and results, and cost estimates, which account for the planned staged construction of the pumping systems. The construction staging was based on the mine development schedule.

The following paragraphs and Table 20 provide key design details:

- All pipelines are designed for year-round operation. All pump barges or water intakes are equipped with agitation to mitigate surface freezing and allow pumps to operate all year.
- All pipelines will be profiled to facilitate free draining, maintaining a single high point with no intermittent low points. The exception is the TSF Pond-to-WTP pipeline, which will have low point drains and manually actuate in the winter months post-pump shut down due to constraints preventing the grading of intermittent low points. Pipelines encountering end-of-line slack flow necessitate a gooseneck vent to mitigate against pipe collapse and contribute to smooth pumping operation.
- The submersible pumps located in the sumps operate based on a hydrostatic level control. Each sump pump raft is tethered to remain within the footprint of the pump cell (low point in the sump). This allows each submersible pump to lower the water level of the main sump completely when necessary. Sump 3 (S03) deviates from the other sumps because it utilizes a self-priming pump, with the intake tethered to the pump cell location. A self-priming pump was selected for S03 because of the greater required capacity and unavailability of a submersible pump for these conditions.
- Redundant pumping capabilities were intentionally omitted for the submersible pumping systems within the sumps (S01 to S09) and the vertical turbine pump for sedimentation pond 1 (SP01) in the design to reduce costs. For these systems, in the unlikely event of a pump failure, the sumps may overflow parts of the mine site but would not lead to uncontrolled discharge to the environment.

- Sedimentation pond pumps operate by hydrostatic level control while total suspended solids (TSS) limits are respected. The pumps are designed to activate with rising pond levels and deactivate when the pond level is low, or the TSS exceeds the specified discharge limit. The TSS limit adheres to *Directive 019 pour l'industrie minière* (of the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs of the Province of Quebec, 2012) with a maximum of 30 mg/L and a monthly average limit of 15 mg/L. In cases of pump shutdown due to high TSS, a predefined time delay precedes the automatic restart of the pump sequence, allowing particles time to settle. During commissioning, time values will be adjusted to ensure adequate settling time and prevent resuspension. Discharge into sedimentation ponds strategically occurs on the opposite bank of the sedimentation pond dewatering pumps to allow particles to settle out before environmental discharge.
- The pump selection, summarized in Table 20, prioritized cost effectiveness, favouring submersible pumps, except for sump pump 3, which employs a self-priming pump due to its flow rate and required head exceeding standard submersible pump parameters. Lo-lift and vertical turbine pumps were chosen for their suitability in sedimentation ponds, offering ease of maintenance and additional pump reliability.
- In the SP02A system, an additional backup pump was deemed necessary to minimize downtime. Electrical houses (e-house) are strategically positioned on land, along with the vertical turbine pumps wherever feasible. Given the substantial fluctuation in SP02's pit level, the e-house and pumps are situated on a barge to optimize top-water discharge and prevent solids discharge.

Table 20: Sumps and Ponds Pump System Design Summary

System	Pump Type	Duty	Standby	Pump location	E-house location	Total flowrate (m^3/h)	Pipeline Length (m) [TDH m]	Motor size per pump (hp)	Pipeline Nominal Size (HDPE 4710)
S01	Submersible	1	-	Barge	Shore	900	1615 [29]	200	16
S02	Submersible	2	-	Barge	Shore	1080	290 [52]	200	20
S03	Self Priming	1	-	Shore	Shore	1080	585 [69]	350	20
S05	Submersible	1	-	Barge	Shore	720	1140 [31]	200	16
S06	Submersible	1	-	Barge	Shore	720	515 [18]	100	16
S07	Submersible	1	-	Barge	Shore	720	205 [26]	200	10
S09	Submersible	1	-	Barge	Shore	1080	395 [29]	250	16
SP01	Vertical Turbine	1	-	Shore	Shore	1440	300 [13]	150	18
SP02A	Vertical Turbine	3	1	Barge	Barge	3600	2700 [113]	700	32 and 24 [(a)]
SP02B	Vertical Turbine	3	2	Barge	Barge	1351	3530 [134]	700	28 and 24 [(a)]
SP03	Lo-Lift	1	1	Shore	Shore	3600	10 [3]	250	28
SP04	Lo-Lift	1	1	Shore	Shore	3600	20 [8]	250	28
TSF to WTP	N/A	N/A	N/A	N/A	N/A	1200	3190 [75]	N/A	16

Notes: TDH : Total Dynamic Head. N/A: outside of WSP's scope. HDPE 4710: high density polyethylene

(a) SP02 pipelines require an initial ascent along the ramp to the in-pit SP02 sedimentation pond.

4.7 Water Treatment Plant

The Troilus Project WMP includes a water treatment plant (WTP) for the surplus water from the TSF Pond before its discharge to the environment. Based on Troilus's experience from the previous and current operations at the Site, the suspended solids in the TSF Pond are fine and passive gravity settling is not efficient. Instead, the WTP is used to remove the solids. Currently, Troilus is operating a 1,200 m^3 hour WTP at the location immediately near the TSF. The plant is approaching the end of its usable life cycle and may need to be replaced during the early years of the new planned operation.

WSP undertook a feasibility study design of the new WTP, including:

- A site selection study for the new plant. The current location would be covered by the TSF dam raises and by the waste dump placement.
- A water treatment technology comparison and selection analysis.
- A feasibility study design for the selected technology, including the list of major equipment, general arrangement drawings including major pipe routes, piping and instrumentation diagrams, preliminary instrument list, and estimation of capacity expenditures and preliminary operating expenditures.

Appendix H documents the plant's feasibility design and all the activities that have been undertaken. Also, the used data, the basis of design and the cost estimates are documented in detail. Key points are provided in the next paragraphs:

- The new WTP was designed for a 1,200 m^3/hour treatment capacity, similar to the one of the current plant. The water balance analysis (see Section 6.0 and Appendix M) confirmed that this capacity is sufficient to control the TSF Pond water level under all climate scenarios.
- After analyzing several possible locations and consulting with Troilus, a location northwest of sedimentation pond SP01 was selected due to the reduced pipeline length from the TSF Pond.
- The treatment technology comparison concluded with the selection of a gravity separation, ballasted-flocculation lamella clarifier. The technology scored overall best in a multi-criteria comparison of treatment efficiency, reliability, complexity, maintenance requirements, and tolerance to changing influent TSS concentrations. Figure 13 summarises the block flow diagram for the selected technology.
- Treatment includes adding three chemicals: coagulant (ferric sulphate), flocculant (polymer), and ballast (microsand). The function and the handling of each chemical are presented in Appendix H.
- An excavated 536 m^3 sludge pond is located near the plant, allowing for sludge storage during 21 days of plant operation at full capacity. From the sludge pong, the decanted solids would be trucked back to the TSF.

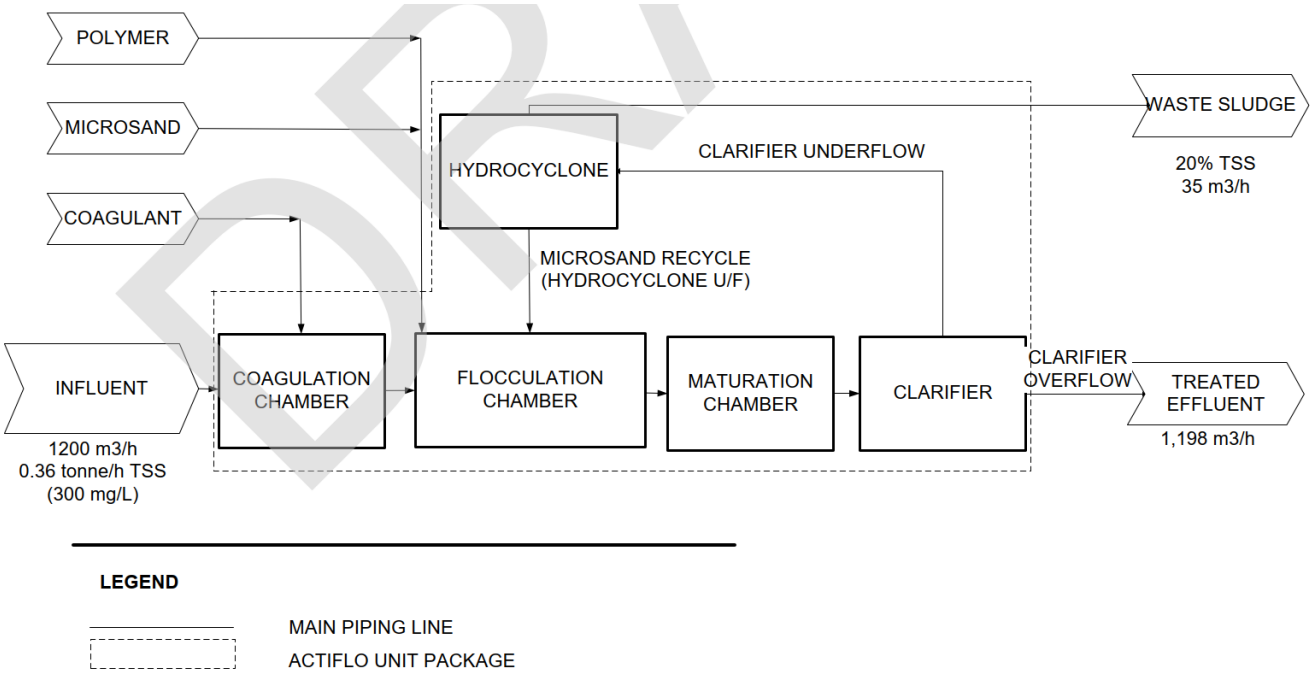


Figure 13– Water Treatment Plant - Block Flow Diagram for the Selected Treatment Technology (Ballasted Flocculation System)

4.8 Tailings Storage Facility Water Management

Tailings deposition in the concave TSF creates a water pond (the TSF Pond) in the southeastern part of the facility. The pond collects the runoff from the tailings beach and the upstream mountain slope, as well as the water released from tailings during the consolidation process. Some water collected at the toe of the containment dykes may be returned to the TSF as well. The TSF Pond water is evacuated by pumping to the ore processing plant or, when required, to the flocculation treatment plant.

The water level in the pond is controlled by pumping such that a minimum 3 m water depth is maintained at all times to prevent solids resuspension or ice obstructions around the pump intake. Based on a water balance analysis (see Section 6.0 and Appendix M), an operating pond water level has been selected, above which the surplus volume is pumped to the WTP. This allows for maintaining the pond water level at all times below the maximum operating water level; this is the level that still allows for the storage of the TSF's environment design flood, as defined by regulatory requirements, without uncontrolled discharge via the emergency spillway.

An emergency spillway is constructed with the invert 1.5 m below the dyke crest elevation. The spillway is a wide, open channel protected by boulders against surface erosion. The spillway respects the design criteria of safely discharging the probable maximum flood while still maintaining enough freeboard so that a concurrent 100-year wind velocity does not lead to waves overtopping the TSF dykes.

WSP (2024b) and Appendix I document the water management analyses for the TSF, including the following analyses for different TSF development snapshots:

- Extracting the TSF Pond's capacity curves. Figure 14 presents the pond's stage-storage curve and the significant operating levels for the final development stage.

- Quantifying the volume of the applicable environmental design flood and the associated maximum normal operating water level for the TSF Pond. The results of this calculation for the final development stage are included in Figure 14; they were verified by the water balance analysis in Section 6.0 and Appendix M.
- Designing the TSF emergency spillway channel (see also Figure 15):
  - The channel will be relocated twice during the TSF's operating life and will be raised in sync with the TSF dyke raise. The channel will have a 24 m base width for the original (current) location and a 30 m base width for the subsequent locations.
  - The emergency spillway channel will consist of a 1% sloped segment near the dyke crest, followed by a 20% steep chute to the toe of the dyke; the chute slope is limited at 4.2% for the final relocation. The riprap protection against erosion was calculated to be a D_{50} of a minimum of 400 mm for the 20% segments and 150 mm for the 1% and 4.2% segments.
  - The design includes dissipation ponds at two of the spillway chutes.

TSF downstream water management will be similar to that currently in place for the existing TSF:

Currently, ditches collect dyke seepage and convey it to three small sumps, where the water quality is monitored, and the water is either discharged to the environment or returned to the TSF Pond.

- The current operation mode will continue during the initial construction period. Additional collector ditches and sumps (S02 and S03, see WSP 2024b) will be constructed along southwest and northwest TSF boundaries to accommodate the dyke raises.
- Once the TSF Main Dyke extends beyond the existing collector ditches, seepage and runoff from the downstream dyke slope for much of the dyke's length will drain through the WD-W-1 waste dump and will be collected in the SP02 sedimentation pond. From there, the water will be either returned to the ore processing plant to be used as process water or, after verifying the compliance of the water quality with applicable regulations, it will be pumped to the Main Diversion Channel to be discharged to the environment.
- Once the TSF East Dyke is built, the collection sump S07 will be constructed downstream of the dyke.

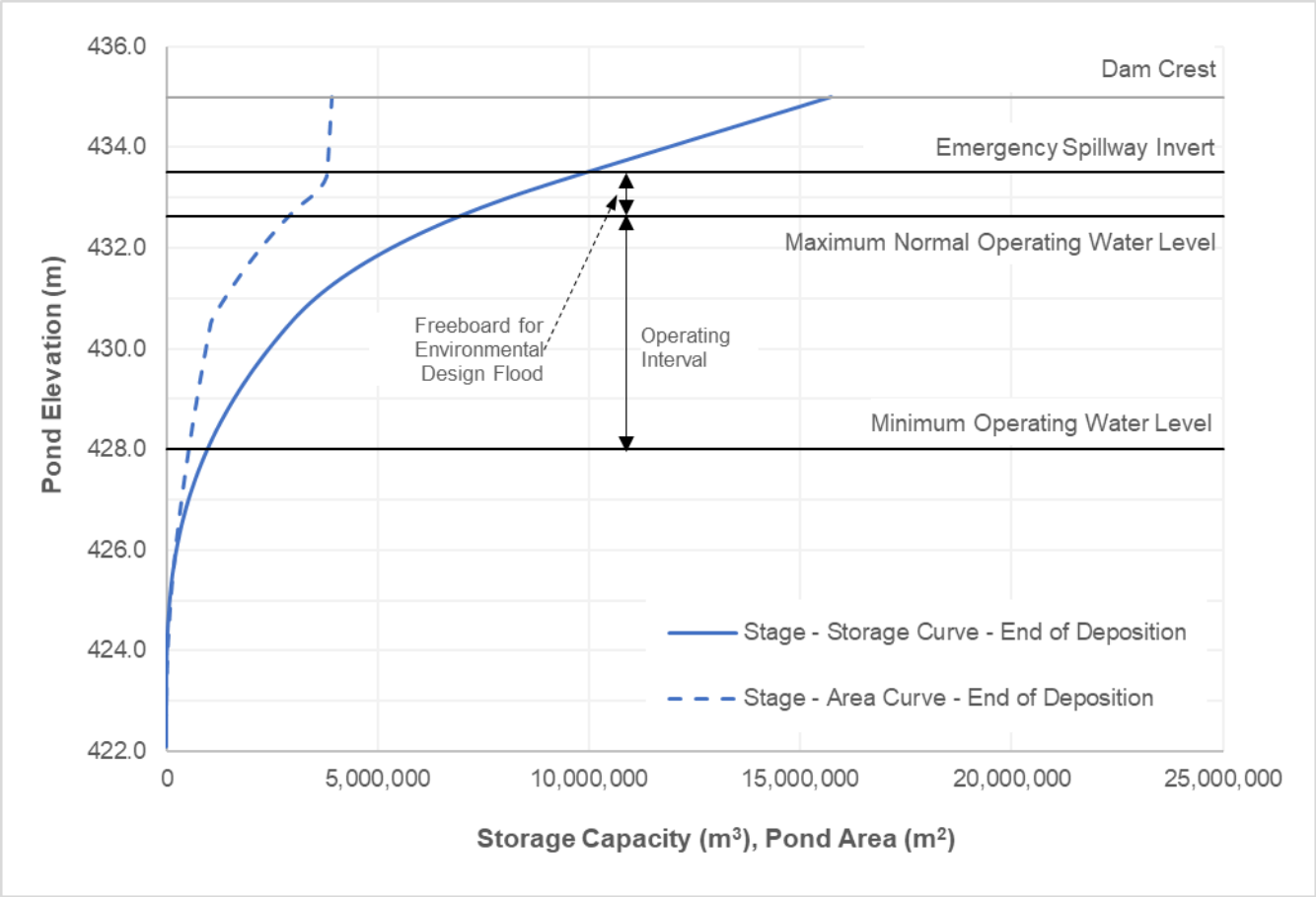


Figure 14: TSF Pond Stage / Storage / Area Curve – End of Last Year of Operation

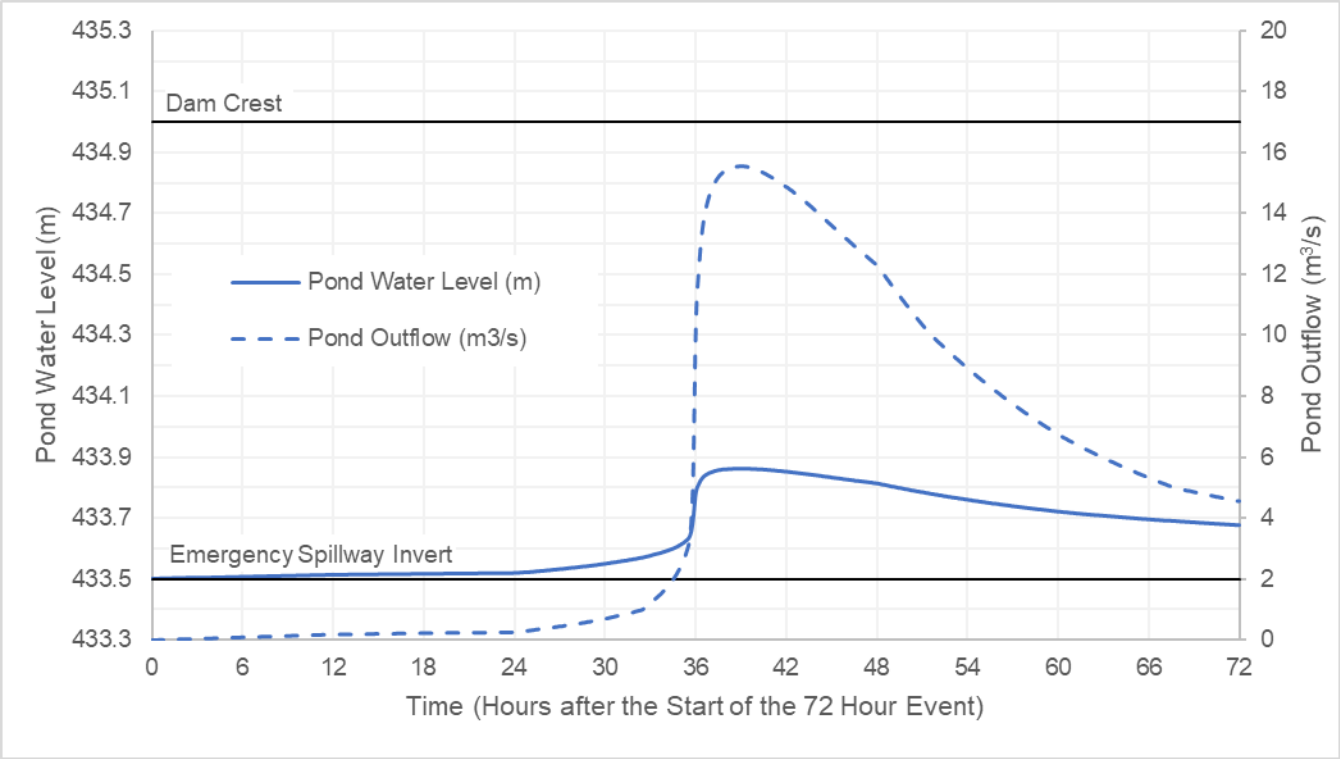


Figure 15: Simulating the Summer-Fall Probable Maximum Flood in the TSF – Last Year of Operation

4.9 Quantities

Material Take Off (MTO) construction quantities for the Troilus Surface Water Management Plan are included in Appendix K.

This includes the following:

1. Construction of the primary and secondary diversions, contact water ditches, sedimentation ponds and sumps, and expected maintenance requirements.
2. Supply and installation of pumps and pipes for surface water management.
3. Supply and installation of the Water Treatment Plant.

Assumptions for each category are also included in Appendix K.

Table 21 summarizes the SWMP quantities for each year based on capital expenditures (CAPEX) (pre-production during Year -2 and Year -1) and operating expenditures (OPEX) (year 1 through Year 22).

Quantities for the pumping systems and pipes are included in Appendix G. Material requirements for the replacement Water Treatment Plant are included in Appendix H.

Table 21: SWMP MTO Summary – CAPEX / OPEX Split

Item	Unit	CAPEX (Yr -3 to Yr -1)	Opex (Yr 1 to Yr 22)
Construction and Site Prep			
General site preparation (area for clearing and grubbing)	ha	100.2	55.1
Temporary construction access and enablement works	EA	62	123
Water management and temporary erosion and sediment controls	EA	62	123
Total Excavation volumes			
Top soil (peat) excavation volume	10^3 m^3	478.5	238.8
Total overburden excavation volume	10^3 m^3	1,865.5	866.2
Bedrock excavation volume	10^3 m^3	390.2	2.8
Fill Material			
General fill volume	10^3 m^3	95.4	51.0
Low permeability compacted fill volume, for berms or channel lining	10^3 m^3	56.6	-
Granular materials			
Riprap volume, D50 = 100 mm	10^3 m^3	57.9	36.1
Riprap volume, D50 = 300 mm	10^3 m^3	16.0	13.3
Riprap volume, D50 = 500 mm	10^3 m^3	32.4	10.6
Sand and gravel volume (for filter or bedding material or channel substrate)	10^3 m^3	117.7	40.3
General waste rock volume	10^3 m^3	282.6	173.0
Granular fill volume, for access roads	10^3 m^3	41.2	21.7
Lining Material			
Non-woven Geotextile surface area, for filter material	ha	39.7	36.1
Bituminous Geomembrane surface area, for channel lining	ha	1.8	-
Culverts			
Culvert length, all diameters (circular or arch culverts)	m	1,310	4,940
Concrete	m^3	210	-
Operations and Maintenance			
Stream Diversion Channel Operation and Maintenance	hrs/yr	860	13,711
Contact water Ditching Operation and Maintenance	hrs/yr	191	5,417
Polishing Pond Operation and Maintenance	hrs/yr	8,580	210,600
Monitoring of the entire SWMP	hrs/yr	13,140	96,360

5.0 GROUNDWATER MANAGEMENT

WSP (2024a) compiles available hydrogeological data, including recent site investigations, and, also, documents the development of conceptual and numerical groundwater flow models covering the Troilus Project site. The model was used to estimate groundwater inflows to the four pits (87, J4, Southwest, and X22), as well as the drawdown cone around the pits as they evolve during the lifetime of the project. The model was also used to verify the surface water–groundwater exchange around the Main Diversion Channel.

Further to WSP (2024a), Appendix L presents a summary of key groundwater flow modelling results, which were used as input to the current WMP:

- The pit development and their dewatering will lead to groundwater drawdowns and an increase of the groundwater infiltration to the pit from the 4,200 m^3/day estimate for the current conditions total infiltration to the existing 87 and J7 pits to a maximum of 7,890 m^3/day estimate for maximum total infiltration to the four pits over the project's operating life. The planned in-pit tailings deposition in the later operating years will lead to a decrease in the pit drawdown and a decrease in the total infiltration.
- The groundwater flow model estimated that, under current conditions, the existing Bibou Creek and diversion channel between Lac Amont and Lac A has an average 210 m^3/day negative inflow-outflow groundwater balance (the creek is losing to groundwater 210 m^3/day more than it is gaining).
- The model estimated that, under final operating conditions, the negative groundwater balance of the planned Main Diversion Channel would be approximately 1,370 m^3/day. The change of 1,160 m^3/day (difference between 1,370 and 210) represents approximately 2% of the mean annual flow, approximately 4.2% of the mean winter flow, and approximately 17% of the lowest flow measurement in the existing Bibou Creek based on the recent surveys (see Appendix C for details). As discussed in Section 4.3, WSP did not include placement of low permeability materials for the construction of the Main Diversion Channel, but this would be the appropriate mitigation measure should future investigations and analyses support the requirement to decrease losses from the Main Diversion Channel to groundwater.
- The groundwater flow model estimated that the inflow-outflow groundwater balance of Lac Amont would change from positive 1,040 m^3/day for the current conditions (the lake is gaining water from groundwater) to 970 m^3/day under final operating conditions.
- Based on local groundwater flow analysis around selected ponds and sumps, WSP estimated that sumps S01, S06, and S07, and sedimentation pond SP04 might receive 2,000, 222, 64, and 735 m^3/day groundwater inflows, respectively. The water balance analysis (see Section 6.0) considered these inflows. These values do not account for the drawdown caused by the pits dewatering, which means that the expected value might be smaller depending on the stage of the mine life.

WSP did not develop a groundwater monitoring plan as part of the current WMP:

- Troilus has already implemented a groundwater monitoring program, which considers the current infrastructure.
- The existing program will be updated during the next stages of the Project's development and, specifically, after the completion of the environmental impact analyses. WSP expects that the updating program will include groundwater monitoring wells downstream of the relevant developments (TSF, pits, dumps and stockpiles, and plant). The time frequency of data collection for groundwater level and, if applicable, groundwater quality is still to be decided.

6.0 SITE-WIDE WATER BALANCE

6.1 Objectives

A site-wide water balance model was developed to:

- Confirm process water availability under various climate conditions.
- Estimate effluent flows from the site to the environment.
- Inform operational rules for the TSF Pond, the main process water source.
- Support the WMP design and provide the required information for permitting efforts and for the future project operation.

Consistent with the available information, the water balance analysis was undertaken for Year 1 conditions (end of Year 1 site configuration, full production capacity), Year 9 (full site development, last complete year of tailings deposition in the TS) and Year 21 (last complete year of production and in-pit tailings deposition.

Appendix M documents the water balance analysis and its results. The following paragraphs provide a high level summary, including key results.

6.2 Description of the Water Balance Model

The water balance model simulated the relevant site water streams (site surface runoff, groundwater inflows to the pits, freshwater intakes to the plant, water transfer within the tailings from the plant to the TSF and the reclaimed water from the TSF to the plant, and the contact water collection at the sedimentation ponds and their release to the environment). The model was developed using GoldSim (GoldSim 2022) dynamic simulation software. The simulation used a daily time step.

Figure 16 below presents the simplified flow logic diagram under the ultimate site configuration and the average annual flows over the 31-year historical period within the 1982 to 2023 time frame. The potential climate change impact for year 2020 to 2051 was verified based on 26 climate models for 3 emissions scenarios (SSP1-2.6, SSP2-4.5 and SSP5-8.5), resulting in a total of 78 possible future climate scenarios.

Other key water balance assumptions include (Appendix M provides data references):

- The production rate is 50,000 tonnes of ore per day at full plant operation.
- The ore water content is 0.026 m^3/t ore. Process fresh water demand is 0.18 m^3/t ore to be supplied from Lac A.
- Tailings are deposited in the TSF at 54.4% solids by weight, and the tailings consolidate to 76.0% solids by weight.
- Besides water in the tailings stream, key water consumption includes 22.7 m^3/d for dust suppression, which will be supplied by the contact water system, and an additional 2.2 m^3/hour potable water consumption to be supplied from Lac A.
- The model included assumptions on the freeze and thaw of tailings bleed water (water released from tailings due to solids settlements and consolidation processes). For example, at a daily -15ºC air temperature, the model included the assumption that around 20% of the tailings bleed water may freeze on the TSF beach before reaching the TSF Pond.

- A minimum 3 m water depth was maintained at all times in the TSF Pond, near the pump intake, to maintain the operability of the pumping system; this minimum depth considers implicitly the impact of the pond ice layer and the risk of resuspending the fine solids on the pond bottom.

The historical climate scenario was also used to develop a sensitivity analysis case for the risk of process water supply deficit. For this case, the tailings solids content at deposition was decreased to 50% solids by weight; the fraction of the bleed water freezing was increased by 50%.

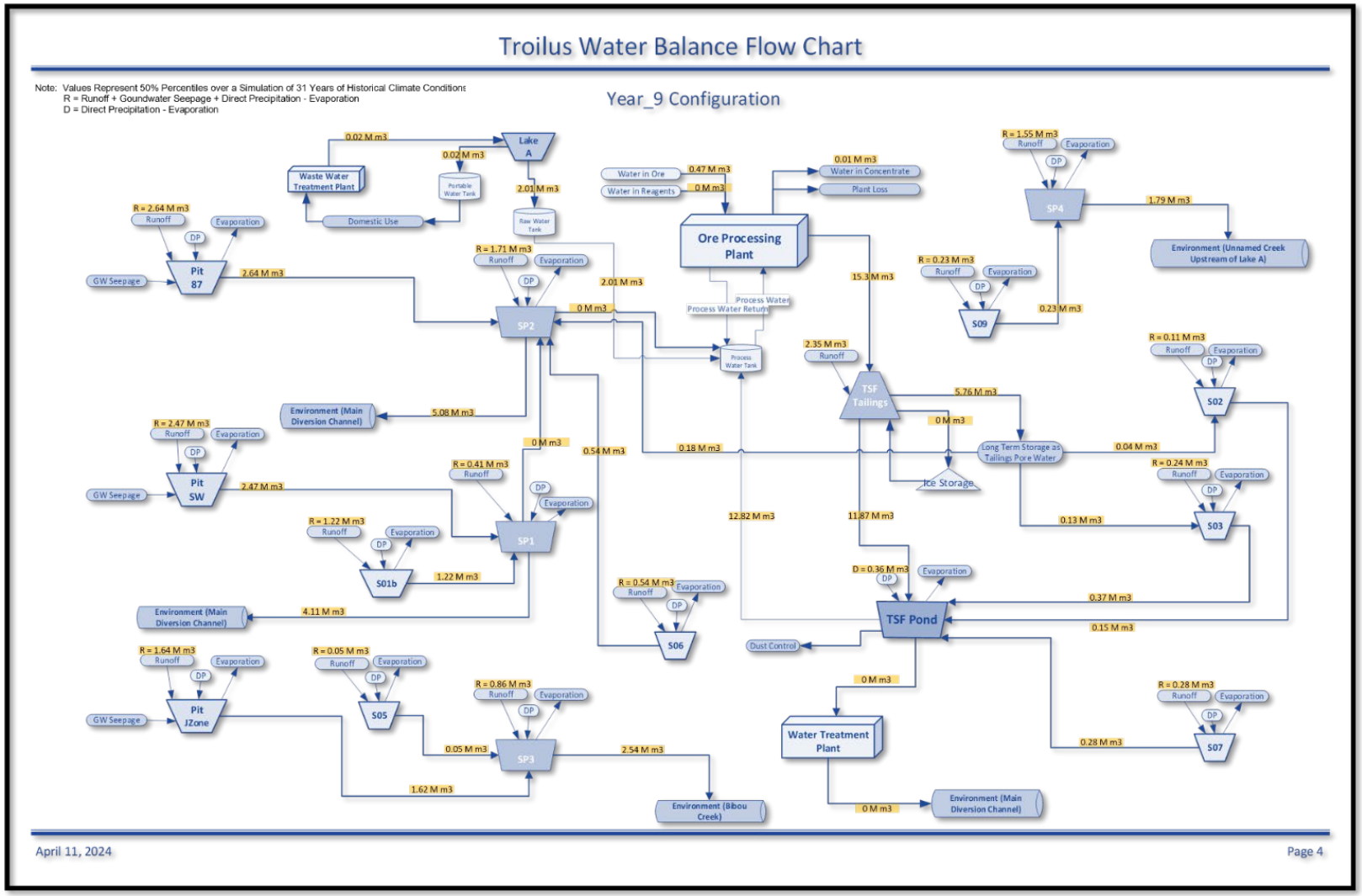


Figure 16: Site-Wide, Median Annual Water Balance for Historic Climate Conditions, Year 9 of Operation

6.3 Sources of Variability and Uncertainty

Water balance results are sensitive to the model parameters and assumptions. Table 22 lists main sources of variability and uncertainty to be addressed during future engineering stages and during the early operation years when updating the Troilus site-wide water balance studies.

Table 22: Water Balance Analysis - Overview of Sources of Variability and Uncertainty and Suggested Mitigation Measures

Source of Variability and Uncertainty	Proposed Mitigation
Runoff estimate for different surface types	Calibration to available historical observations and data collected during the project construction and operation periods
Estimate of tailings consolidation after deposition	Calibration – see above. Sensitivity analysis within the range of incertitude – completed in this study.
Impact of climate variability, including climate change	Quantify the sensitivity of key results to a wider range of climate conditions and climate change projections – completed in this study.
Impact of site progressive development on the water balance	Expand model to account for dynamic site conditions.

6.4 Model Results

6.4.1 Process Water Supply

For all site configurations and climate scenarios, the proposed WMP is able to meet the process water demand. The combination of the Site footprint and the local climate leads to an overall contact water surplus that can be recycled to the Ore Processing Plant.

The conclusion of the previous paragraph was tested and confirmed in a sensitivity analysis case that looked specifically at unfavorable conditions in terms of tailings water management.

Once accounting for the water in ore and reagents, the total Ore Processing Plant and domestic water consumption at full plant capacity is 14.9 M m^3/year, out of which 2.0 M m^3/year is withdrawn from Lac A:

- Out of the remainder, 12.8 M m^3/year, the majority is provided by recycling from the TSF Pond when the tailings deposition occurs there and from the open pit when in-pit tailings deposition is active.
- The remainder is provided by the SP02 pond, which includes a pumping line to the plant.
- Finally, during rare conditions (less than 1% of the climate years), an additional water source is required at the end of the winter season. Since the Site is under overall surplus conditions for all configurations and climate scenarios, meeting this additional demand is a question of adjusting operational rules in response to drier than usual climate. For example, Should the TSF Pond and SP02 water levels stay low during the fall or early winter period, Troilus could divert Southwest Pit pumping towards the S02 or S03 sumps and, from there, to the TSF Pond. Due to the proximity of these locations, no or only minor changes to the pumping system would be required. Recycling the water from the J Pit or from the SP01 or SP04 ponds are also options that would only require minor changes to the pumping systems.

6.4.2 TSF Pond Water Level Control

For all simulated configurations and climate scenarios, the TSF Pond water level was maintained between the minimum operating water level (established to maintain the operability of the water reclaim system) and the maximum normal operating water level (established to maintain the environmental freeboard). Figure 17 and Figure 18 present the typical pond water level variability for Year 1 and Year 9. The actual pond water level stays at least 1 m below the maximum normal operating water level under all conditions. Climate change does not impact this conclusion.

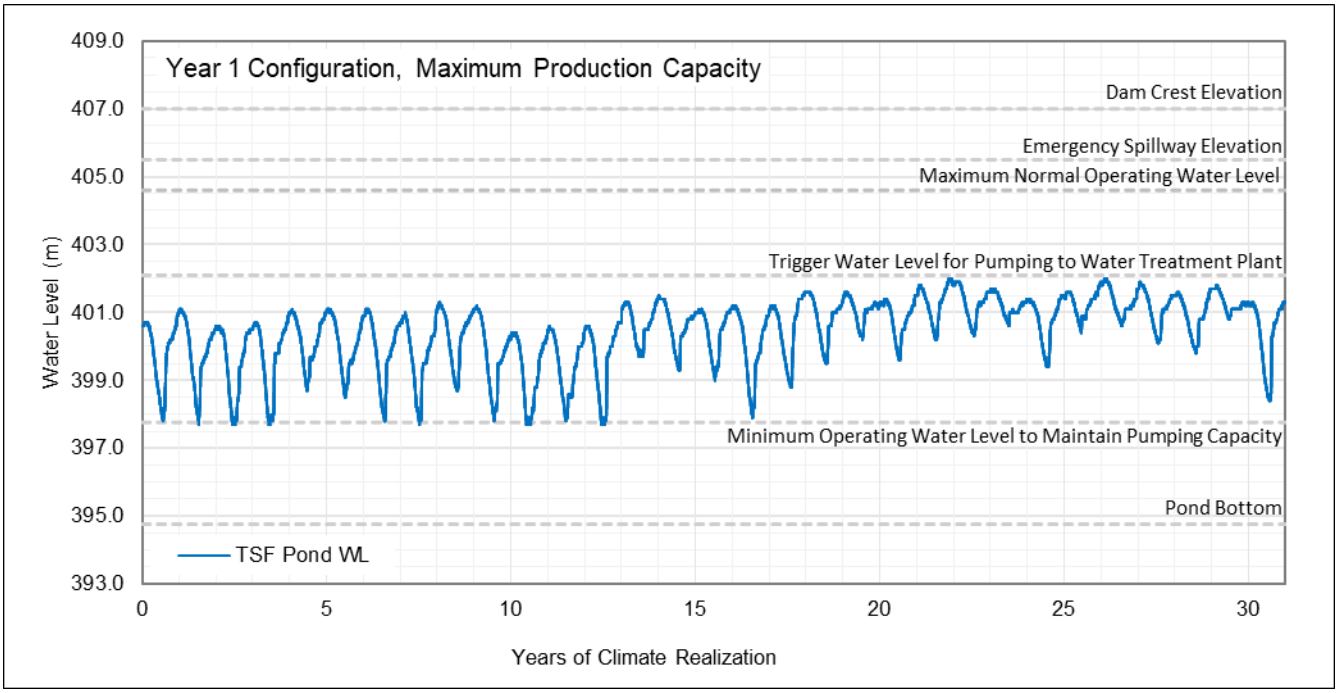


Figure 17: TSF Pond Water Levels Simulated for the Year 1 Site Configuration under 31 Consecutive Historical Climate Years

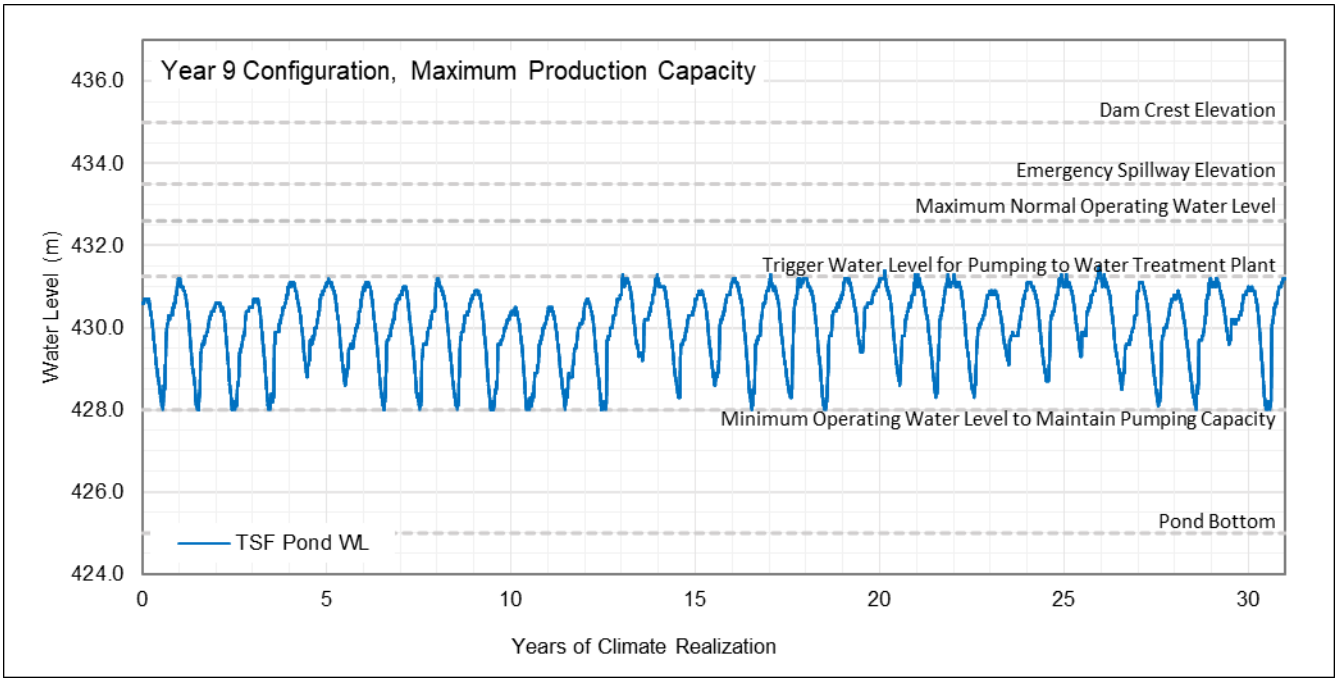


Figure 18: TSF Pond Water Levels Simulated for the Year 9 Site Configuration under 31 Consecutive Historical Climate Years

6.4.3 Water Treatment Plant

The WTP is available to discharge surplus water from the TSF Pond to the environment. The pond water level, above which water is pumped from the TSF Pond to the WTP, has been established at 1.3 to 2.5 m below the maximum normal operating water level (see Section 4.8 and Appendix M), depending on the configuration.

Key results include:

- For the Year 1 configuration (Figure 19), under all simulated climate conditions, pumping to the treatment plant was required for only 15 % of the years. The typical months that required treatment were September and October. When required, the treated volume varied up to 1.1 M m^3/year with an average of 0.65 M m^3/year and 22.5 days of operation per year (average volume and average days of operation over 15% of the climate years when treatment is required).
- For the Year 9 configuration (Figure 20), under all simulated climate conditions, pumping to the treatment plant was required for 59 % of the years. The typical months that required treatment were September and October. When required, the treated volume varied up to 2.7 M m^3/year with an average of 0.67 M m^3/year and 38.9 days of operation per year (average volume and average days of operation over 59% of the climate years, when treatment is required).
- For the Year 22 configuration, under all simulated climate conditions, pumping to the treatment plant was required for 91 % of the years. The typical months that required treatment were September and October. When required, the treated volume varied up to 4.2 M m^3/year with an average of 1.2 M m^3/year and 45.9 days of operation per year (average volume and average days of operation over 91% of the climate years, when treatment is required).

Generally, climate change projections of a wetter climate resulted in larger volumes needing to be discharged and treated at the WTP than under historical climate conditions.

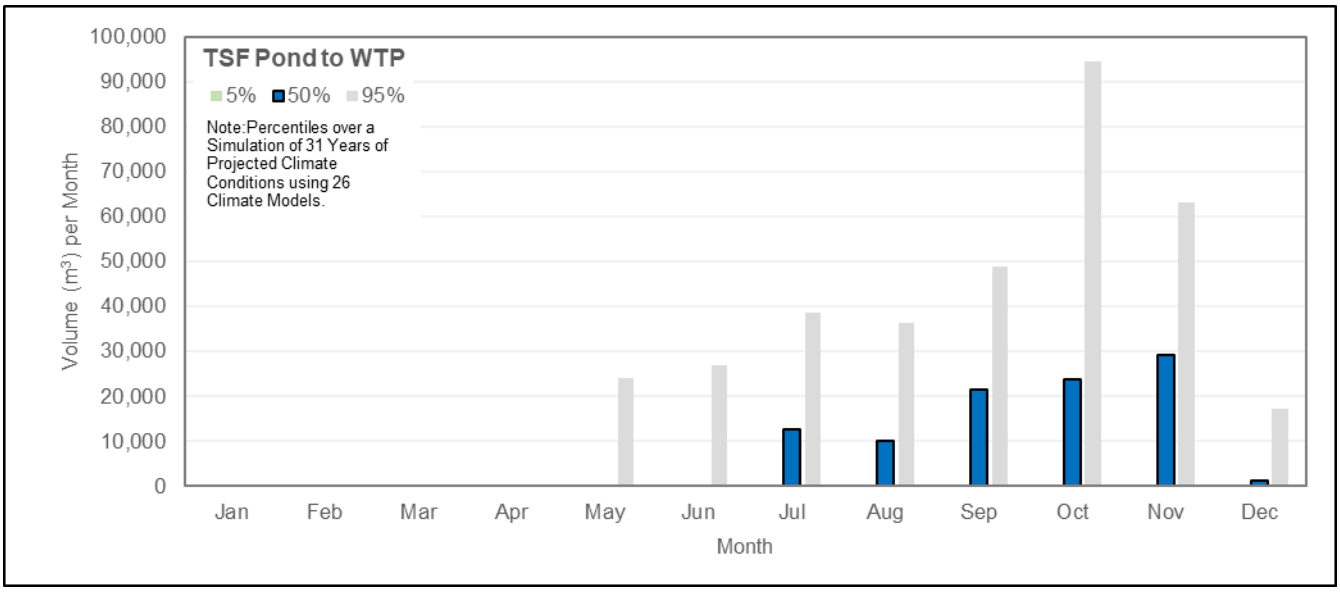


Figure 19: Estimated TSF Water Treatment Plant Fluxes for Year 1 and Climate Change Projection Scenario SSP2-4.5

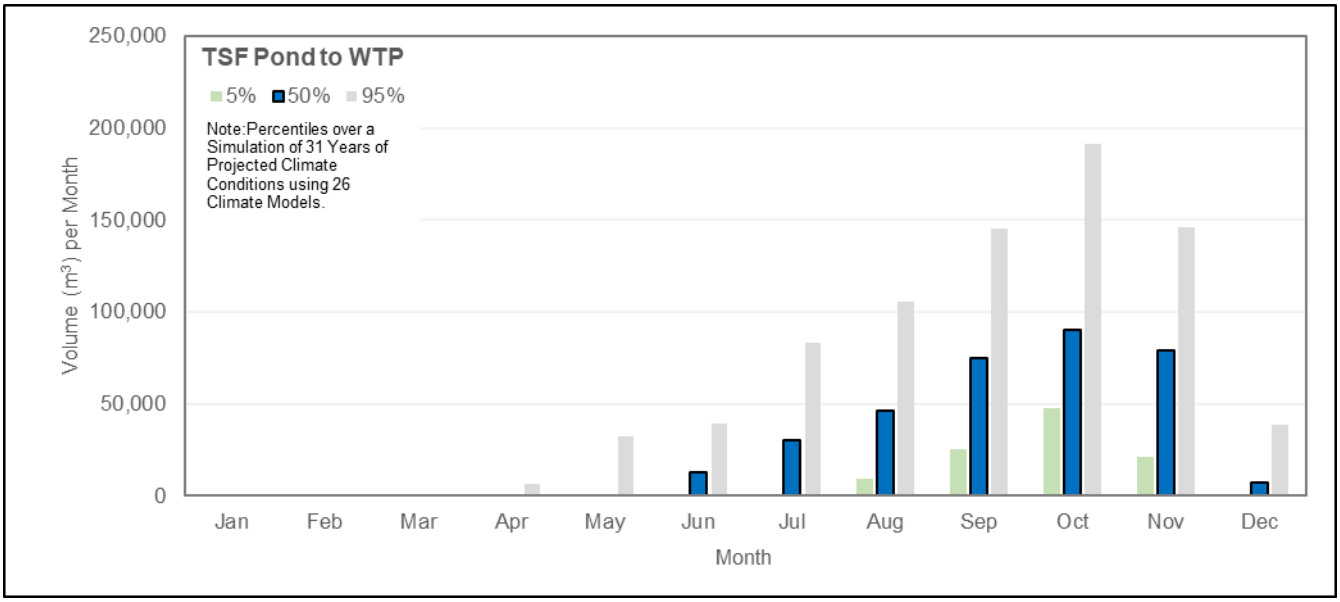


Figure 20: Estimated TSF Water Treatment Plant Fluxes for Year 9 and Climate Change Projection Scenario SSP2-4.5

6.4.4 Effluent Water Volumes

Surplus water is being discharged from the four sedimentation ponds and from the WTP for all site configuration, for all climate scenarios, and year around. Figure 21 and Figure 22 provide example statistics. Appendix M provides a complete list of results. The following paragraphs highlight key points:

- For the end of Year 1 configuration and at full production capacity:
  - The total annual effluent varies between 6.9 M m^3 and 22.0 M m^3. The average annual effluent volume is 11.9 M m^3 for the historical climate, and 12.9, 12.8, and 12.8 M m^3 for the three climate change scenarios, respectively.
  - Among the four effluent points, on average, 0.59% is from WTP, 31% is from SP1, 52% is from SP2 and 17% is from SP4.
- For the end of Year 9 configuration and at full production capacity:
  - The total annual effluent varies between 7.9 M m^3 and 26.9 M m^3. The average annual effluent volume is 13.8 M m^3 for the historical climate, and 15.0, 14.8, and 14.8 M m^3 for the three climate change scenarios, respectively.
  - Among the five effluent points, on average, 2.5 % is from WTP, 29 % is from SP1, 37 % is from SP2, 19 % is from SP3 and 13 % is from SP4.
- For the end of Year 21 configuration and at full production capacity:
  - The total annual effluent varies between 7.4 M m^3 and 25.2 M m^3. The average annual effluent volume is 12.0 M m^3 for the historical climate, and 13,6 M m^3 for the three climate change scenarios.
  - Among the five effluent points, on average, 7.0% is from WTP, 15% is from SP1, 39% is from SP2, 24% is from SP3 and 15% is from SP4.

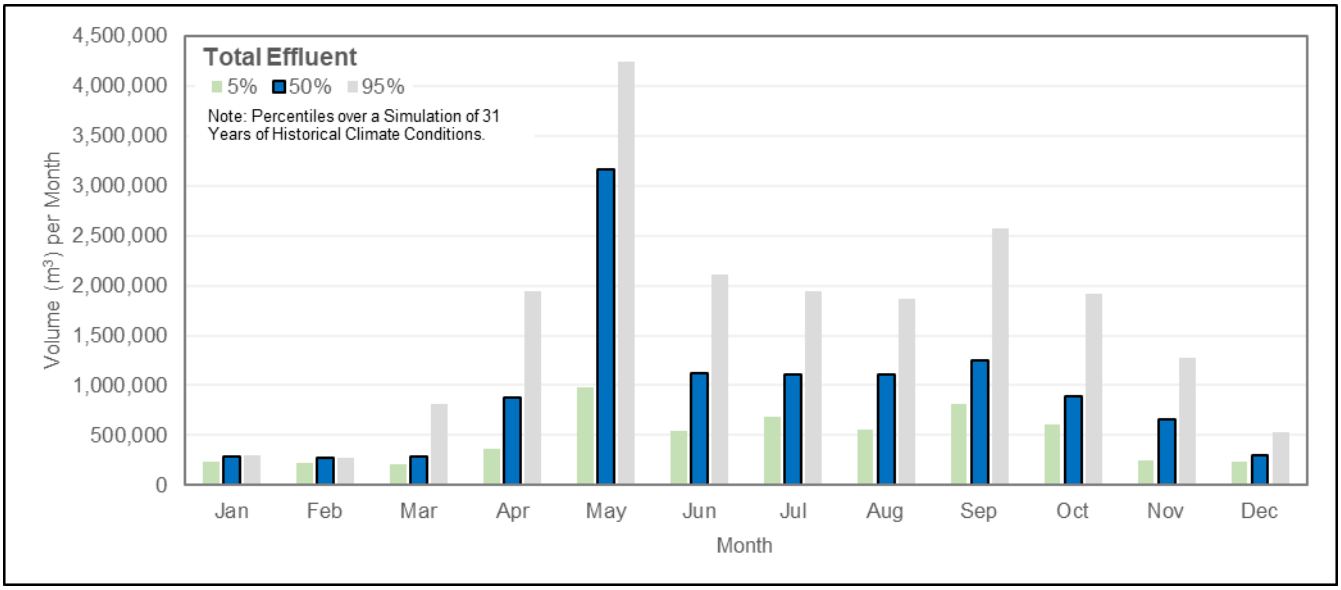


Figure 21: Estimated Total Effluent to the Environment for Year 1 and over 31 Historical Climate Conditions

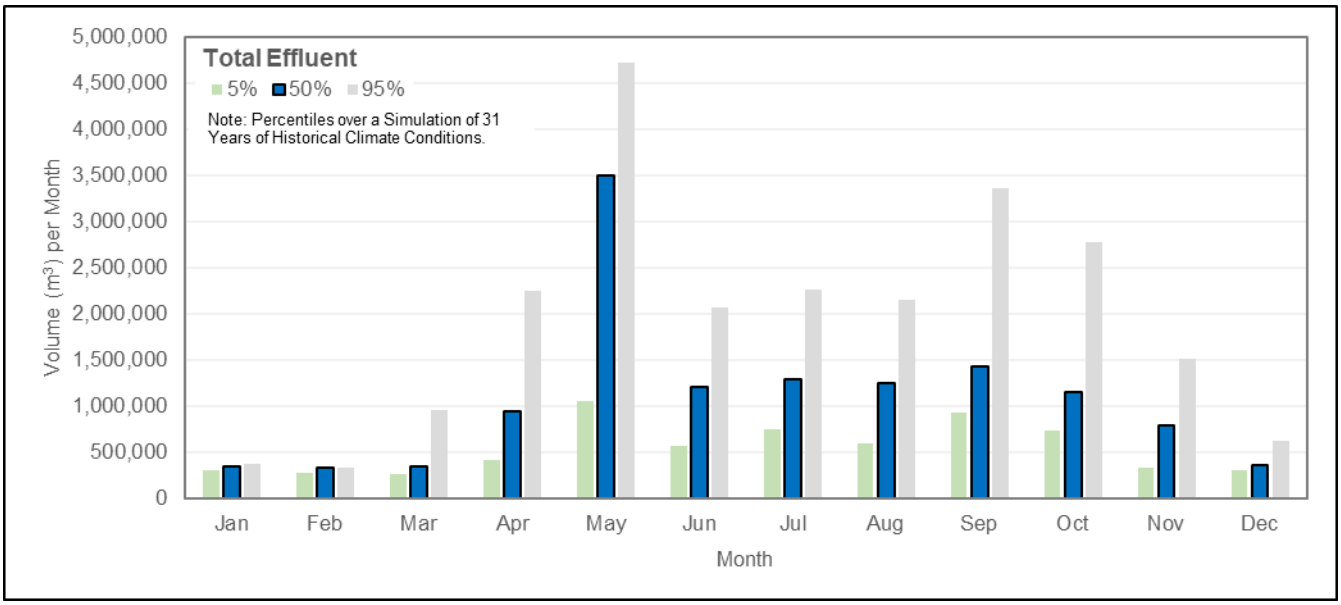


Figure 22: Estimated Total Effluent to the Environment for Year 9 and over 31 Historical Climate Conditions

7.0 WATER QUALITY

As indicated at the beginning of this report (see Section 1.2), the water quality assessment was outside WSP's scope for the feasibility study of the WMP for the Troilus Project. Troilus (2024) indicated that TSS are the only water quality constituents of concern for the site contact water management.

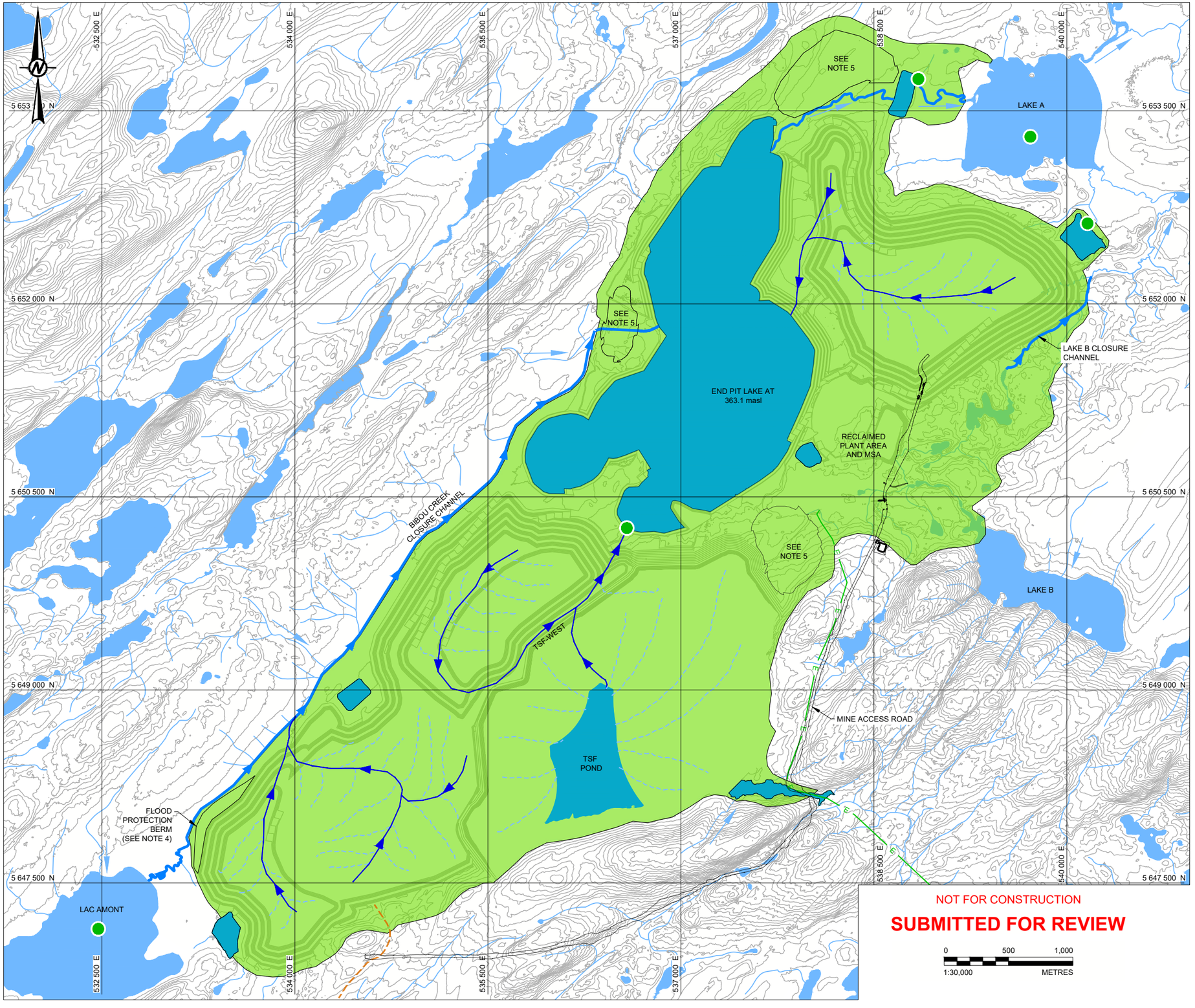
The proposed WMP allows managing TSS in the contact water runoff by controlling effluent to the environment via sedimentation ponds and, for the TSF Pond discharge, a mechanical water treatment plant. Should operational monitoring point to finer than expected suspended solids or to larger than expected sediment volumes, standard mitigation measures include pre-treatment areas (deepened ditch segments that allow solids to settle upstream of the sedimentation ponds) and the addition of flocculants at the sediment pond inflows.

8.0 CONCEPTUAL CLOSURE WATER MANAGEMENT PLAN

A high-level closure drainage concept plan was included in the feasibility design of the Project. This conceptual plan is shown in Figure 23. General closure drainage proposed activities include the following:

- Cover and reprofile the waste dumps, overburden piles, and the tailings beach to encourage efficient and erosion-resistant drainage paths.
- For the TSF:
  - Maintain a permanent pond, whose level would be controlled by an outlet channel draining north across the waste dump near the TSF to the future pit lake. The permanent TSF Pond water level would be lowered relative to existing conditions such that the long-term freeboard could accommodate extreme scenarios without risk to the safety of the TSF dykes.
  - Place granular material within the TSF pond footprint to control suspended solids and provide dust control as the pond is lowered.
- Maintain the upstream 5.2 kilometres of the Bibou Creek Diversion Channel as a permanent stream. The channel is designed such that aquatic habitat is expected to be established in this section of the channel during operations. Channel design elements to promote a smooth transition to closure include:
  - Avoid the use of synthetic materials (geotextiles, geomembranes) in the permanent section of the channel. Preferentially select natural materials (e.g., granular filters, low permeability, soils) which are more robust over the long term.
  - Design of channel geometry such that extreme flood events will be either managed within the channel or overtopping would not lead to a loss of long-term functionality.
  - Promote establishment of aquatic habitat through features such and low flow channels, integration of aquatic habitat features (e.g., riffles, pools, appropriate substrate), which are observed in regional natural water courses, and management of higher flows to preserve established habitat.

- The downstream 4.5 km of the Bibou Creek diversion channel DC1 will be decommissioned. This includes (see Appendix D for references to the station numbers):
  - Backfilling the deep excavation of the channel between Sta 5+250 and 6+170 and Sta 6+670 and 7+990 and grading it to allow safe passage for wildlife.
  - Removing the section of the diversion constructed in fill between Sta 6+170 and 6+670. Drainage to the Fishhook Lake to the north will be returned to existing (pre-development) conditions.
  - Removing the 1.7% rock ramps between Sta 7+990 and Sta 9+300.
- The Bibou Creek diversion channel DC1 will be routed through the future pit lake starting at Sta 5+200. A channel approximately 0.6 km long will be constructed to connect the diversion to the pit lake.
- Allow natural runoff and groundwater inflows to flood the pits and the excavated sumps and ponds to create closure waterbodies. A closure transition period will be required to allow the pit lake to fill naturally while maintaining fish passage and preserving established habitat in the diversion.
- Decommission most collector ditches and construct a new network of closure drainage features. The closure drainage features will, among others, include specific aquatic habitat features. These features are not shown in the closure drainage schematic in Figure 23.



WATER MANAGEMENT

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- DIVERSION CHANNEL (NON-CONTACT WATER)
- FLOW DIRECTION
- NATURAL WATERCOURSES
- NATURAL LAKES
- CLOSURE WATER BODY / CLOSURE WETLAND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- DRAINAGE PATH

MINE INFRASTRUCTURE

- RECLAIMED AREA
- MINE PIT
- E — RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END-OF-MINE-LIFE SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
4. FLOOD PROTECTION BERM MERGED WITH WASTE DUMP AND RECLAIMED.
5. OVERBURDEN DUMPS REMOVED AT CLOSURE AND USED AS SOURCE OF RECLAMATION MATERIAL.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN SCHEMATIC CLOSURE CLOSURE

CONSULTANT

wsp

YYYY-MM-DD	2024-04-26
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO.	CONTROL	REV.	FIGURE
2257554004		A	23

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9.0 RISKS AND OPPORTUNITIES

The current section discusses risks associated with the Troilus water management plan and suggests mitigation measures for these risks; opportunities are also listed. Both the risks and the opportunities should be analyzed in further detail during the next engineering phases and on a regular basis during the construction and operation phases. Risks and mitigations are listed in Table 23. Opportunities are listed in Table 24.

Table 23: Troilus Water Management Plan - Risks and Mitigation Measures

Risk	Mitigation Measure
Construction Costs	
Unexpected high costs for the construction of the water management structures due to differences between encountered ground conditions and design assumptions	Collect additional geotechnical data ahead of detailed design
Unexpected high costs for the construction of the water management structures due to overlaps and constraints with other site infrastructure	Coordinate and integrate mine development teams
Unexpected high care-of-water costs during the construction period	Integrate construction care-of-water plan in future water management plan updates
The construction of the DC1 Main Diversion Channel is likely to be labour intensive and slow. This is due to the detail nature of adding fish habitat features through-out the channel's length. Also, the requirement that more than half of the channel's length would remain in place at the site's restauration adds stringency and a high level of required rigour to the construction. These elements could lead to a high cost of construction for the diversion channel.	Spend adequate effort during the detail engineering and construction preparation phase
Water Management Plan Performance	
Process water supply deficit under winter conditions	Regularly update and calibrate water balance model to refine operation rules. Include the flexibility in the design of the pumping systems to allow for rerouting flows from pits or sedimentation ponds toward the ore processing plant, if required
Collected water quality not meeting effluent discharge guidelines leading to excessive on-site volumes of water with negative consequences on the operations	Conduct geochemical and water quality assessments
High TSS concentrations are observed in sedimentation ponds outflows	Include pre-treatment areas (deeper ditch segments upstream of the pond) and consider adding flocculants at the pond inflows
Climate change leads accentuates extreme events and has a negative effect on the performance and risk associated of the water management structures	Assess regularly the water management plan under most recent climate change projections. Use a risk-informed approach to determine risk levels
Groundwater seepage from the DC1 Main Diversion Channel leads to lower than expected low flow water depths, which does not provide for fish passage	Include a more detailed assessment of potential seepage losses and integrate low permeability materials in the channel construction if there is a risk of significant water losses
Fish do not use the DC1 channel for habitat or passage	Integrate biology expertise in the detail engineering phase and during the operational period

Table 24: Troilus Water Management Plan - Opportunities

Opportunities	Benefits
Integrate waste, tailings, and water management plant over the entire life of mine	Reduced overall costs
Optimize design of water management structures and timing of construction	Lower construction costs
Use a risk-informed design approach	Lower project risk levels
Integrate detailed closure landform and drainage plan in the operational plans, including progressive reclamation of waste dumps	Lower closure costs

10.0 CONCLUSIONS

Water management is a critical part of a mine project's construction, operation, and closure. A water management plan, including a feasibility engineering design and site-wide water balance model, was completed in view of restarting mining operations on the Troilus Site. The water management plan aimed to facilitate efficient mine operations and reduce effects on downstream receiving waterbodies.

The proposed water management plan includes water management structures to construct over the LoM:

- Four stream diversion channels with a total length of 15.6 km, including a 9.7 km long channel representing the main diversion structure; and
- Twenty-five collection ditches with a total length of 18.9 km, eight collection sumps, four sedimentation ponds, and pumping stations to manage the contact runoff within the project development area. One of the sedimentation ponds will make use of the southern extremity of the 87 Pit; the other three ponds will be built by excavation in the natural ground.

The construction of these structures is planned to be staggered over the first few pre-processing and operational years to limit initial capital costs. The use of available water management infrastructure and equipment were considered. The construction staging was based on the available mine development schedule.

The contact water surplus will be treated to limit the concentration of suspended solids before discharge to the environment. The treatment will either be passive in the sedimentation ponds or active with a flocculation/sedimentation plant for the water in the TSF Pond. Based on ongoing geochemical investigations, Troilus indicated that suspended solids are the only contact water quality parameter, which is expected to require treatment.

The water balance model indicated that the contact water management system could provide the required process water supply even when accounting for seasonal effects and variable climate conditions.

11.0 RECOMMENDATIONS

Engineering analyses included in this report will need to be updated and refined during the next engineering phase. Further integration between water management and mine, waste, and tailings management plans for the construction, operational, and close periods are strongly recommended.

In preparation for the next engineering phase for the water management structures, WSP recommends completing the following studies:

- Extend and improve the available geochemical characterization of the various water streams to be managed by the future Troilus mine operations. These streams include waste rock and tailings runoff and seepage, groundwater seepage to pits and ponds, and natural runoff. The improved characterization is required to verify major water management assumptions.
- Further refine hydrology and aquatic baseline studies to confirm and optimize the fish passage and fish habitat approach for the Main Diversion Channel.
- Develop progressive reclamation and mine closure plans.

12.0 SIGNATURE PAGE

WSP Canada Inc.

Main Contributor	Contribution
Jonathan Friebel	Technical lead for water management plan and hydrotechnical and civil design
Vlad Rojanschi, P.Eng.	Overall senior review, technical review of water management plan and hydrotechnical and civil design, preparation of tailings water management analysis, preparation of climate and hydrology baseline studies, senior review of water balance analysis in Appendix M
Mike Valkenburg	Preparation of design for pump and pipeline system in Appendix G
Max Nodwell	Preparation of design for water treatment plant in Appendix H
Pierre Primeau, P.Eng.	Senior review of design for pump and pipeline system in Appendix G and of design for water treatment plant in Appendix H
Xavier Léveillée-dallaire, EIT	Preparation of groundwater management analysis in Appendix L
Mathieu Gosselin, P.Eng.	Preparation and senior review of groundwater management analysis in Appendix L
Canny Tung	Preparation of water balance analysis in Appendix M
Jie Chen	Review of water balance analysis in Appendix M

DRAFT

DRAFT

Jonathan Friebel
Senior Water Resources Consultant

Vlad Rojanschi, P.Eng., Dr.-Ing.
Senior Water Resources Engineer

JF/VR/es

https://wsponline.sharepoint.com/sites/gld-169483/project files/5 technical work/2257554004 - site wide wmp - fs/15 - report/059-2257554004-rpt-reva-troilusfs-swmp-date2024.docx

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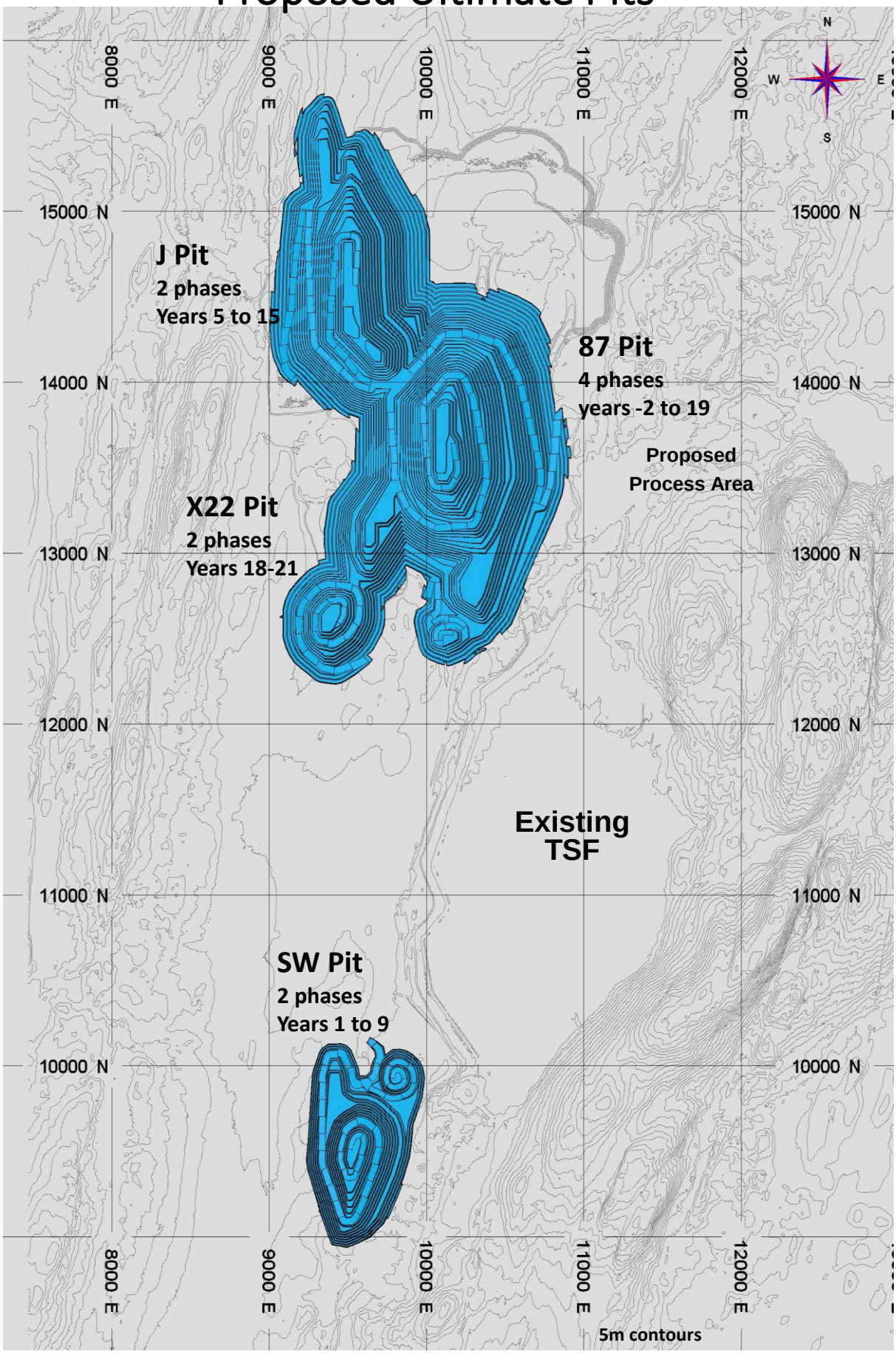
APPENDIX A

Mine Sequence (AGP, 2024)

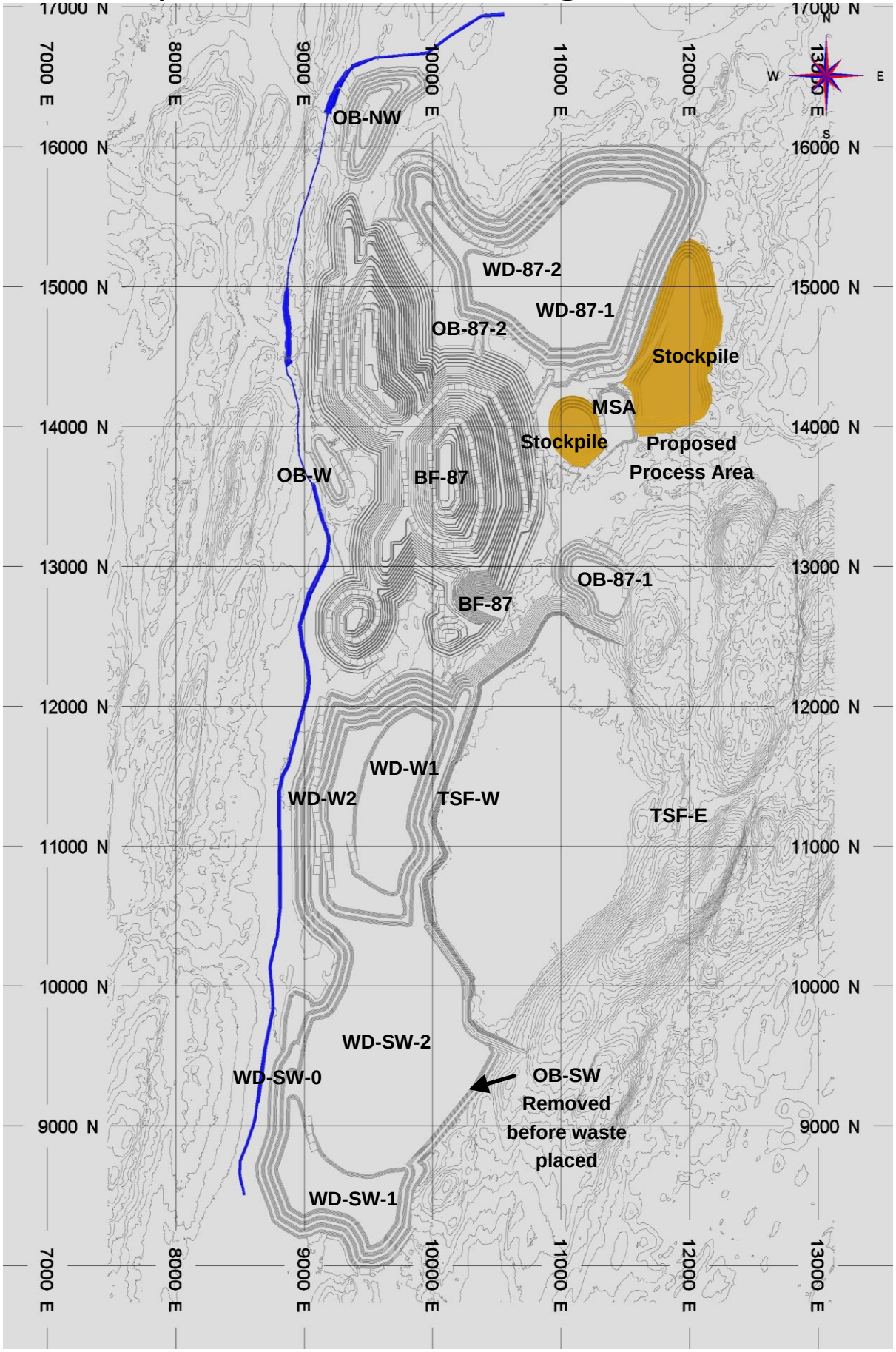
Troilus Mining Activities

March 19, 2024

Proposed Ultimate Pits

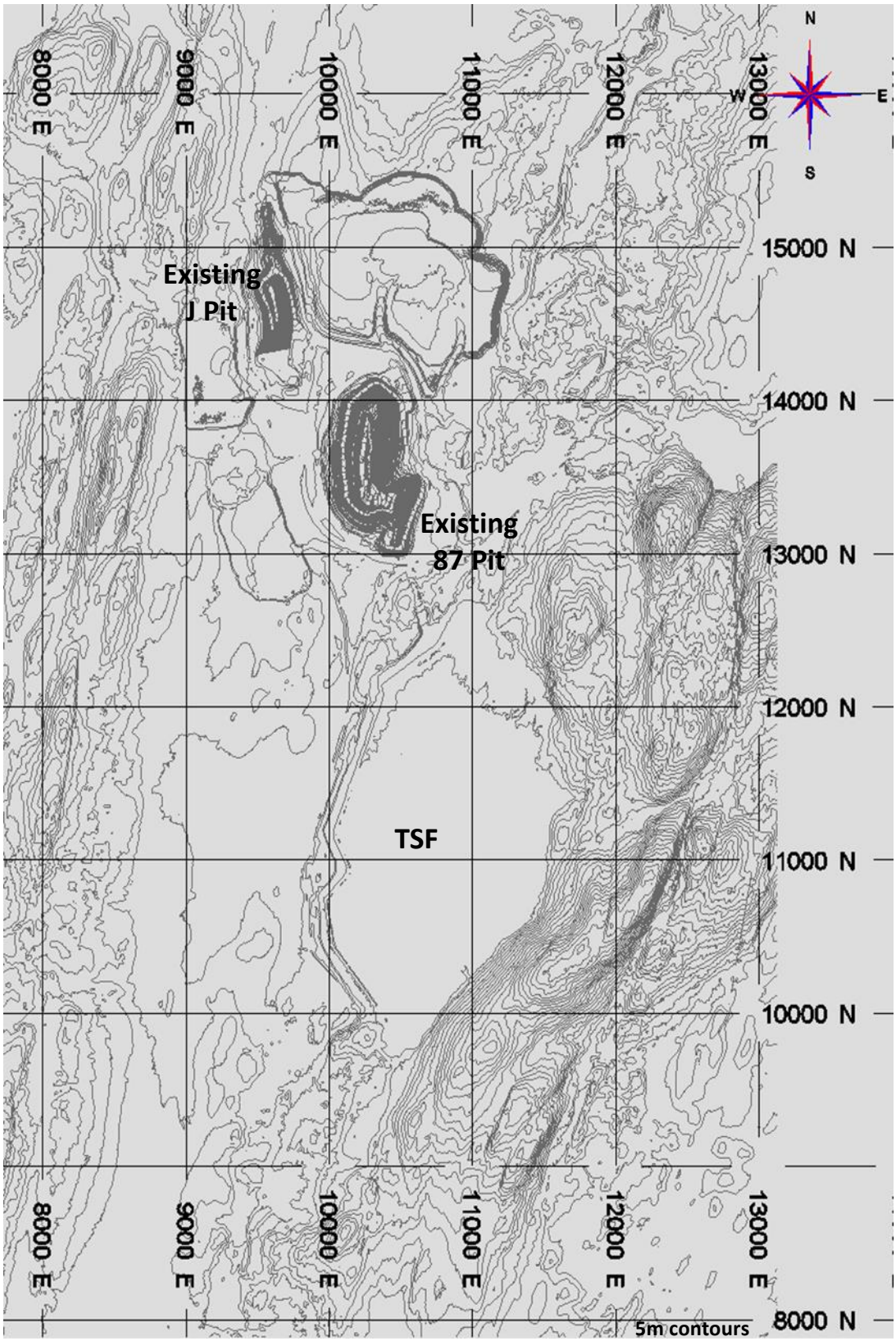


Proposed Material Storage Facilities

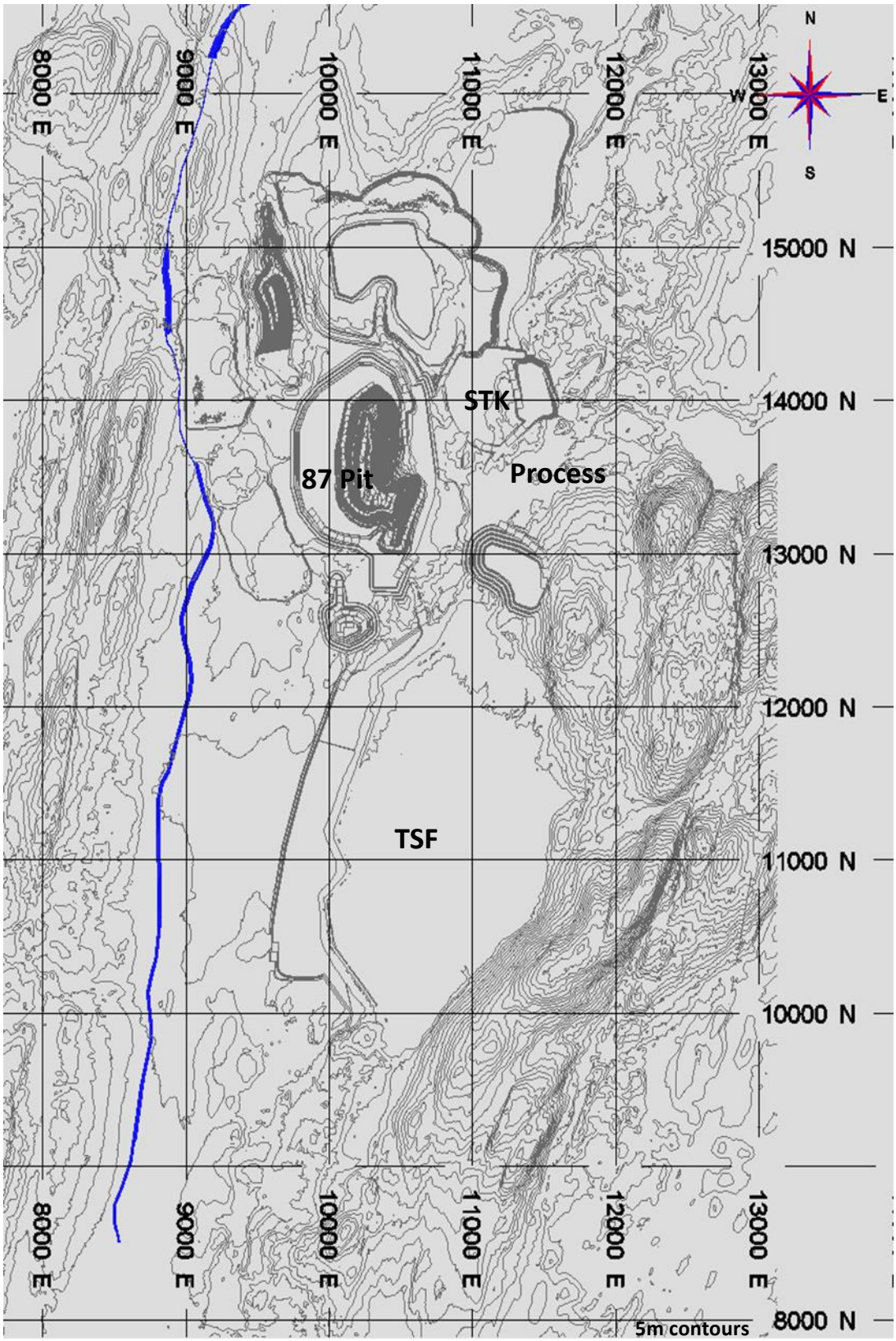


Mine Sequence

before mining

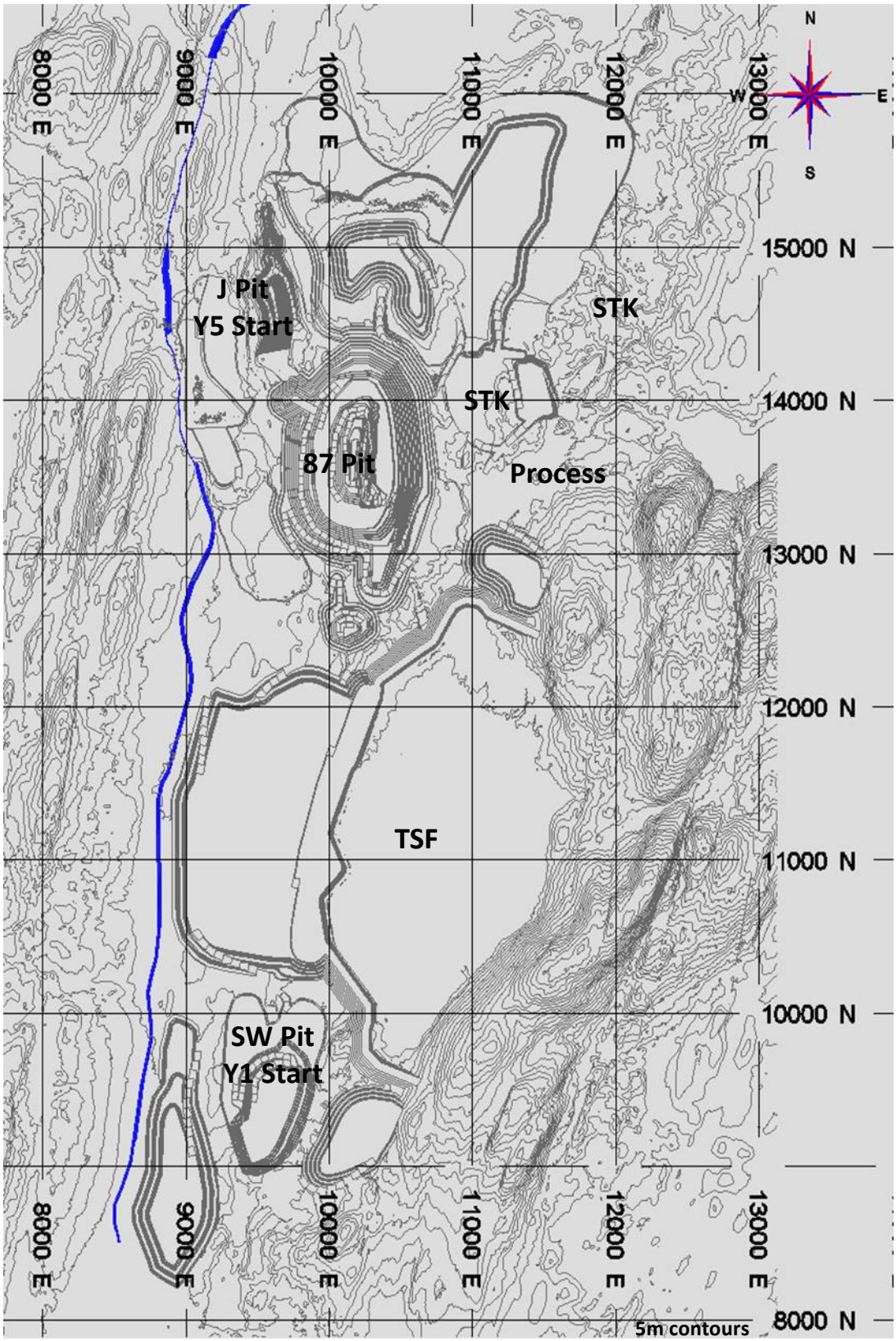


Year -1
(end of pre-production)



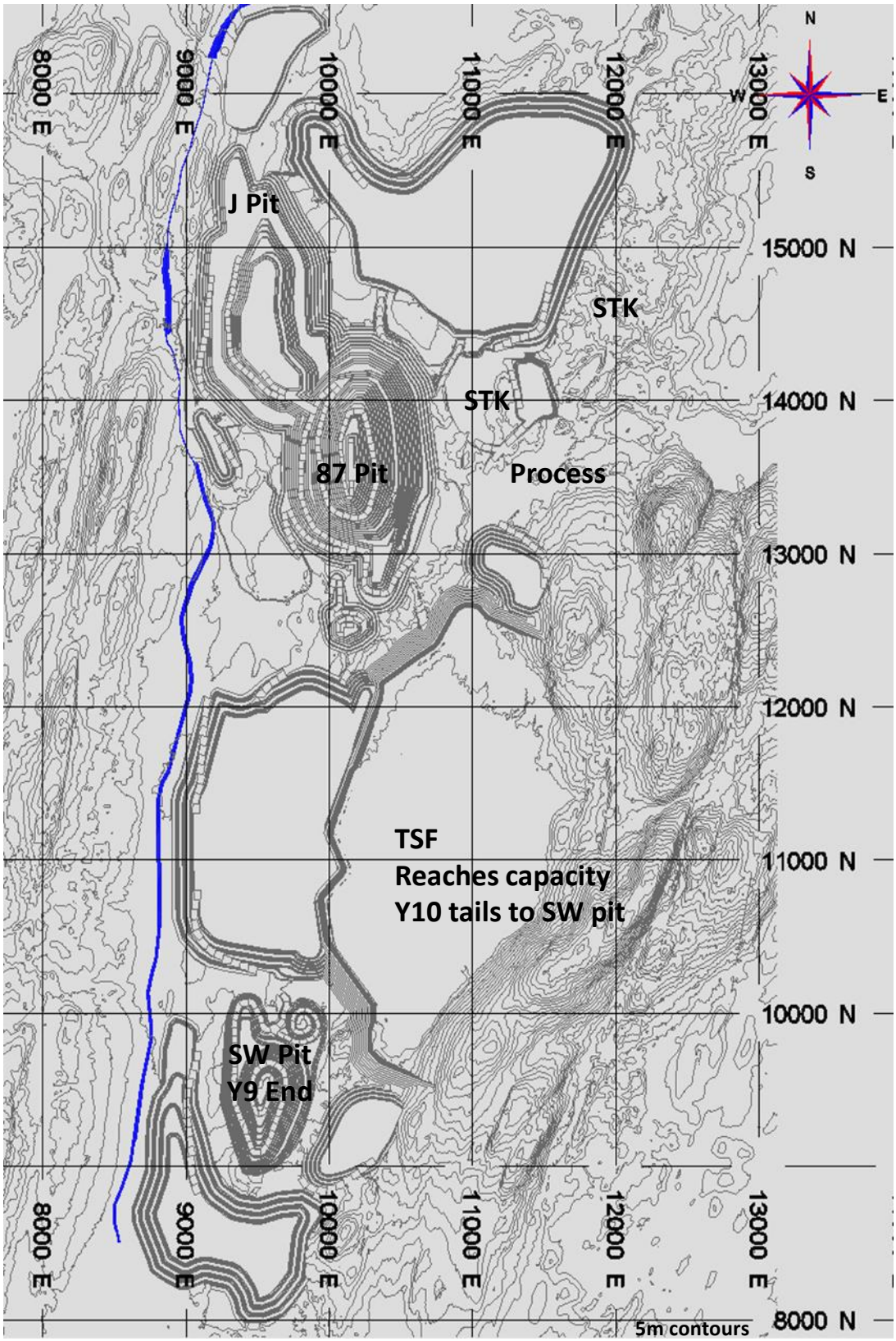
Active pit during pre-production = 87

Year 5



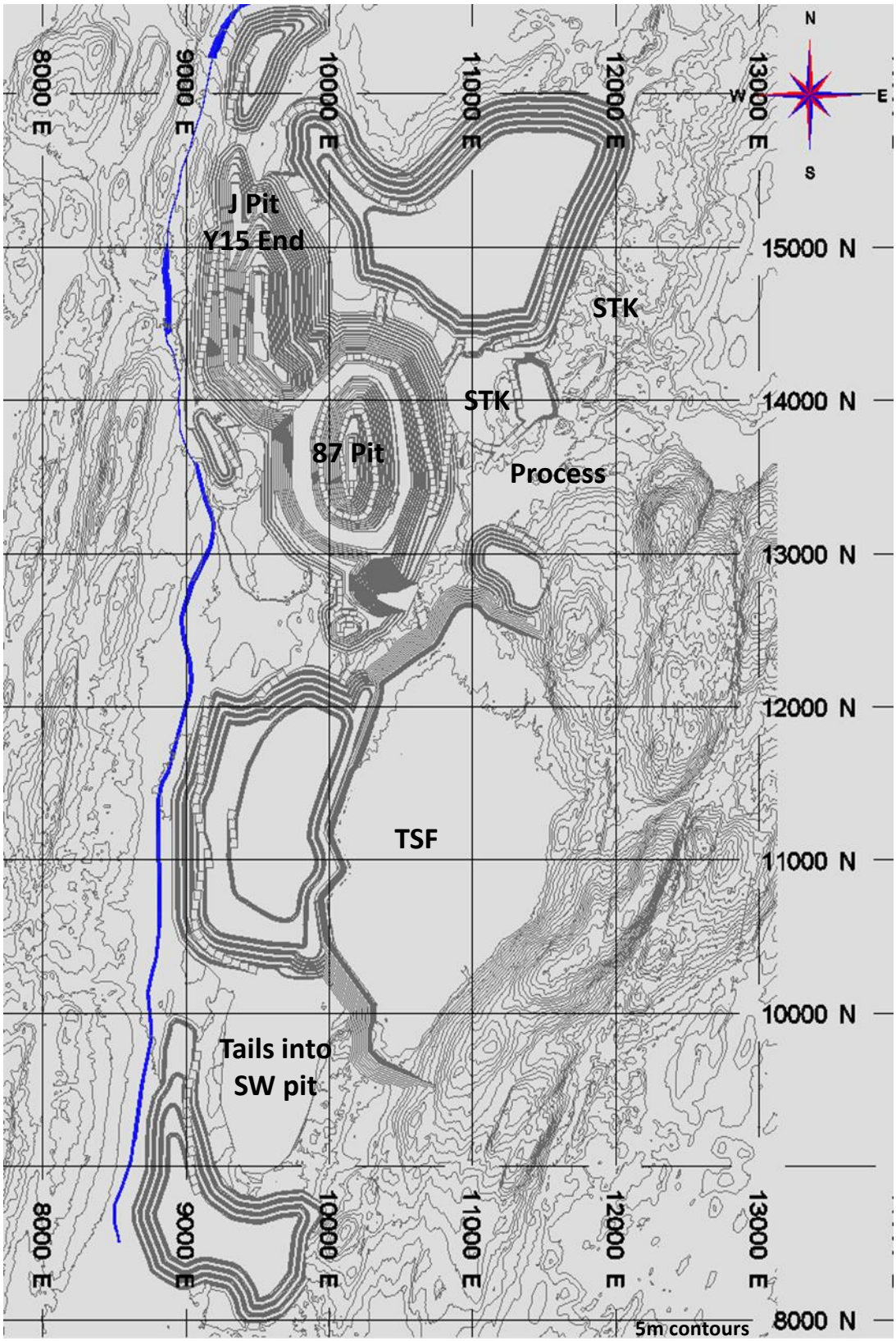
Active pits for years 1-5 = 87, SW, J

Year 10



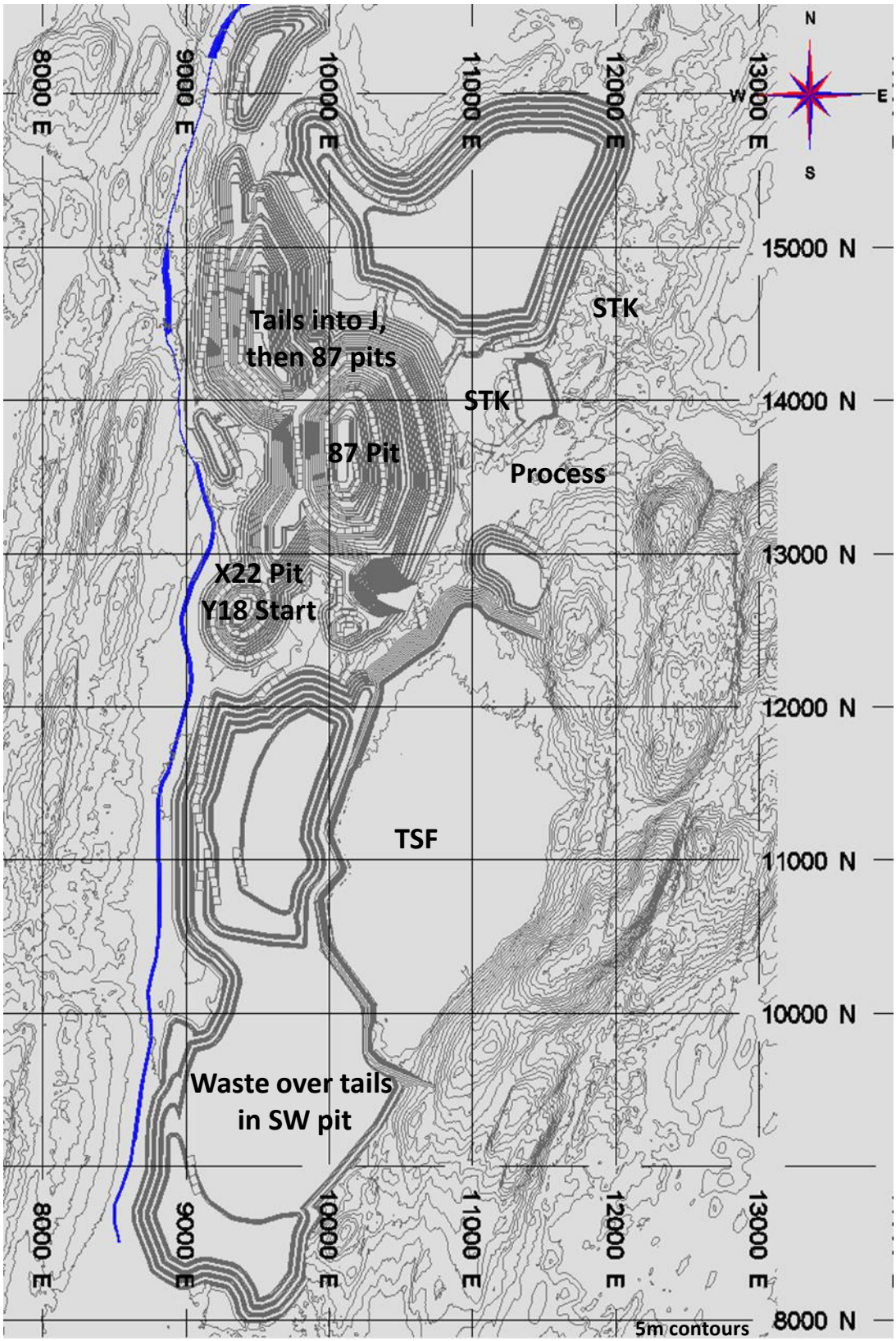
Active pits for years 6-10 = 87, SW, J

Year 15



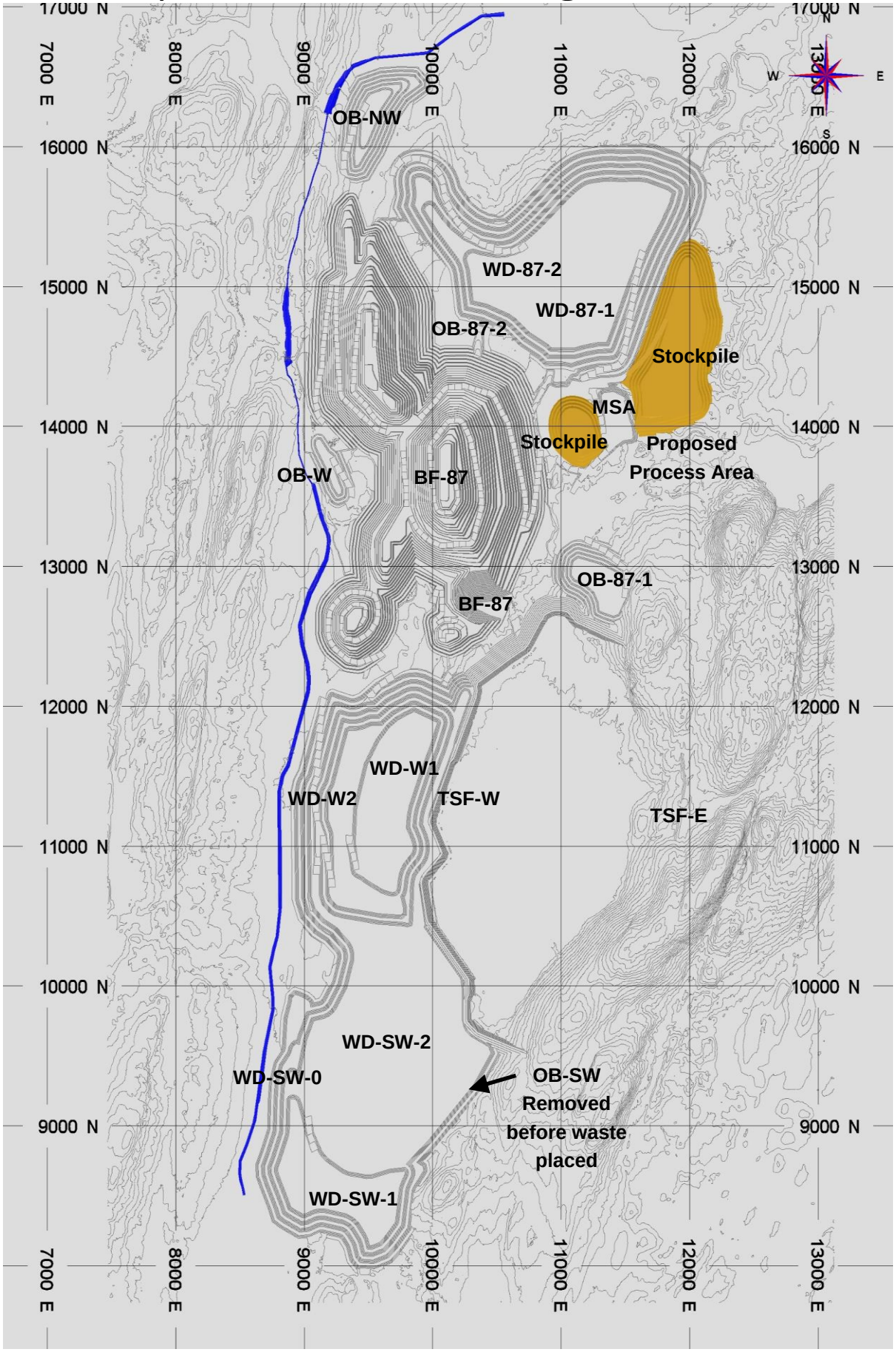
Active pits for years 11-15 = 87, J

Year 21
Mining complete



Active pits for years 15-21 = 87, X22

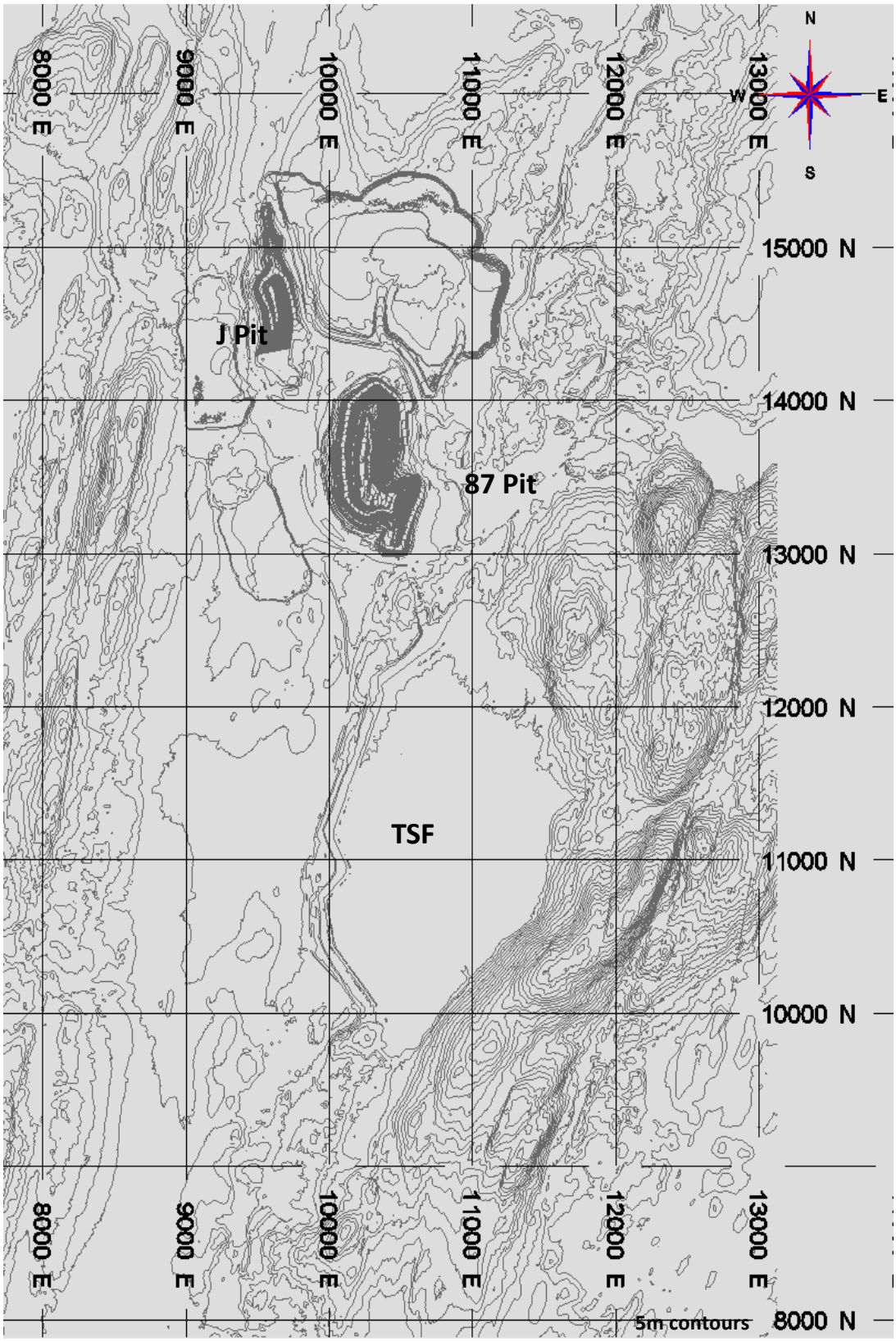
Proposed Material Storage Facilities



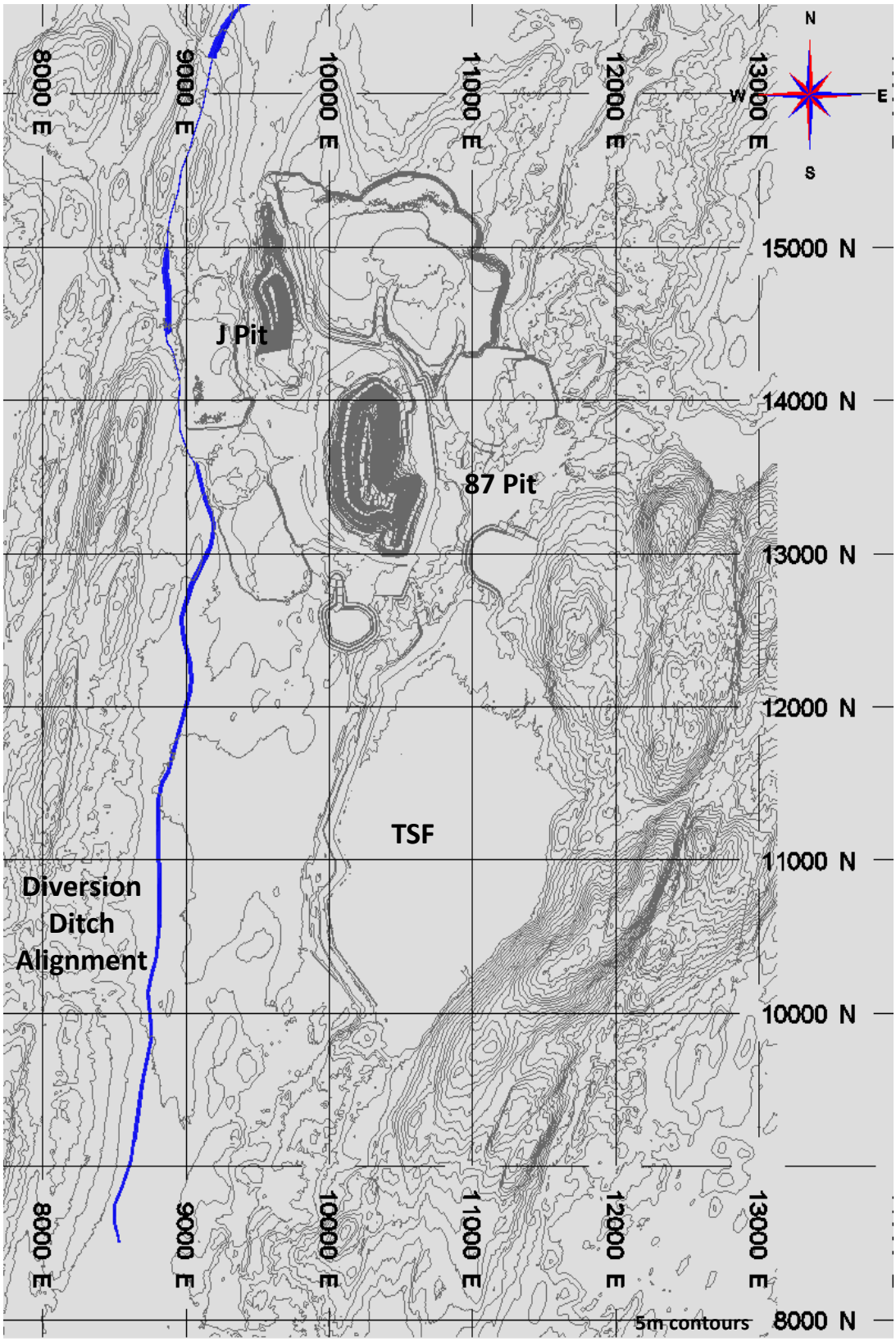
Troilus FS Annual Progress Maps (schedule v9, 50ktpd)

February 10, 2024

before mining



Year -2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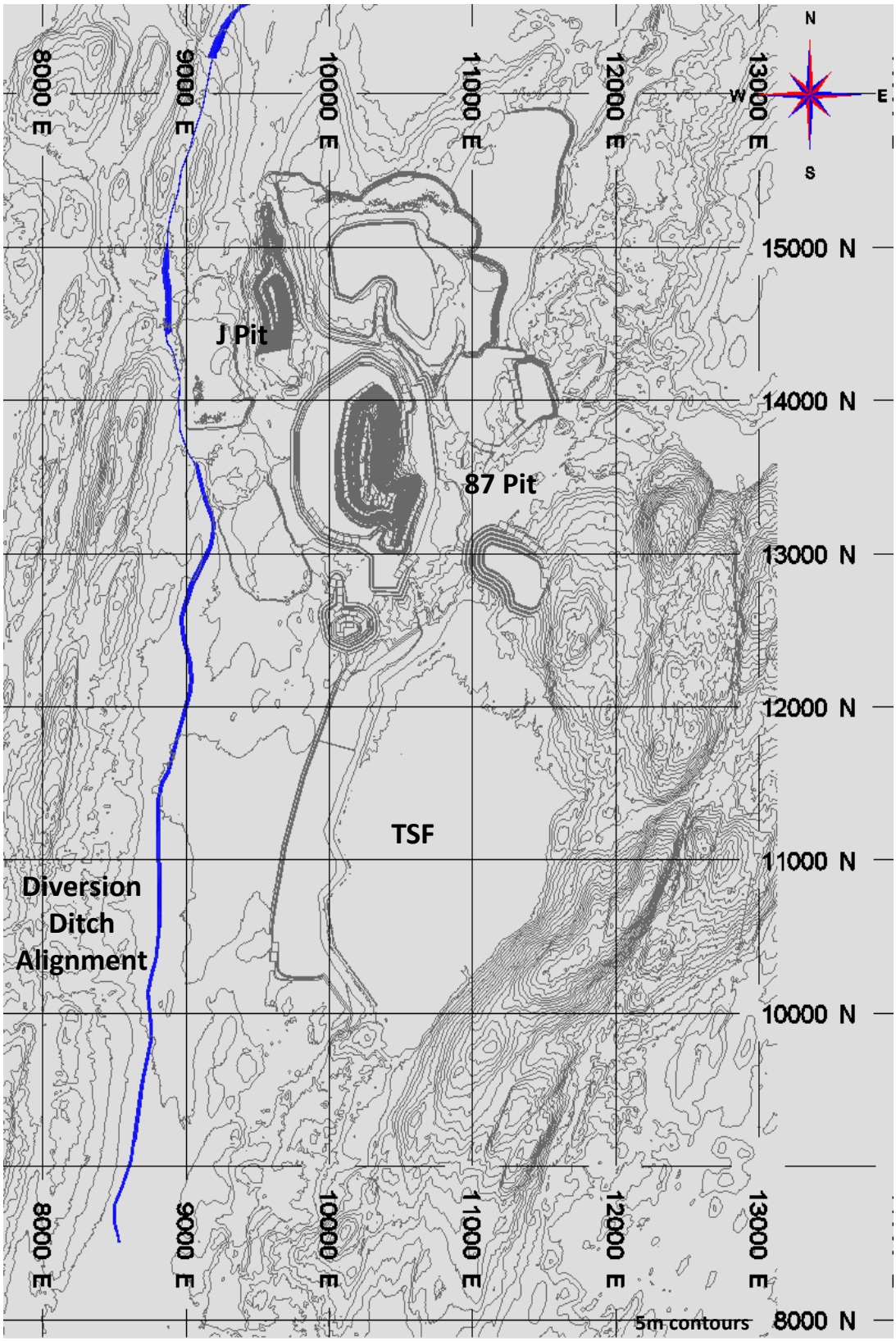
J Pit
87 Pit
TSF
Diversion
Ditch
Alignment
5m contours

Year -1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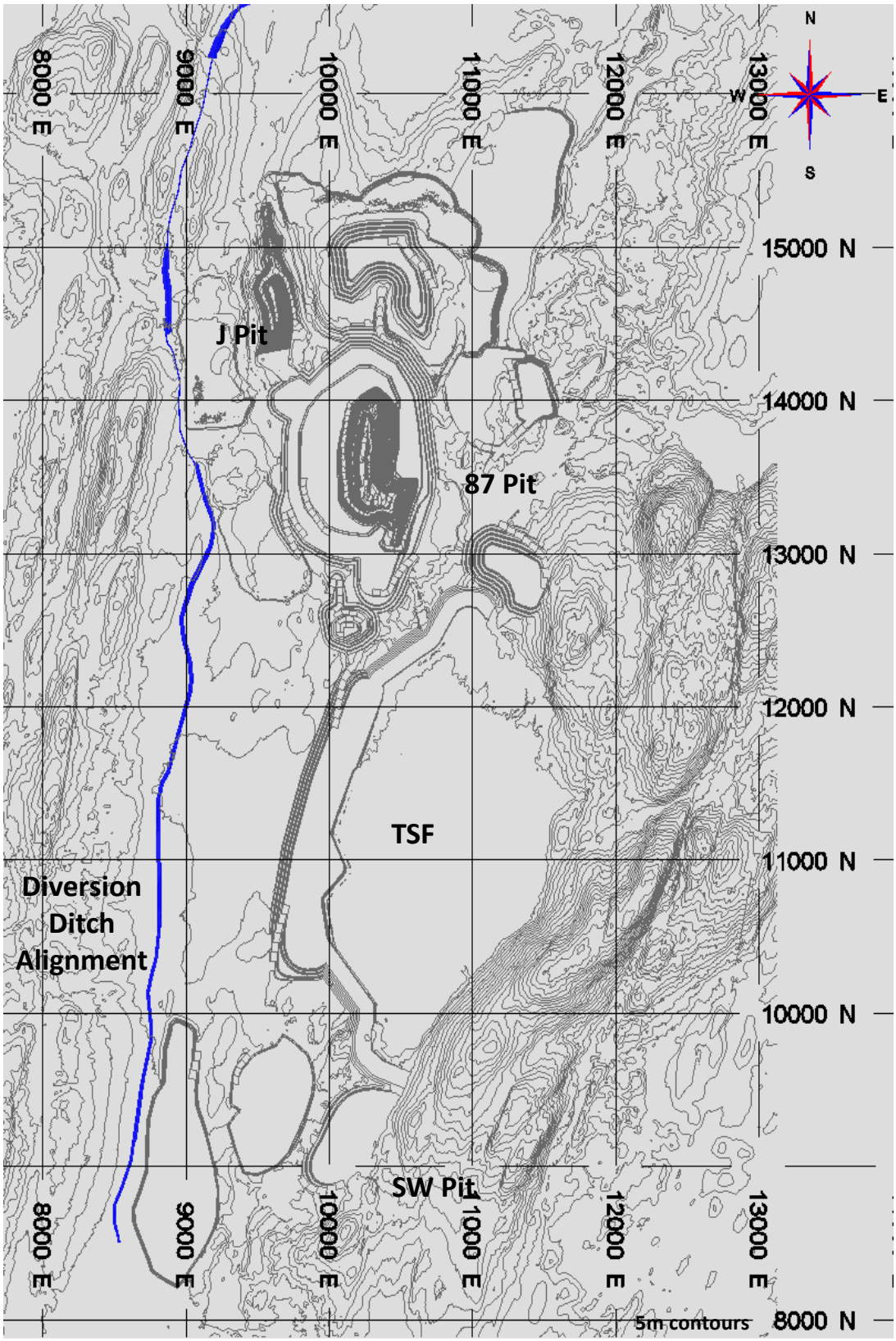
87 Pit
TSF
Diversion
Ditch
Alignment
5m contours

Year 1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Diversion
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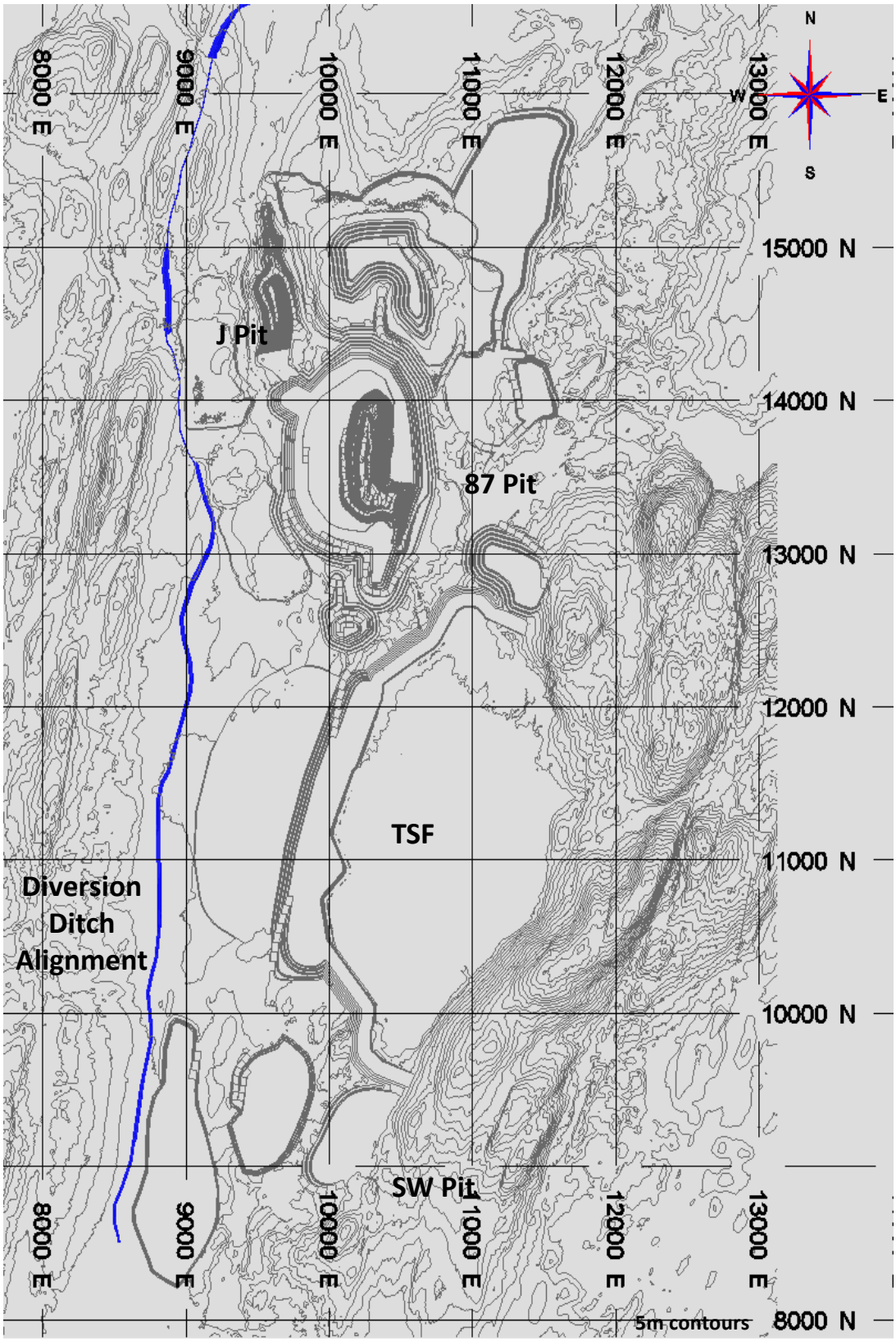
Alignment
SW Pit
5m contours

Year 2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J Pit
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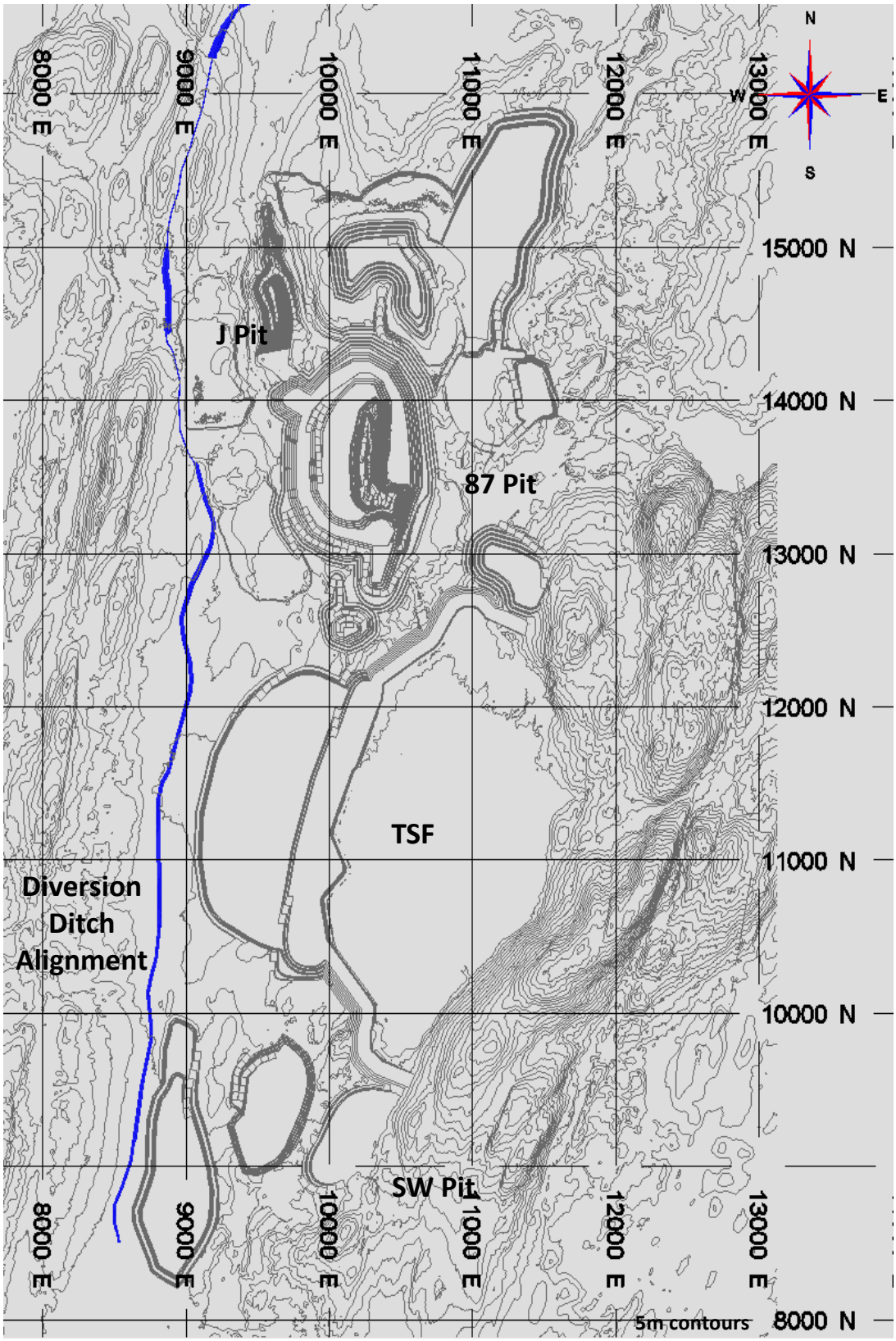
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 3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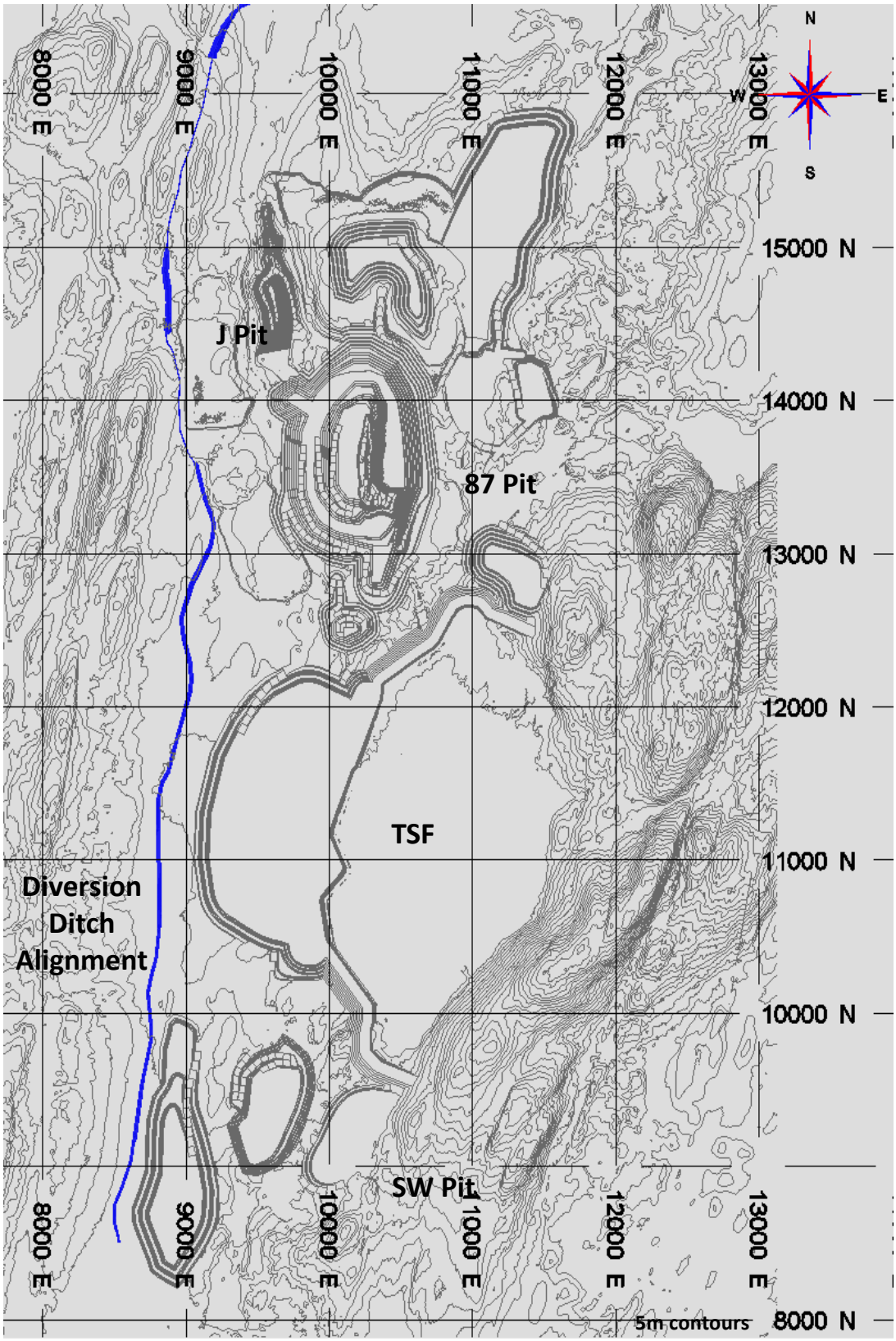
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 4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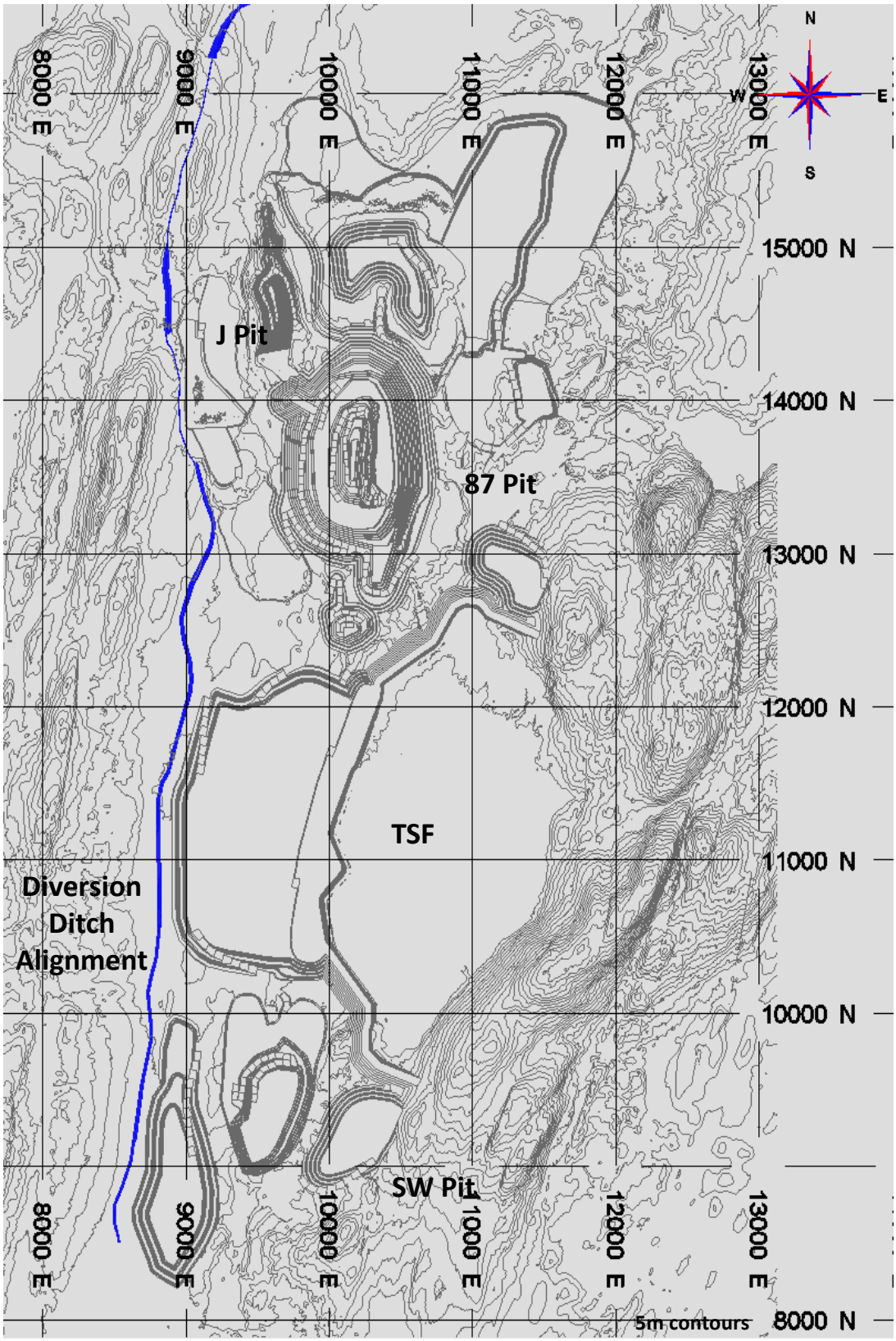
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 5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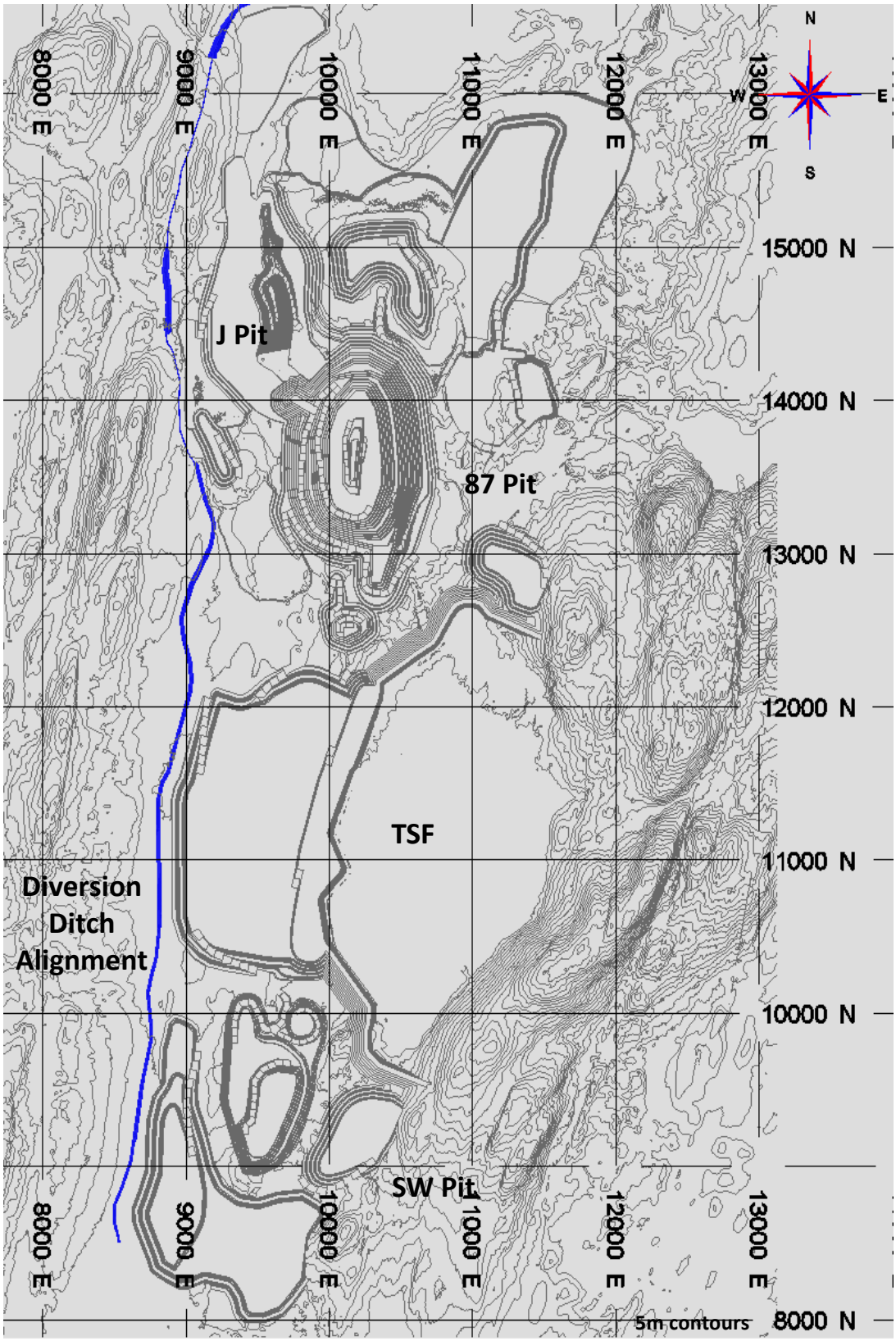
87 Pit
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 6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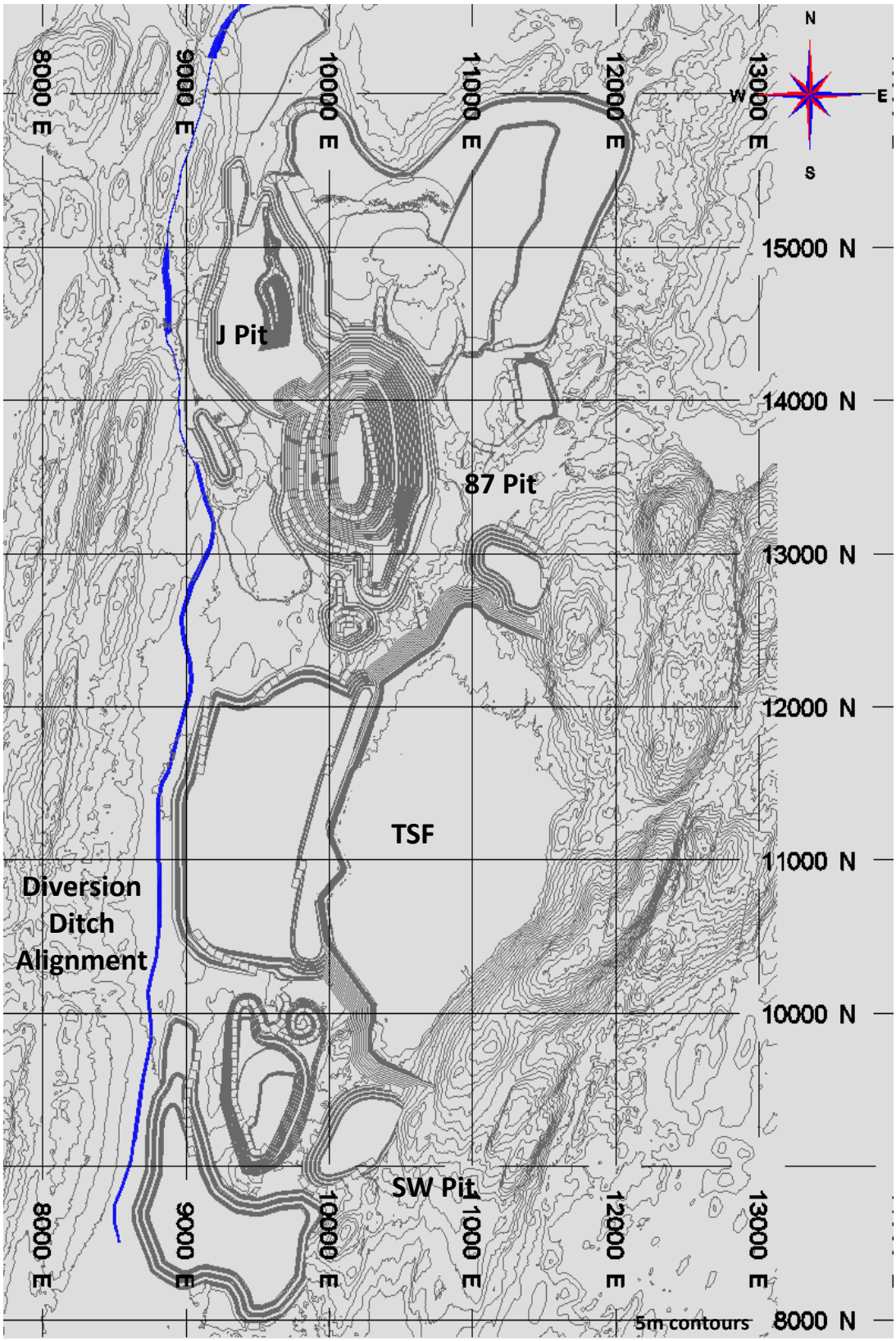
87 Pit
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 7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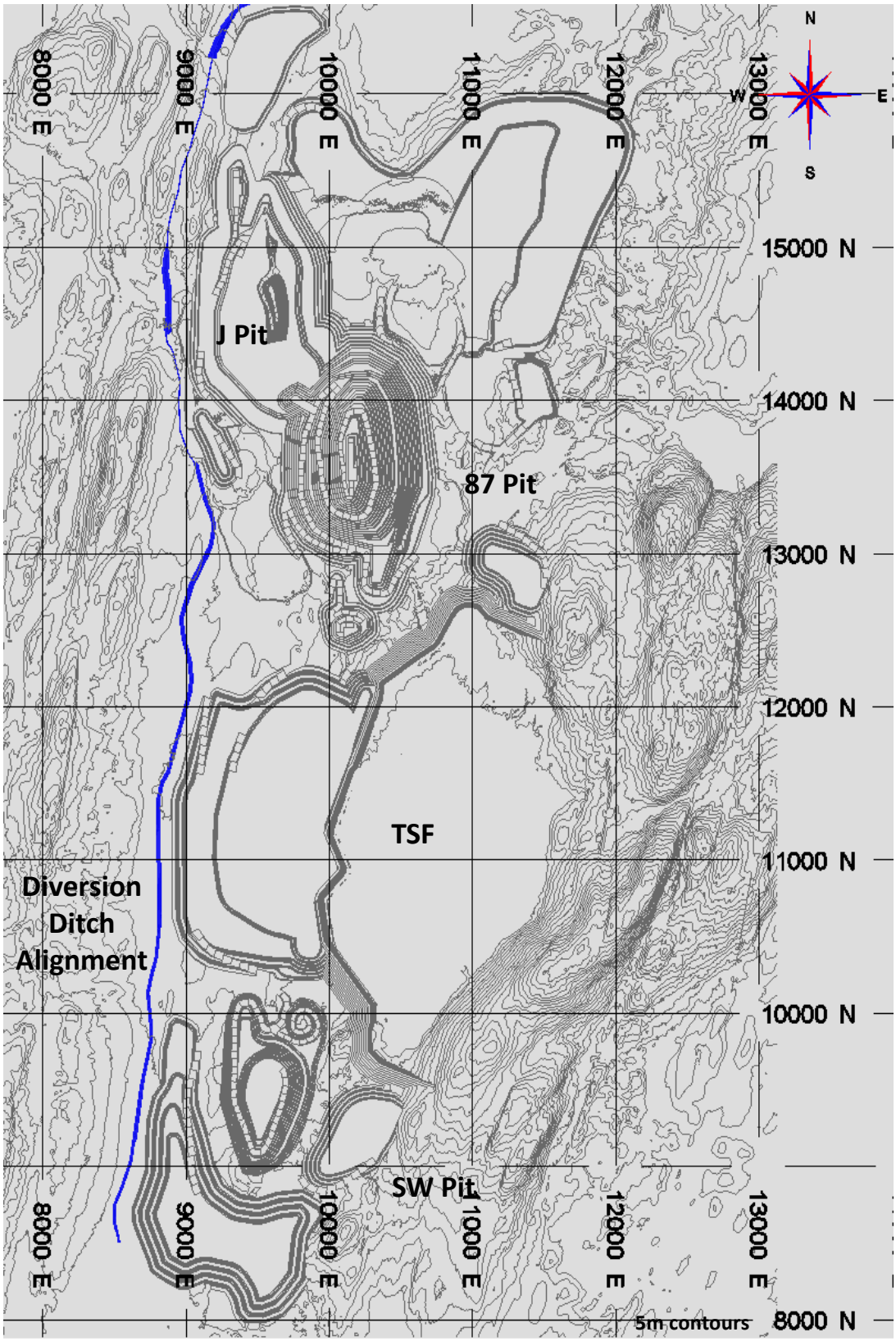
87 Pit
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 8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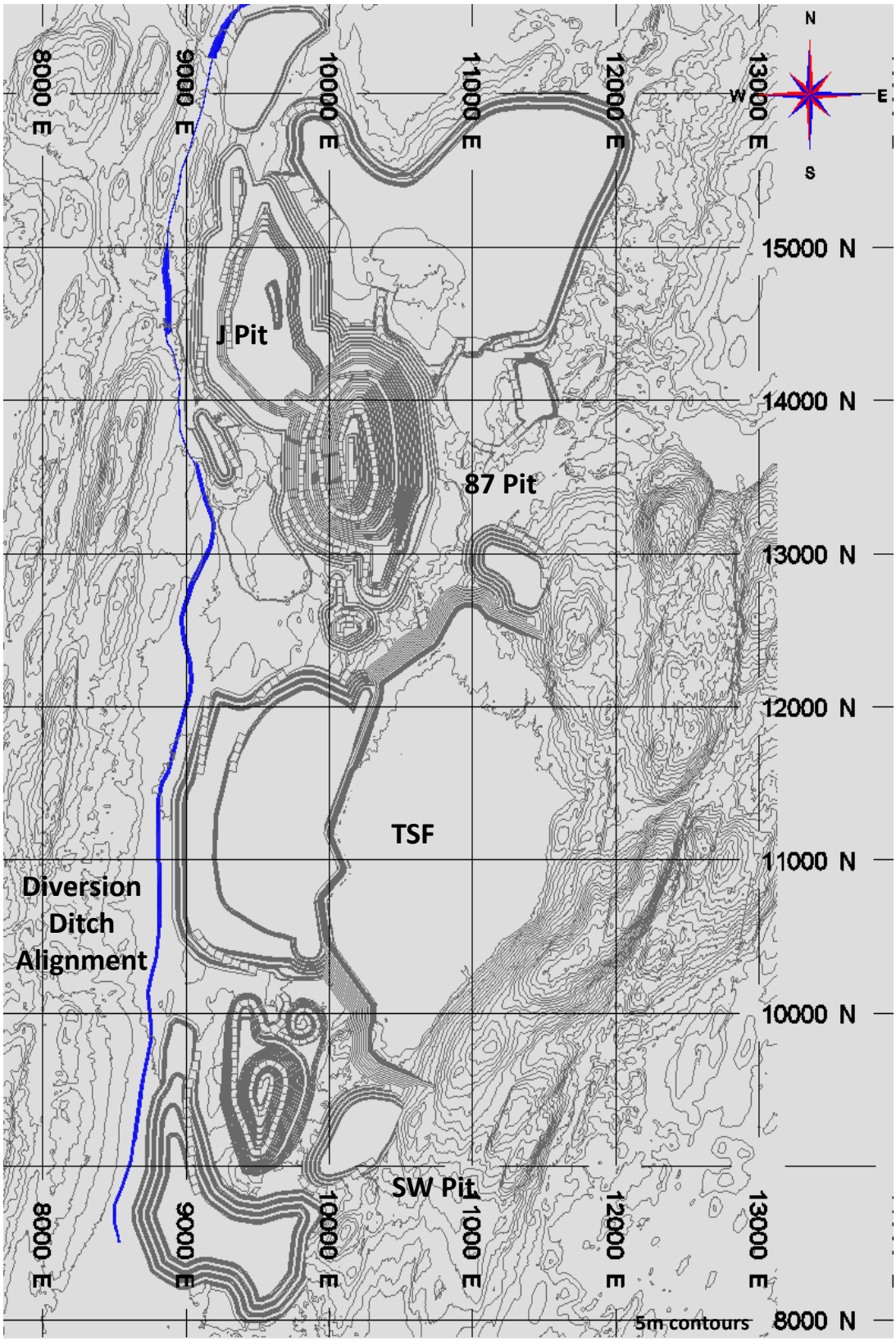
87 Pit
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 9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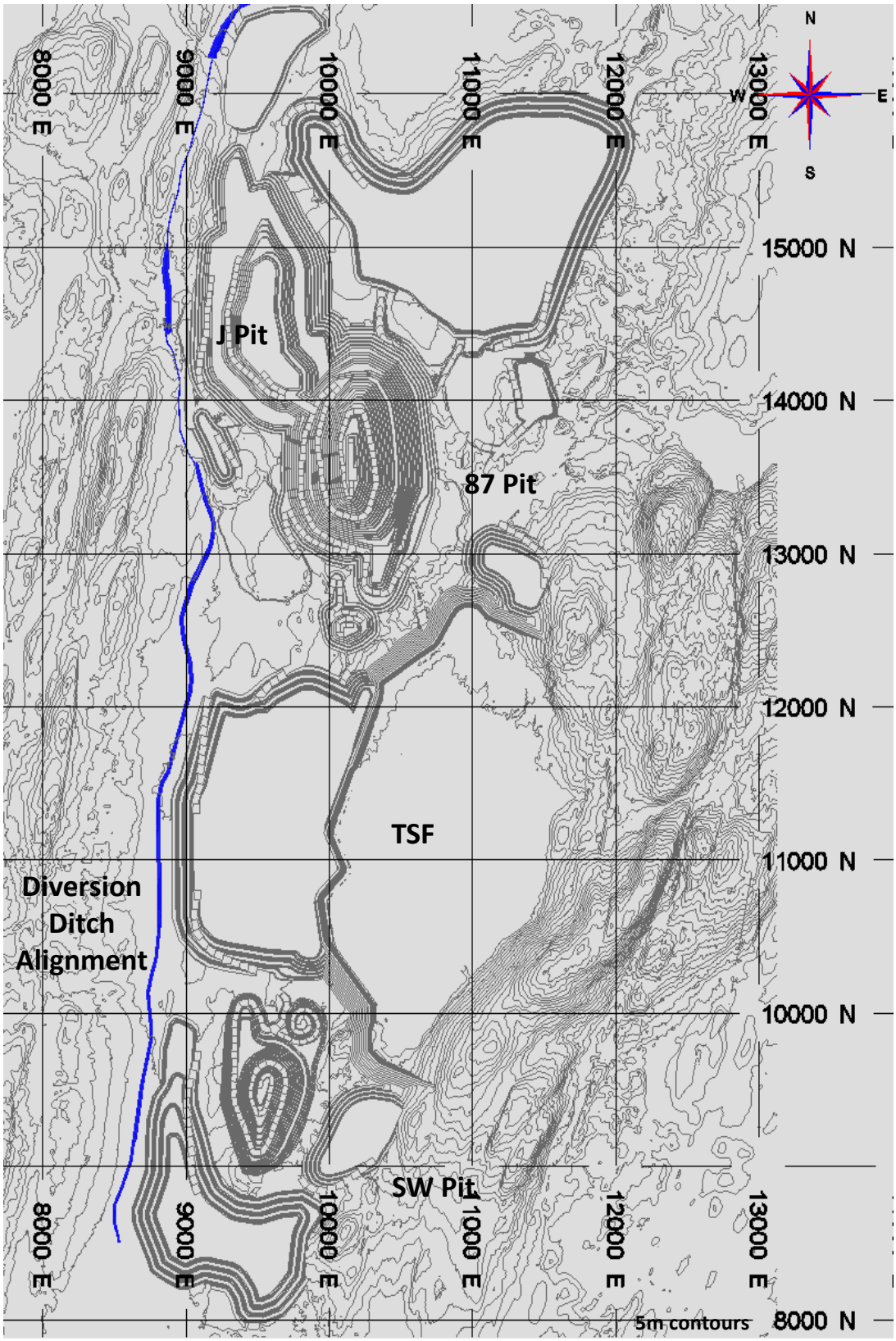
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 10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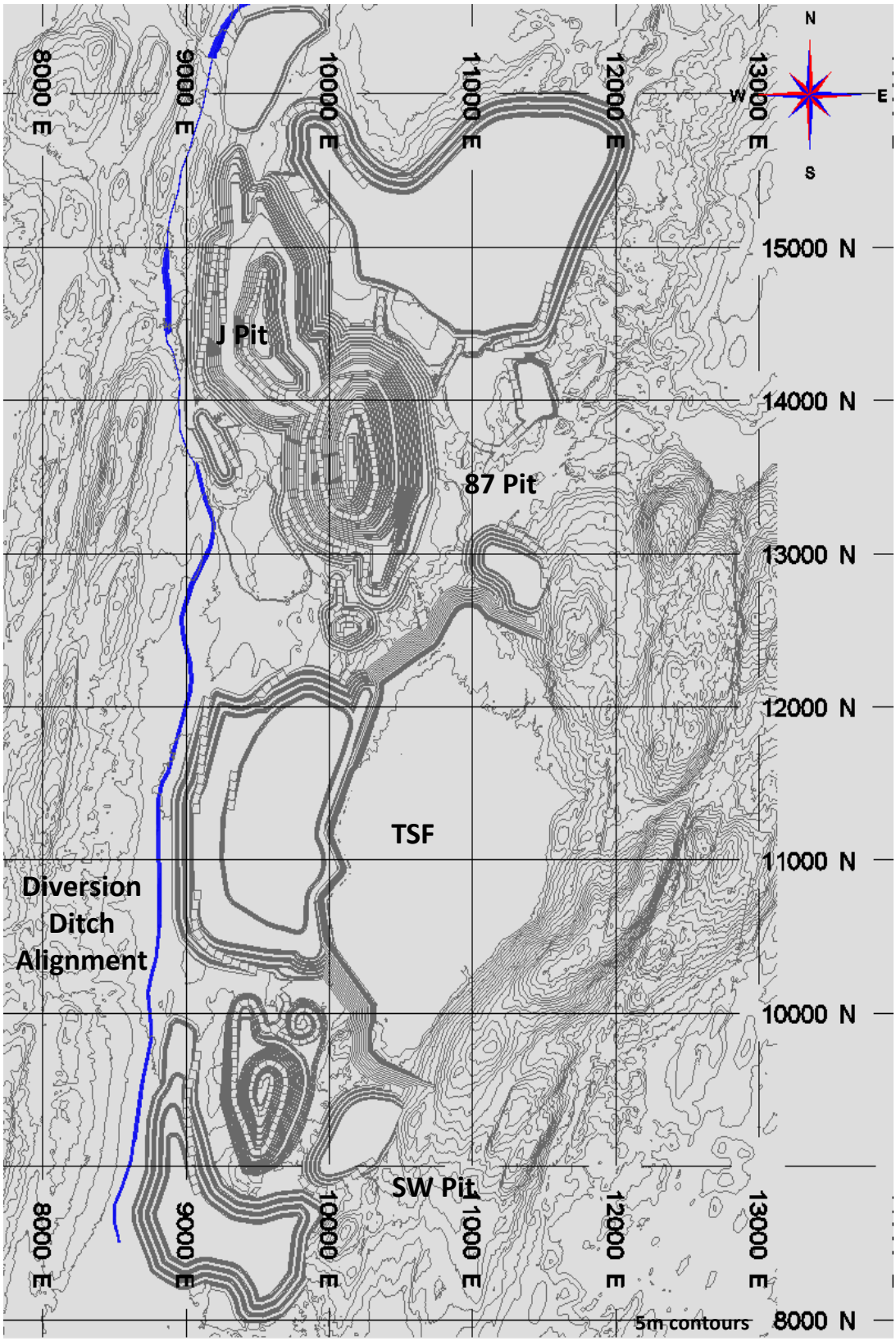
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 11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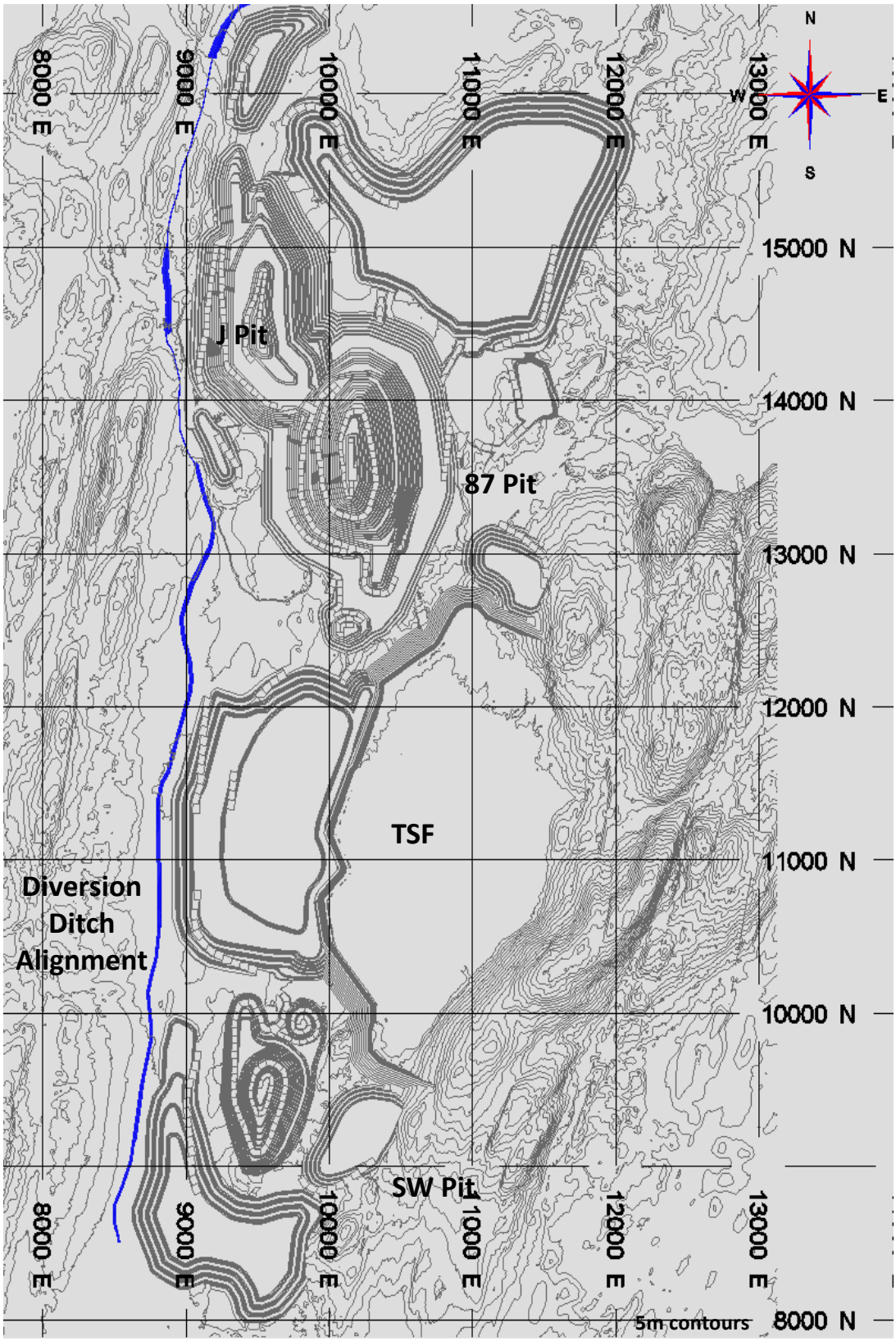
87 Pit
TSF
Diversion
Ditch
Alignment
SW Pit
5m contours

Year 12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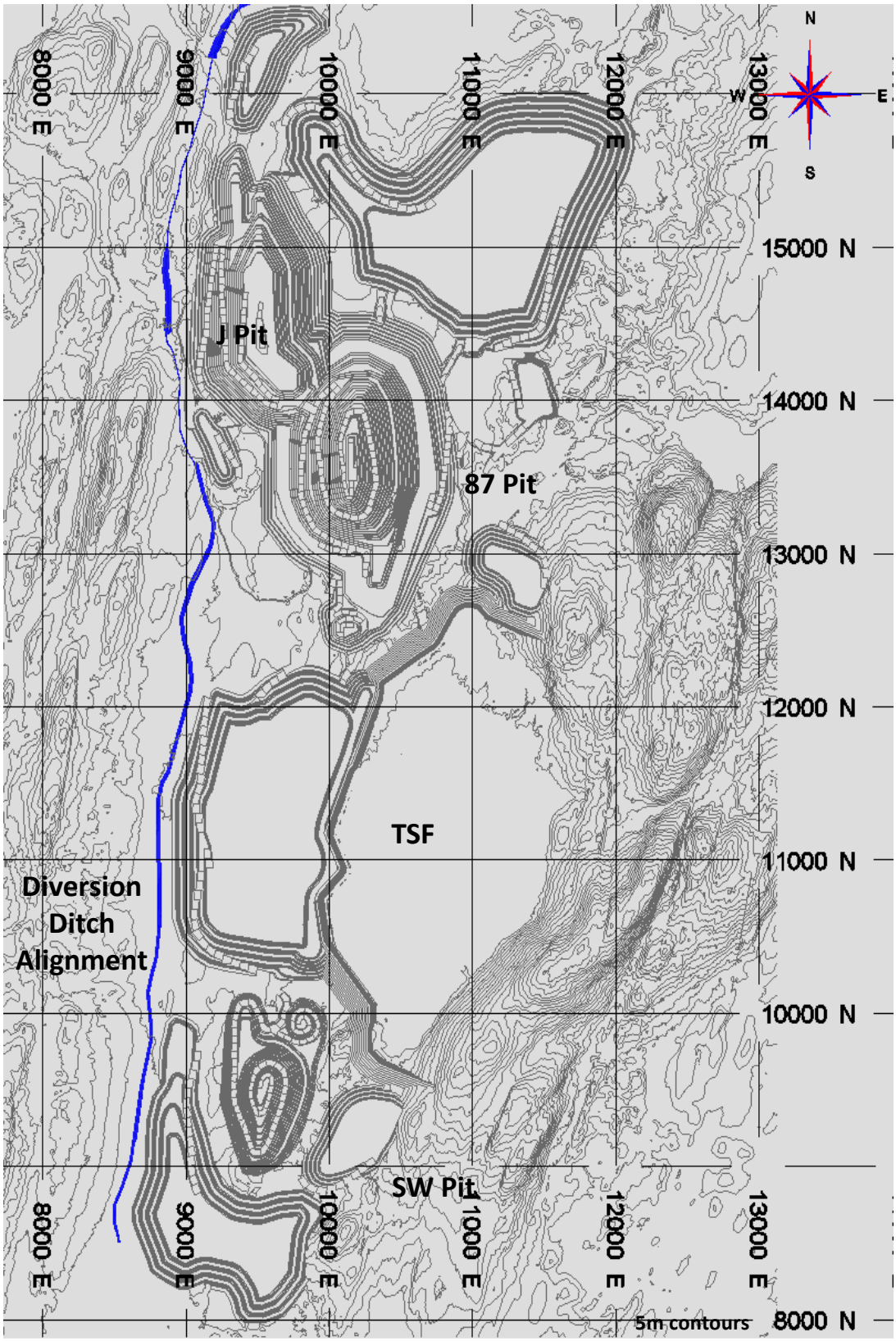
87 Pit
TSF
Diversion
Ditch
Alignment
SW Pit
5m contours

Year 13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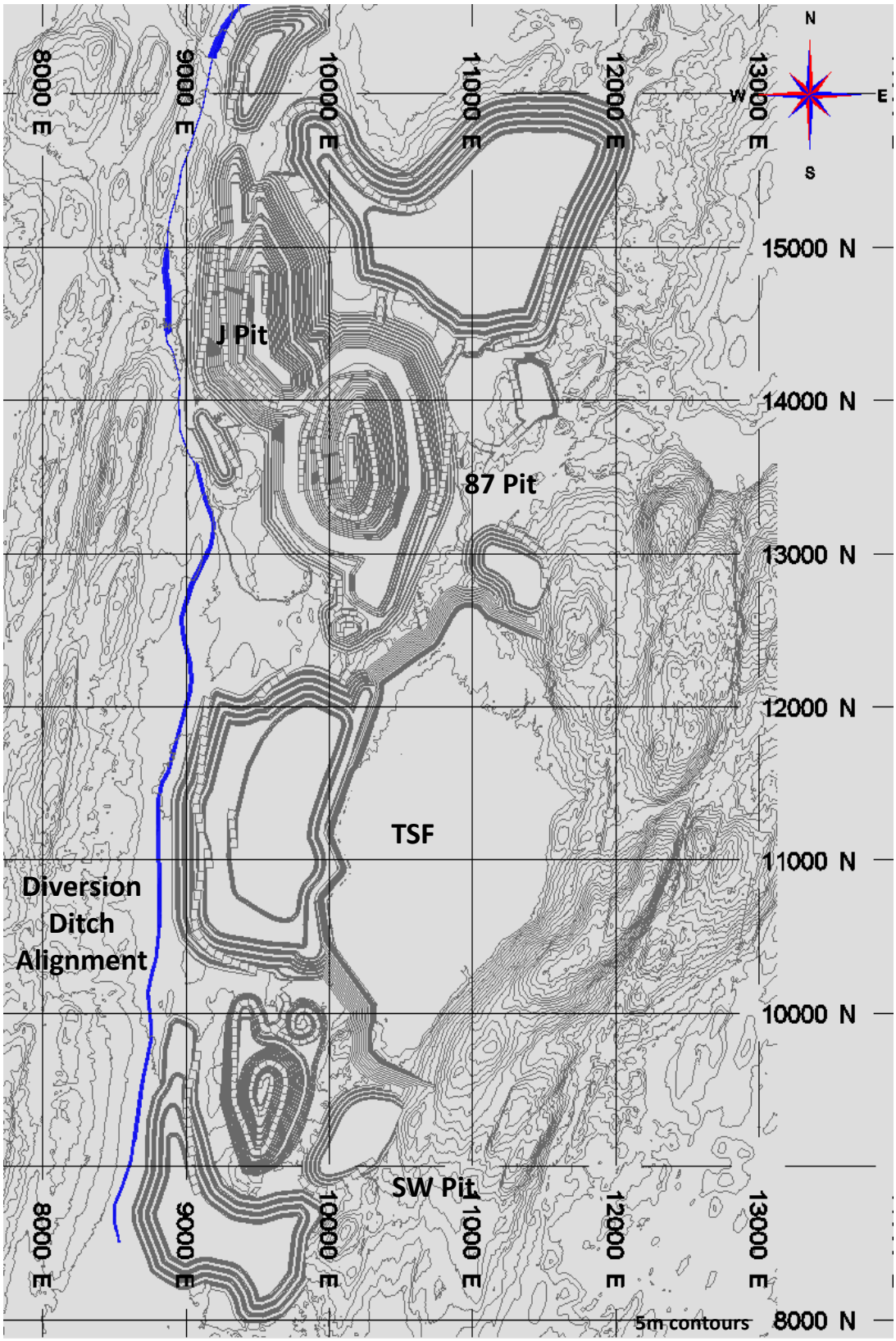
87 Pit
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 14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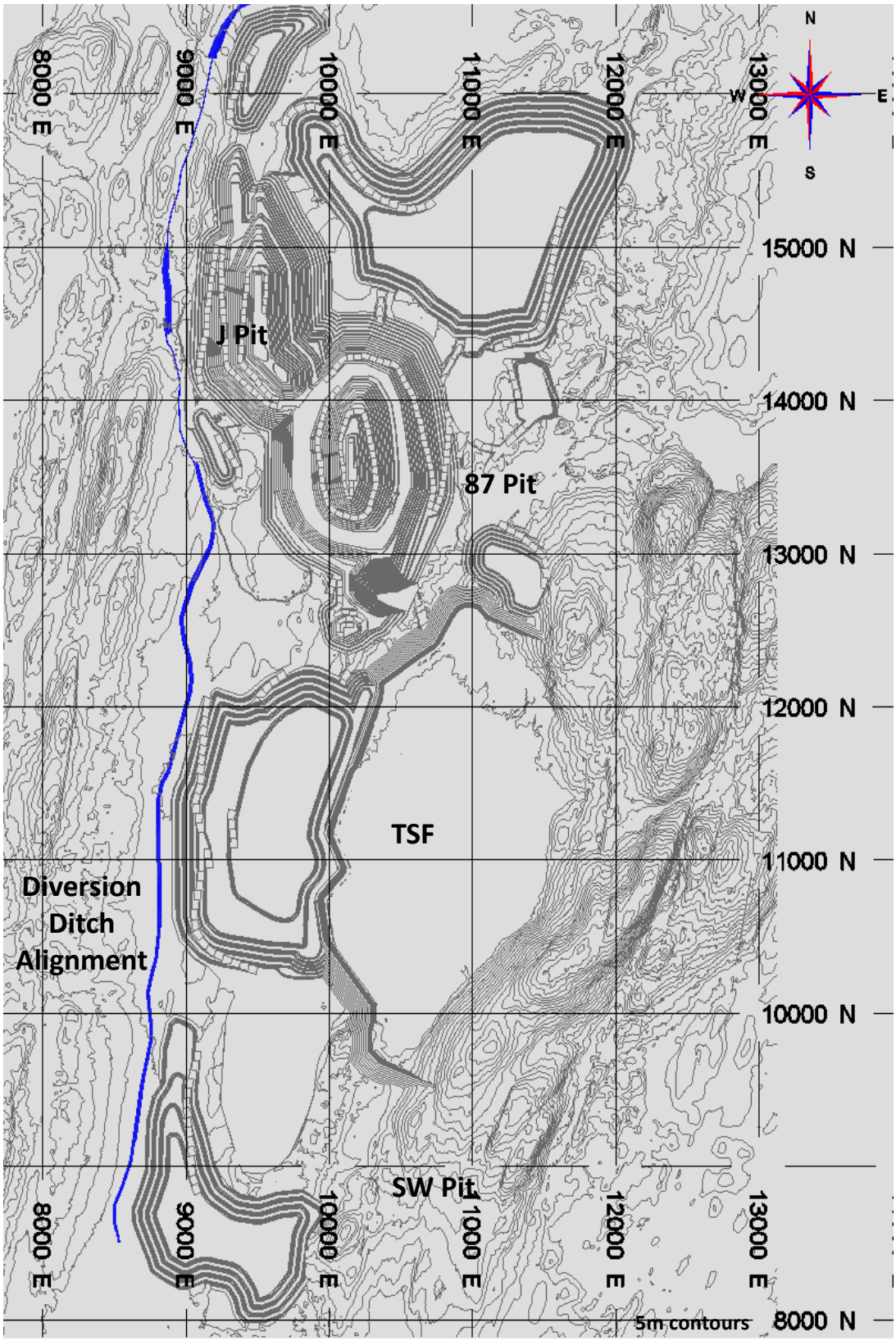
87 Pit
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 15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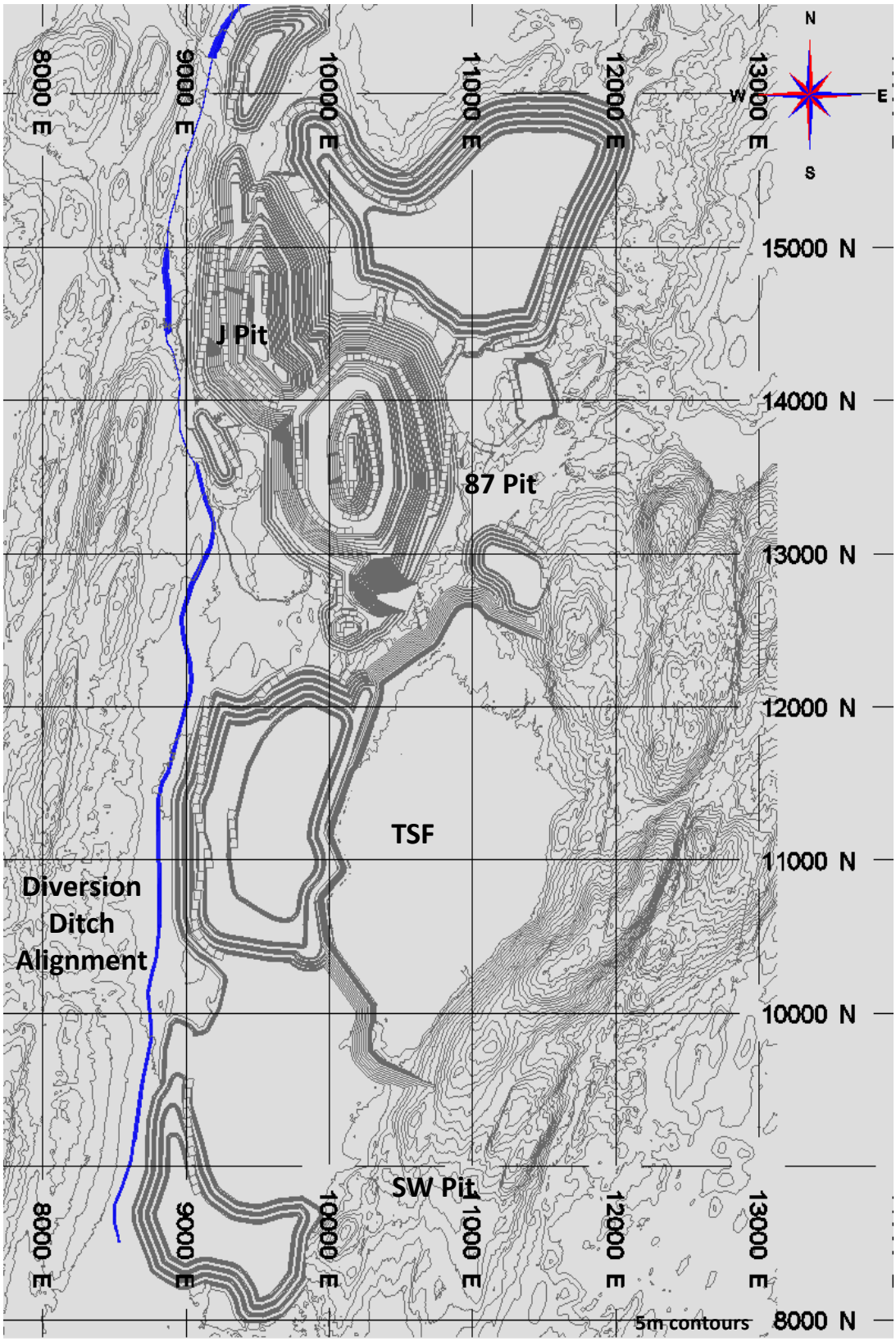
TSF
Diversion
Ditch
Alignment
SW Pit
5m contours

Year 16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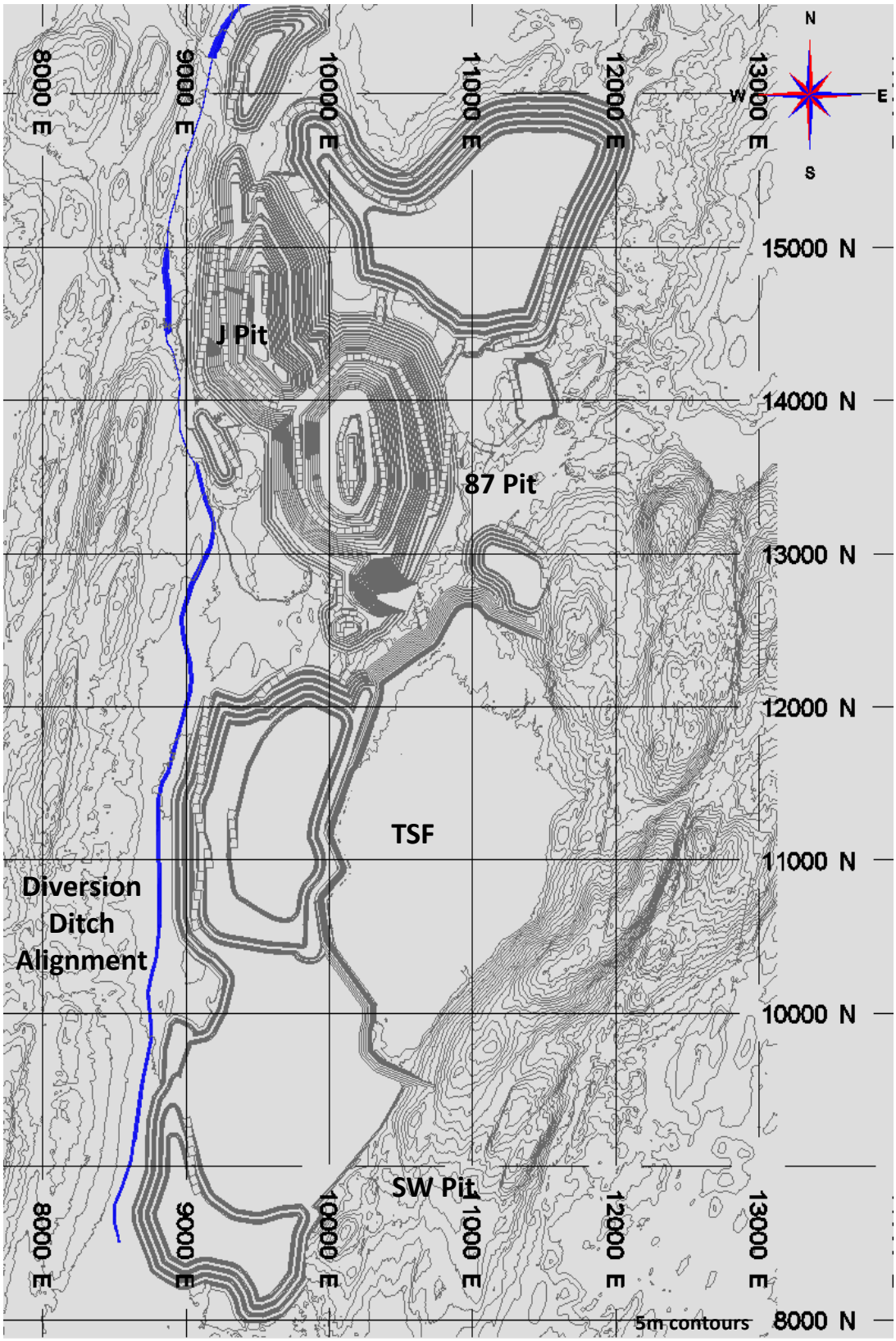
TSF
Diversion
Ditch
Alignment
SW Pit
5m contours

Year 17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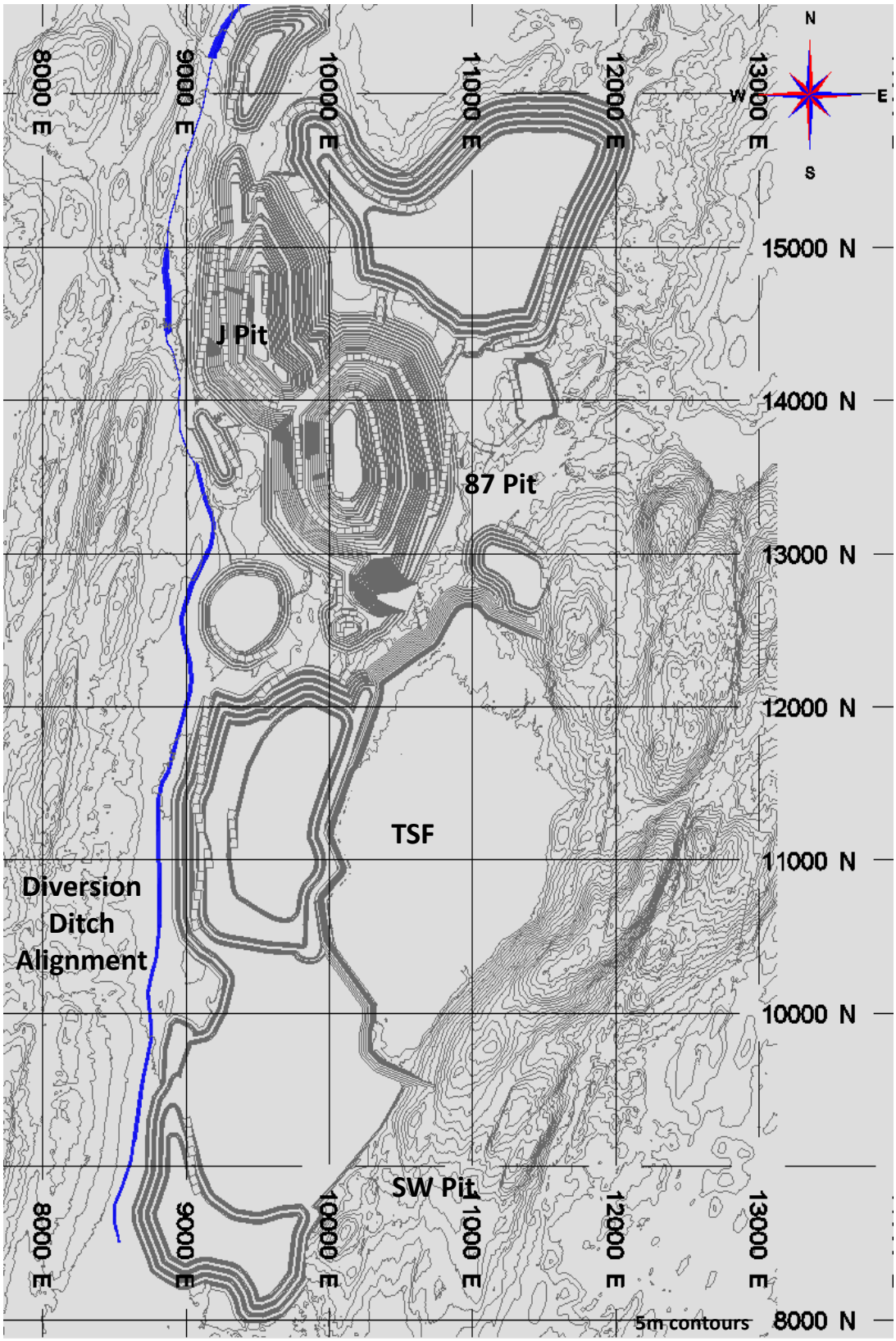
J Pit
87 Pit
TSF
Diversion
Ditch
Alignment
SW Pit
5m contours

Year 18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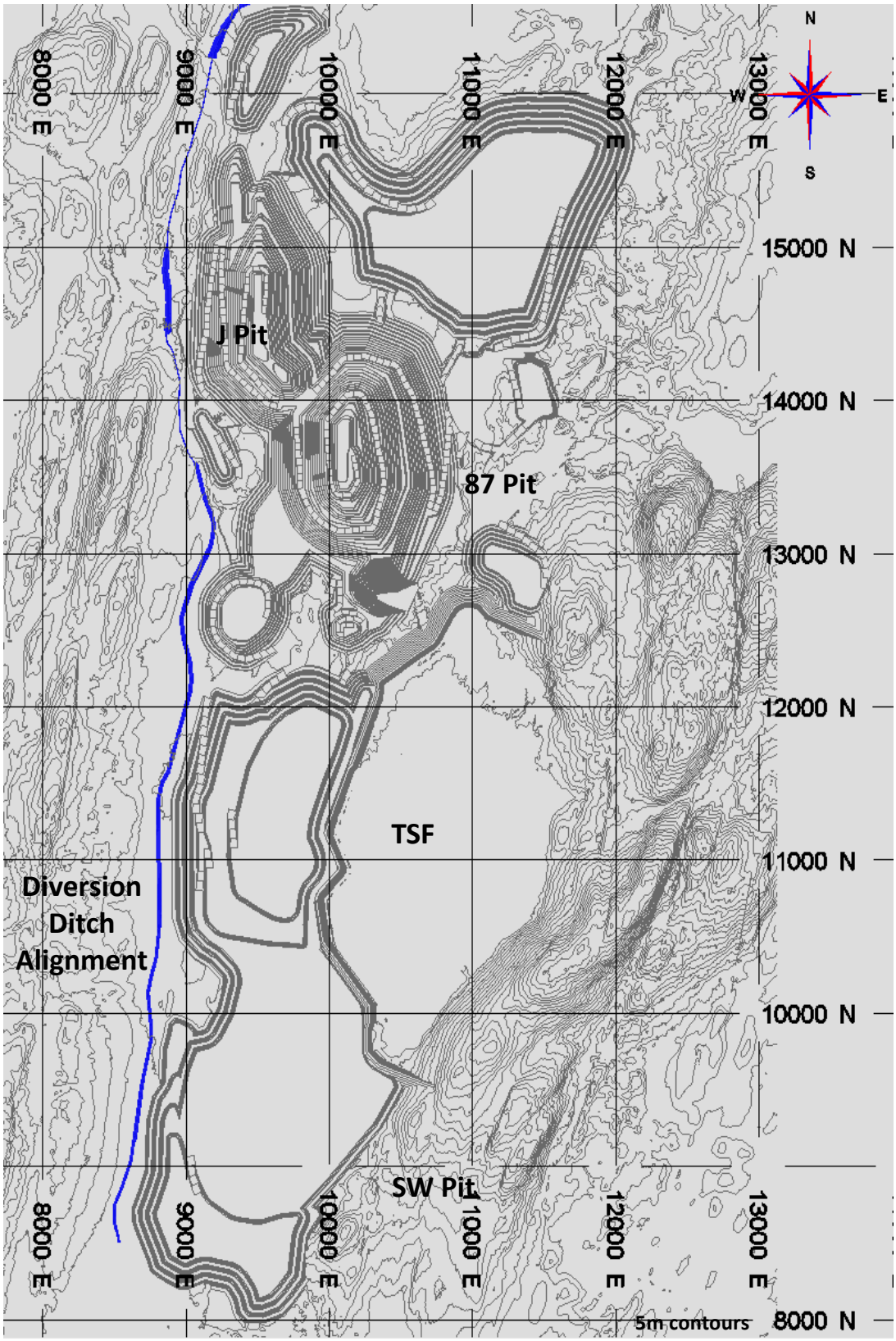
J Pit
87 Pit
TSF
Diversion
Ditch
Alignment
SW Pit
5m contours

Year 19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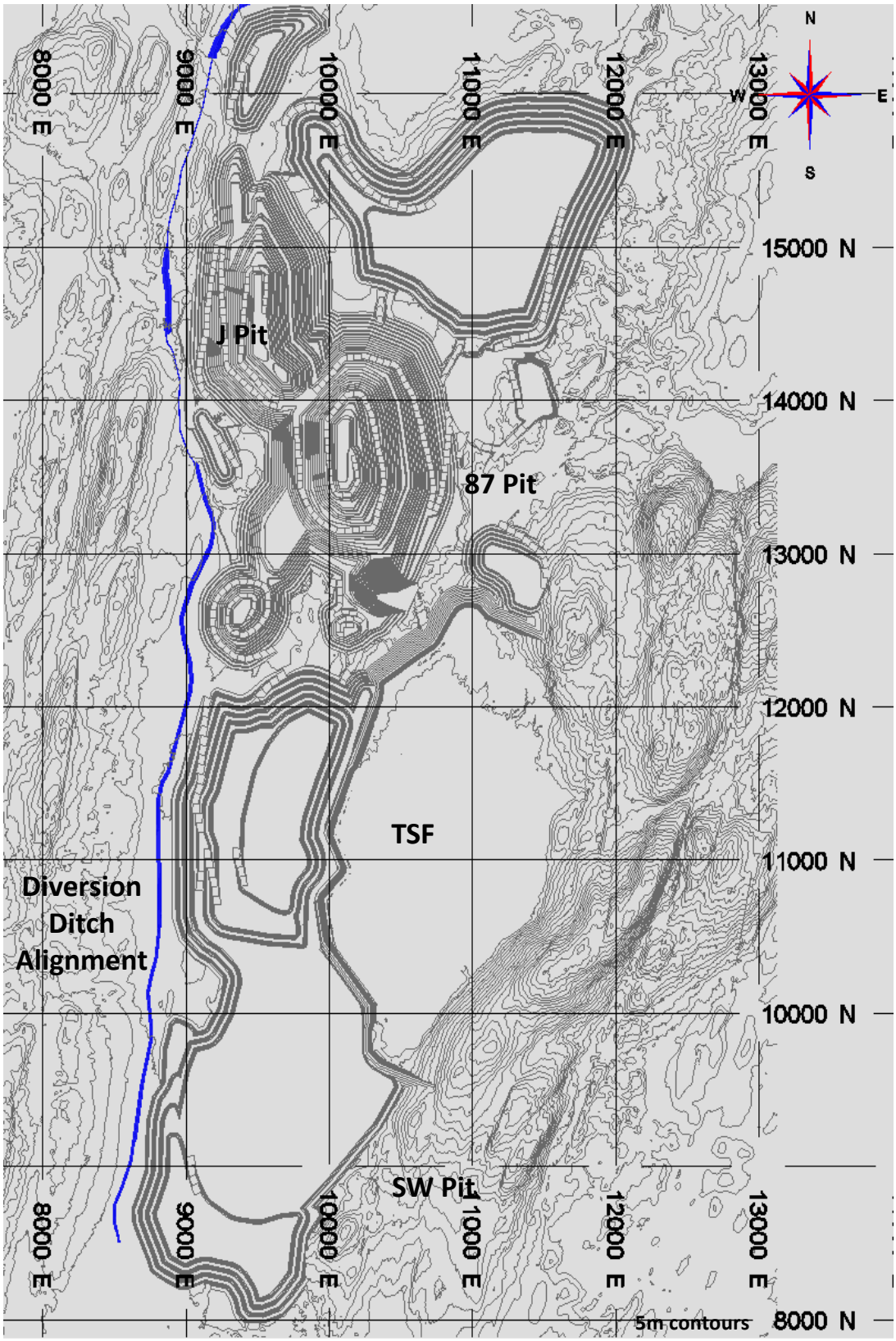
J Pit
87 Pit
TSF
Diversion
Ditch
Alignment
SW Pit
5m contours

Year 20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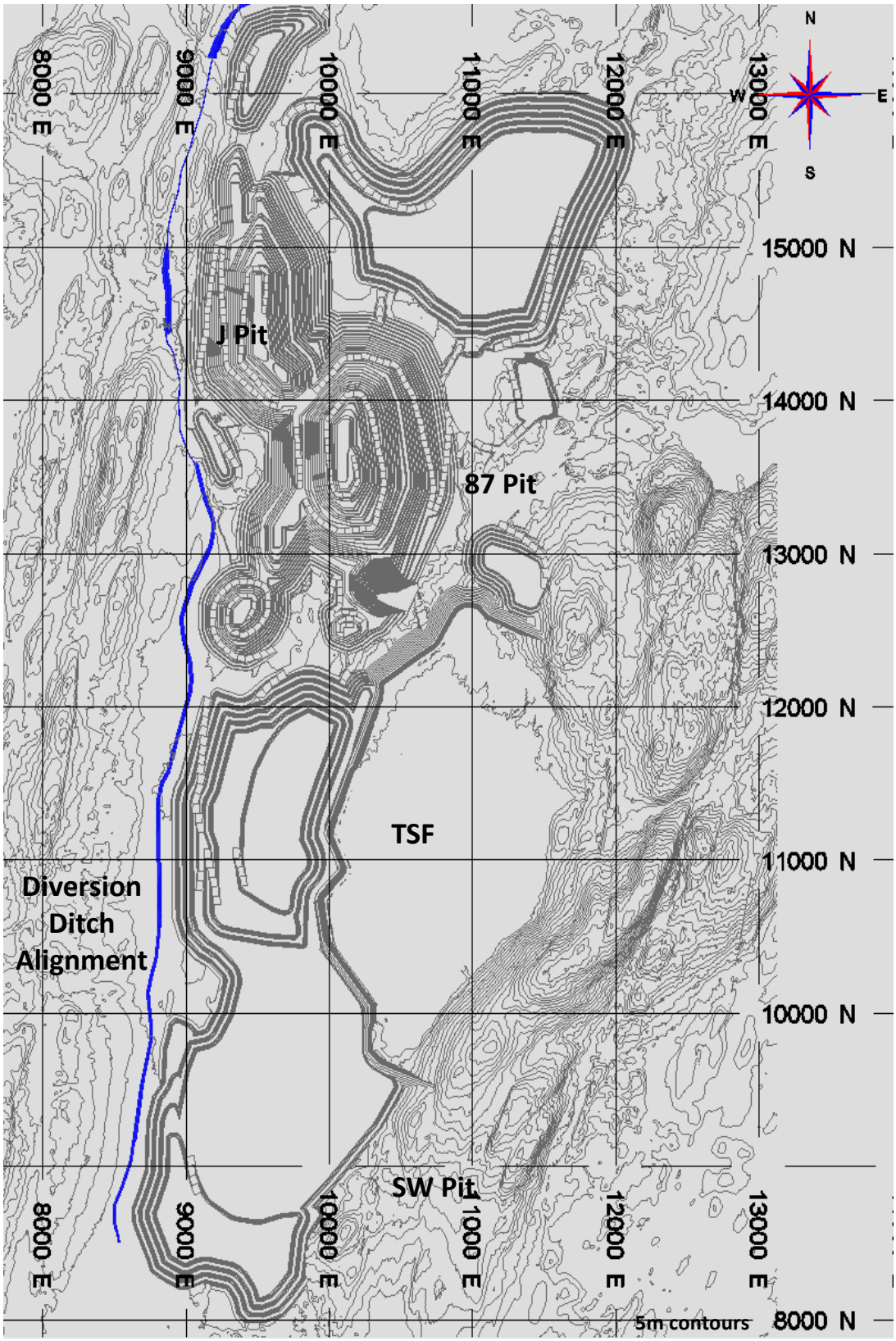
87 Pit
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

Year 21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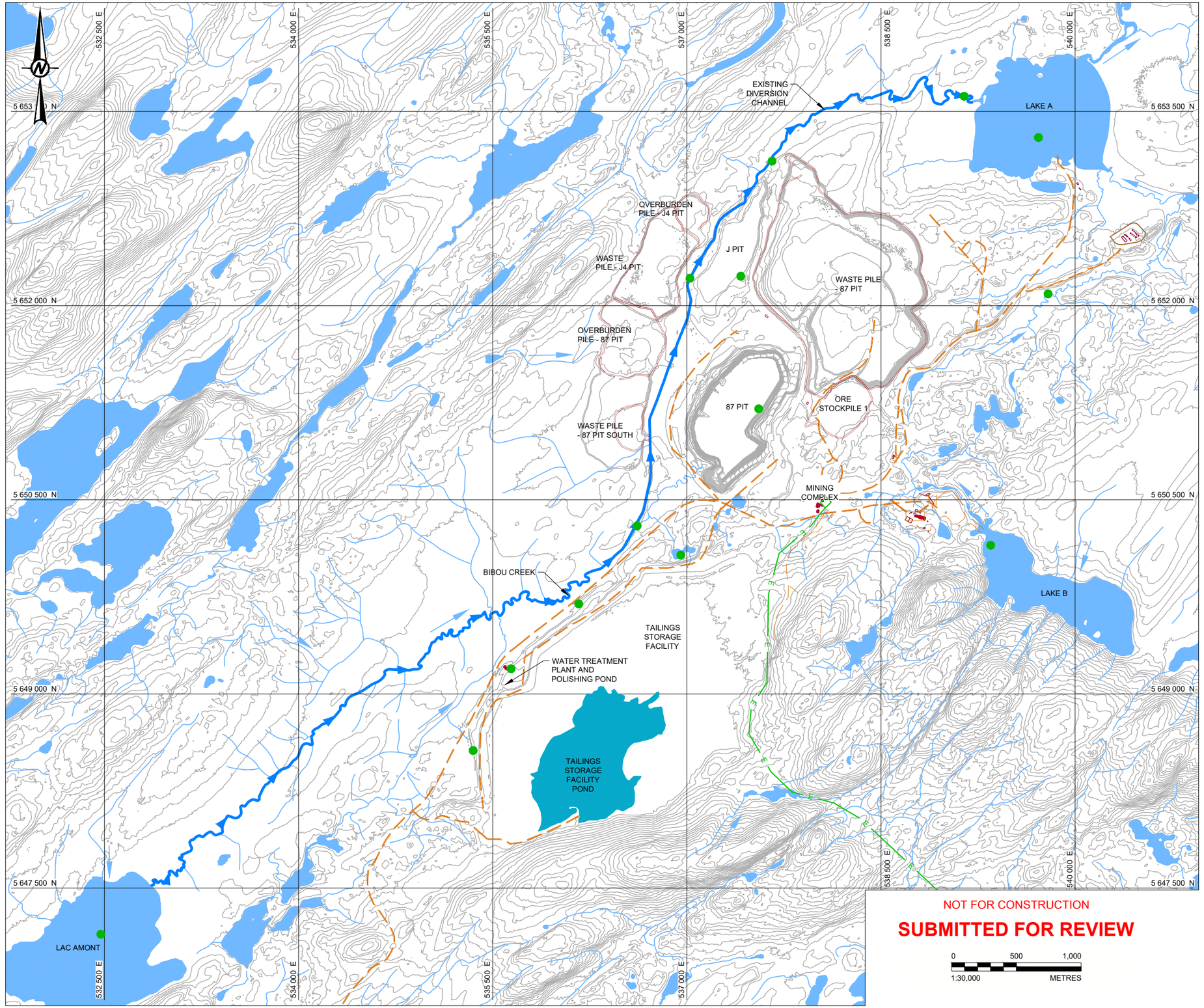
J Pit
87 Pit
TSF
SW Pit
Diversion
Ditch
Alignment
5m contours

APPENDIX B

Water Management Plan Figures



LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- BIBOU CREEK AND EXISTING DIVERSION CHANNEL
- EXISTING OVERBURDEN, WASTE AND ORE PILES
- NATURAL STREAMS
- E — ELECTRICITY TRANSMISSION LINE (2023)
- PROCESS PLANT
- FLOW DIRECTION
- EXISTING ROADS (2023)
- NATURAL LAKES
- TSF POND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2022.
3. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. COORDINATES SYSTEM : UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

CLIENT
TROILUS

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
SURFACE WATER MANAGEMENT PLAN SCHEMATIC EXISTING 2024 CONDITIONS

CONSULTANT
WSP

YYYY-MM-DD	2024-04-26
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO. 2257554004 | CONTROL | REV. A | FIGURE 01

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

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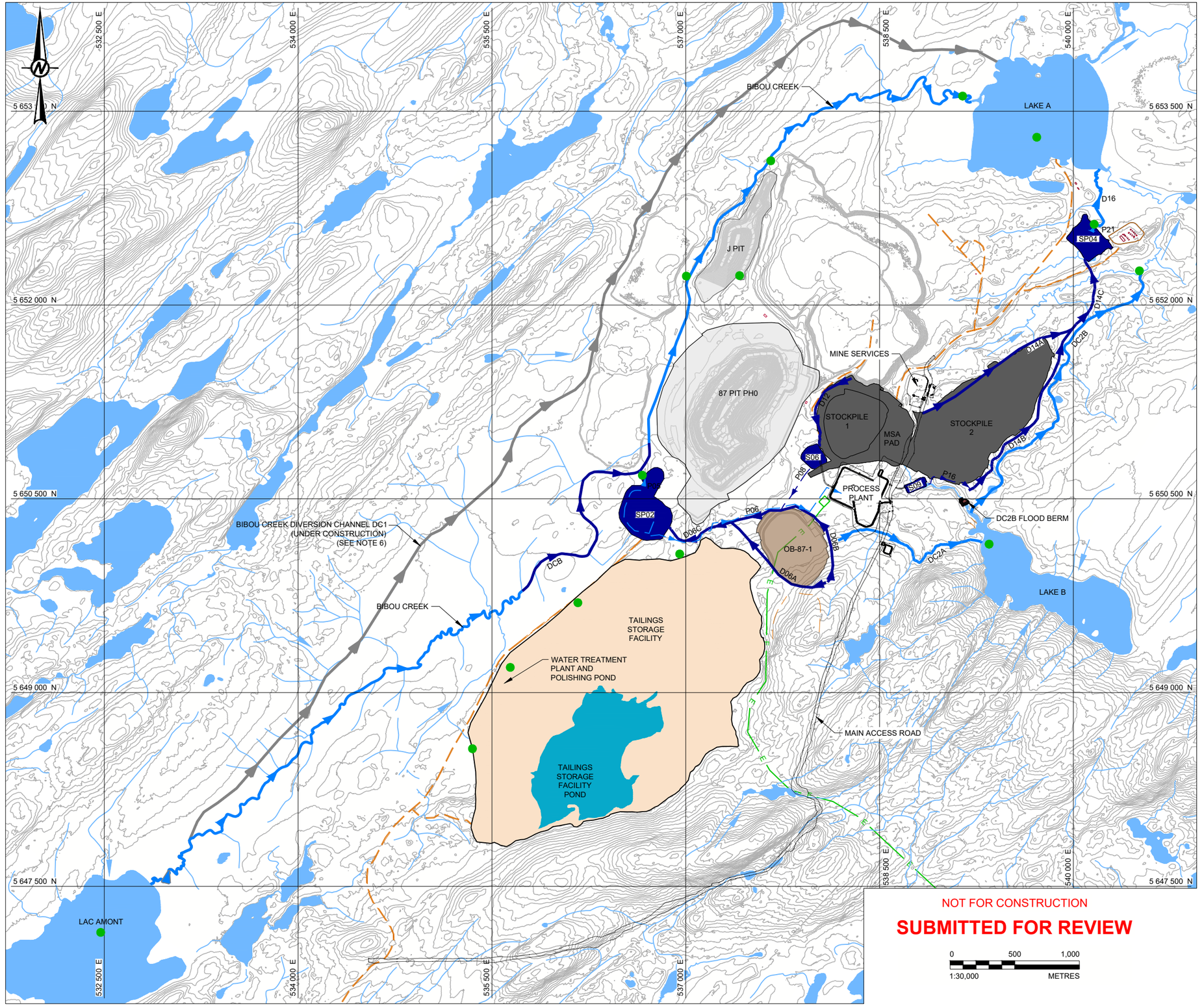

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- BIBOU CREEK AND EXISTING DIVERSION CHANNEL
- NATURAL STREAMS
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- P## — CLEAN WATER PIPELINE (PUMPING)
- P## — CONTACT WATER PIPELINE (PUMPING)
- FLOW DIRECTION
- NATURAL LAKES
- SP## — SEDIMENTATION POND (CONTACT WATER)
- S## — SUMPS / PUMP STATION (CONTACT WATER)
- TSF POND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- PROCESS PLANT
- E — ELECTRICITY TRANSMISSION LINE (2023) (SEE NOTE 5)
- EXISTING ROADS (2023)
- FUTURE ROAD

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2022.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END OF YEAR (-2) SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
5. TIMING OF REPLACEMENT LINE CONSTRUCTION MAY CHANGE DEPENDING ON TIMING OF 87-OB-1 DEPOSITION.
6. DC1 CONSTRUCTION TO COMMENCE IN LATE FALL OR EARLY WINTER.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN SCHEMATIC END OF YEAR (-2)

CONSULTANT

wsp

YYYY-MM-DD	2024-04-26
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO. 2257554004 | CONTROL | REV. A | FIGURE 02

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

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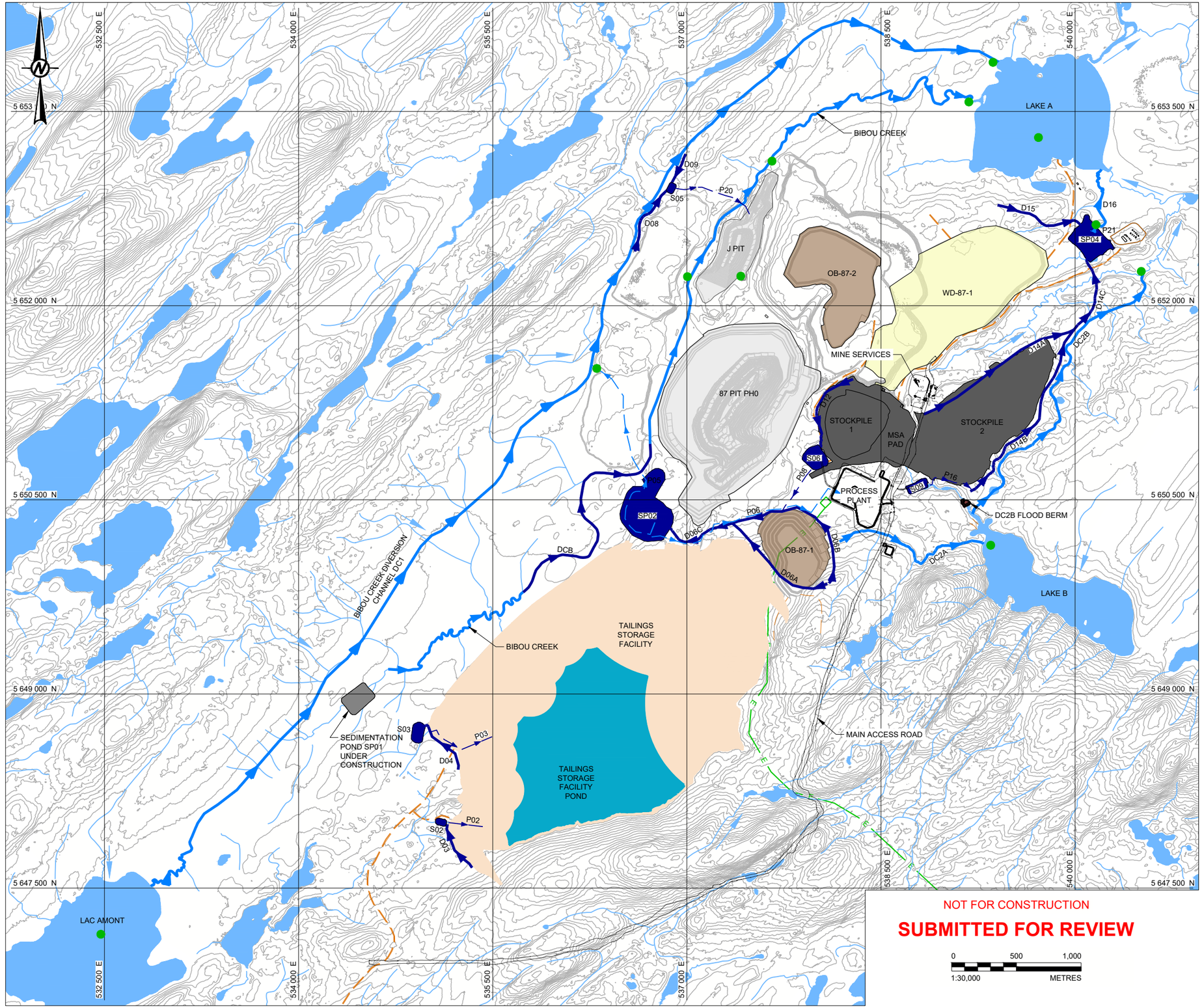

LEGEND

- TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- BIBOU CREEK AND EXISTING DIVERSION CHANNEL
- NATURAL STREAMS
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- P## — CLEAN WATER PIPELINE (PUMPING)
- P## — CONTACT WATER PIPELINE (PUMPING)
- FLOW DIRECTION
- NATURAL LAKES
- SP## — SEDIMENTATION POND (CONTACT WATER)
- S## — SUMPS / PUMP STATION (CONTACT WATER)
- TSF POND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- WASTE DUMP
- PROCESS PLANT
- E — ELECTRICITY TRANSMISSION LINE (SEE NOTE 5)
- EXISTING ROADS (2023)
- FUTURE ROAD

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2022.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END OF YEAR (-1) SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
5. TIMING OF REPLACEMENT LINE CONSTRUCTION MAY CHANGE DEPENDING ON TIMING OF 87-OB-1 DEPOSITION.

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN SCHEMATIC END OF YEAR (-1)

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000

1:30,000 METRES

CONSULTANT

WSP

YYYY-MM-DD	2024-04-26
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO. 2257554004 | CONTROL | REV. A | FIGURE 03

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

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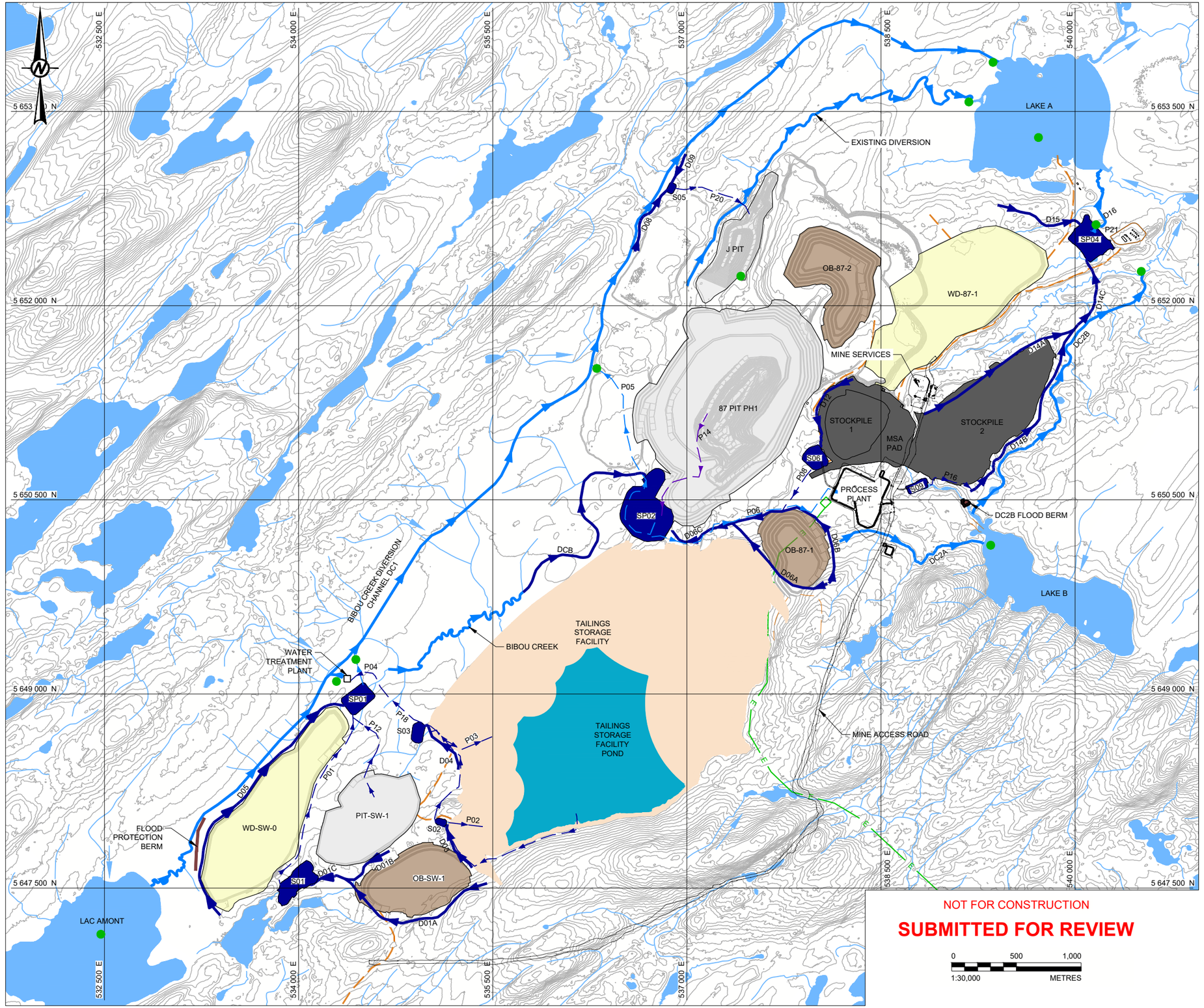

LEGEND

- TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- NATURAL STREAMS
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- P## — CLEAN WATER PIPELINE (PUMPING)
- P## — CONTACT WATER PIPELINE (PUMPING)
- P## — PIT DEWATERING
- FLOW DIRECTION
- NATURAL LAKES
- SP## — SEDIMENTATION POND (CONTACT WATER)
- S## — SUMPS / PUMP STATION (CONTACT WATER)
- TSF POND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- WASTE DUMP
- PROCESS PLANT
- E — ELECTRICITY TRANSMISSION LINE (SEE NOTE 5)
- EXISTING ROADS (2023)
- FUTURE ROAD

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2022.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END OF YEAR (1) SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
5. TIMING OF REPLACEMENT LINE CONSTRUCTION MAY CHANGE DEPENDING ON TIMING OF 87-OB-1 DEPOSITION.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN SCHEMATIC END OF YEAR 1

CONSULTANT

wsp

YYYY-MM-DD	2024-04-26
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO. 2257554004 | CONTROL | REV. A | FIGURE 04

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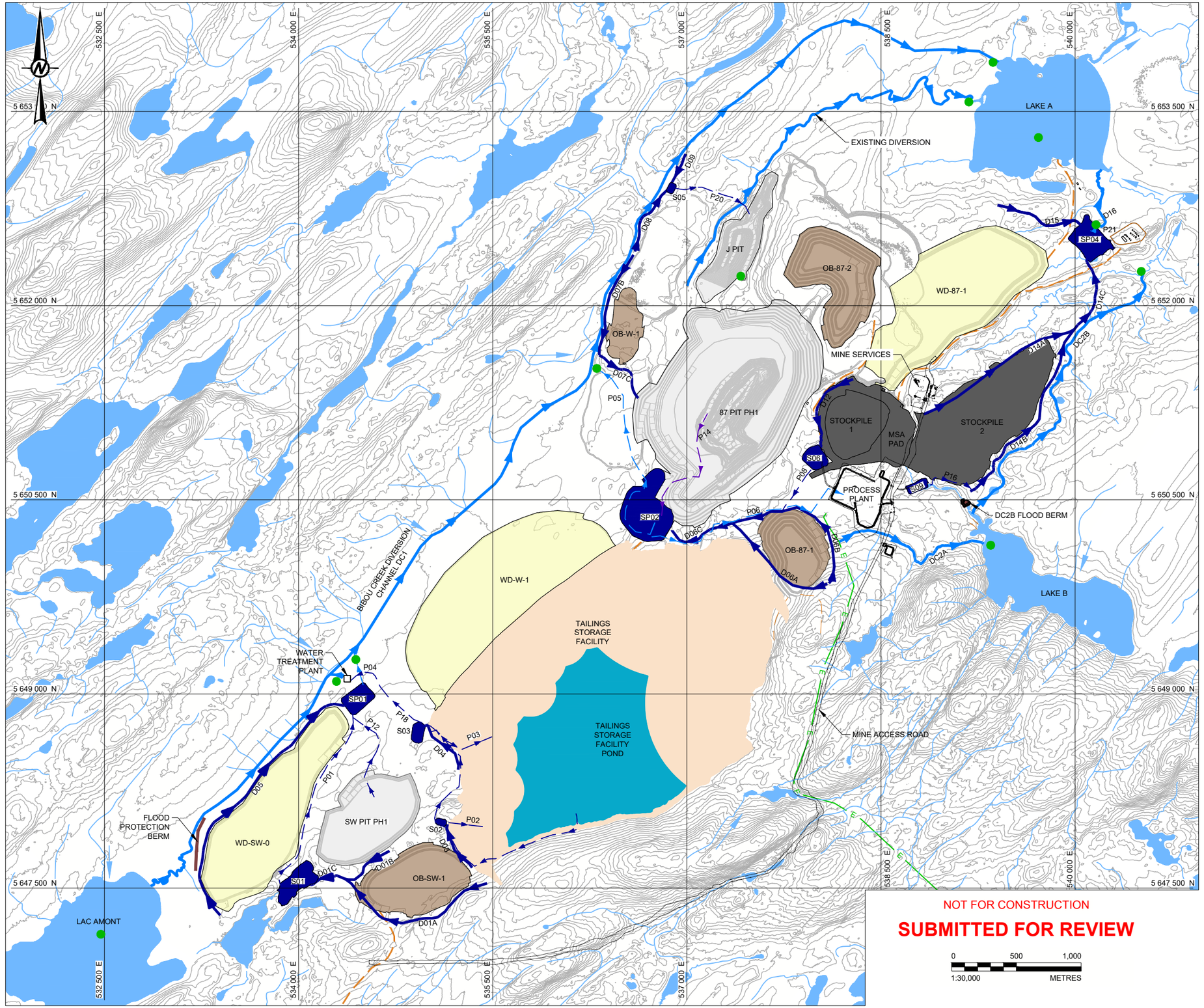

LEGEND

- TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- NATURAL STREAMS
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- P## — CLEAN WATER PIPELINE (PUMPING)
- P## — CONTACT WATER PIPELINE (PUMPING)
- P## — PIT DEWATERING
- FLOW DIRECTION
- NATURAL LAKES
- SP## — SEDIMENTATION POND (CONTACT WATER)
- S## — SUMPS / PUMP STATION (CONTACT WATER)
- TSF POND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- WASTE DUMP
- PROCESS PLANT
- E — RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, FEBRUARY10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END OF YEAR (2) SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN SCHEMATIC END OF YEAR 2

CONSULTANT

WSP

YYYY-MM-DD	2024-04-26
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO.	CONTROL	REV.	FIGURE
2257554004		A	05

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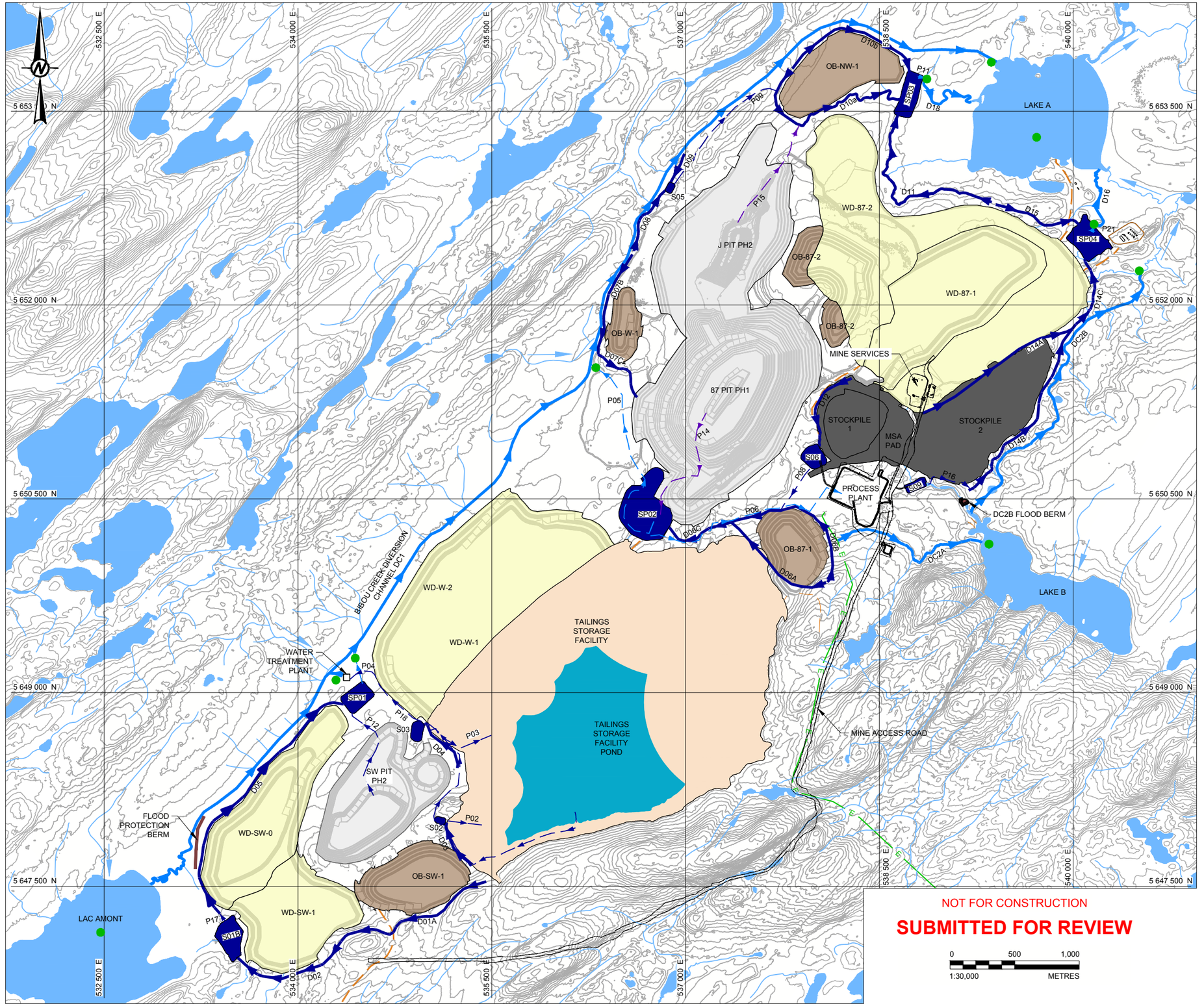

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- NATURAL STREAMS
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- P## — CLEAN WATER PIPELINE (PUMPING)
- P## — CONTACT WATER PIPELINE (PUMPING)
- P## — PIT DEWATERING
- FLOW DIRECTION
- NATURAL LAKES
- SP## — SEDIMENTATION POND (CONTACT WATER)
- S## — SUMPS / PUMP STATION (CONTACT WATER)
- TSF POND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- WASTE DUMP
- PROCESS PLANT
- E — RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END OF YEAR (6) SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN SCHEMATIC END OF YEAR 6

CONSULTANT

WSP

YYYY-MM-DD	2024-04-26
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO.	CONTROL	REV.	FIGURE
2257554004		A	06

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

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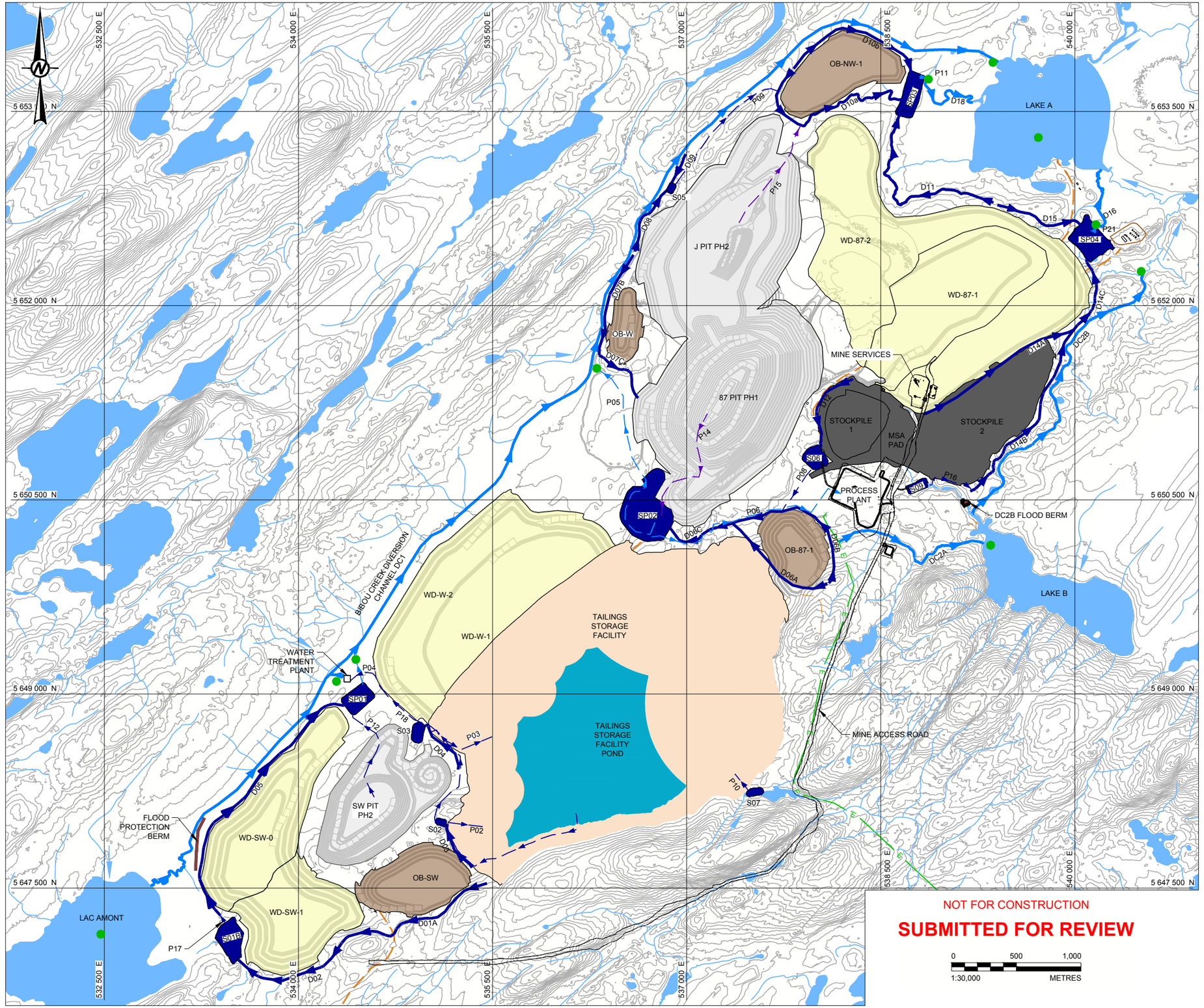

LEGEND

- TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- NATURAL STREAMS
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## CONTACT WATER DITCH
- D## DRAINAGE THROUGH WASTE ROCK
- P## CLEAN WATER PIPELINE (PUMPING)
- P## CONTACT WATER PIPELINE (PUMPING)
- P## PIT DEWATERING
- FLOW DIRECTION
- NATURAL LAKES
- SP## SEDIMENTATION POND (CONTACT WATER)
- S## SUMPS / PUMP STATION (CONTACT WATER)
- TSF POND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- WASTE DUMP
- PROCESS PLANT
- E RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END OF YEAR (8) SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN SCHEMATIC END OF YEAR 8

CONSULTANT

wsp

YYYY-MM-DD	2024-04-26
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO.	CONTROL	REV.	FIGURE
2257554004		A	07

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

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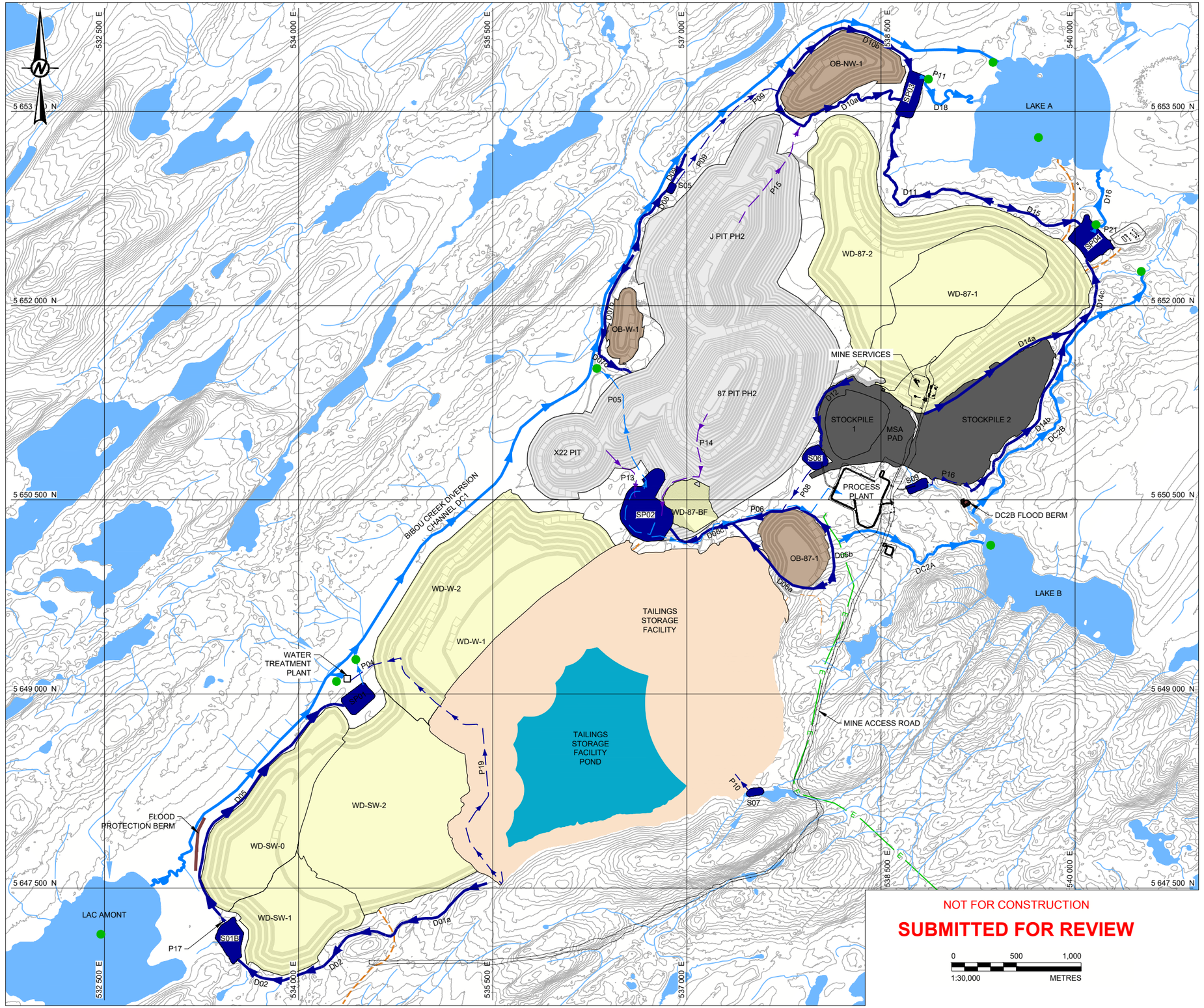

WATER MANAGEMENT

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- P## — CLEAN WATER PIPELINE (PUMPING)
- P## — CONTACT WATER PIPELINE (PUMPING)
- P## — PIT DEWATERING
- FLOW DIRECTION
- NATURAL WATERCOURSES
- NATURAL LAKES
- TSF POND
- SP## — SEDIMENTATION POND (CONTACT WATER)
- S## — SUMPS / PUMP STATION (CONTACT WATER)
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- WASTE DUMP
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- PROCESS PLANT
- E — RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END-OF-MINE-LIFE SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN SCHEMATIC END OF MINE LIFE

CONSULTANT

WSP

YYYY-MM-DD	2024-04-26
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO.	CONTROL	REV.	FIGURE
2257554004		A	08

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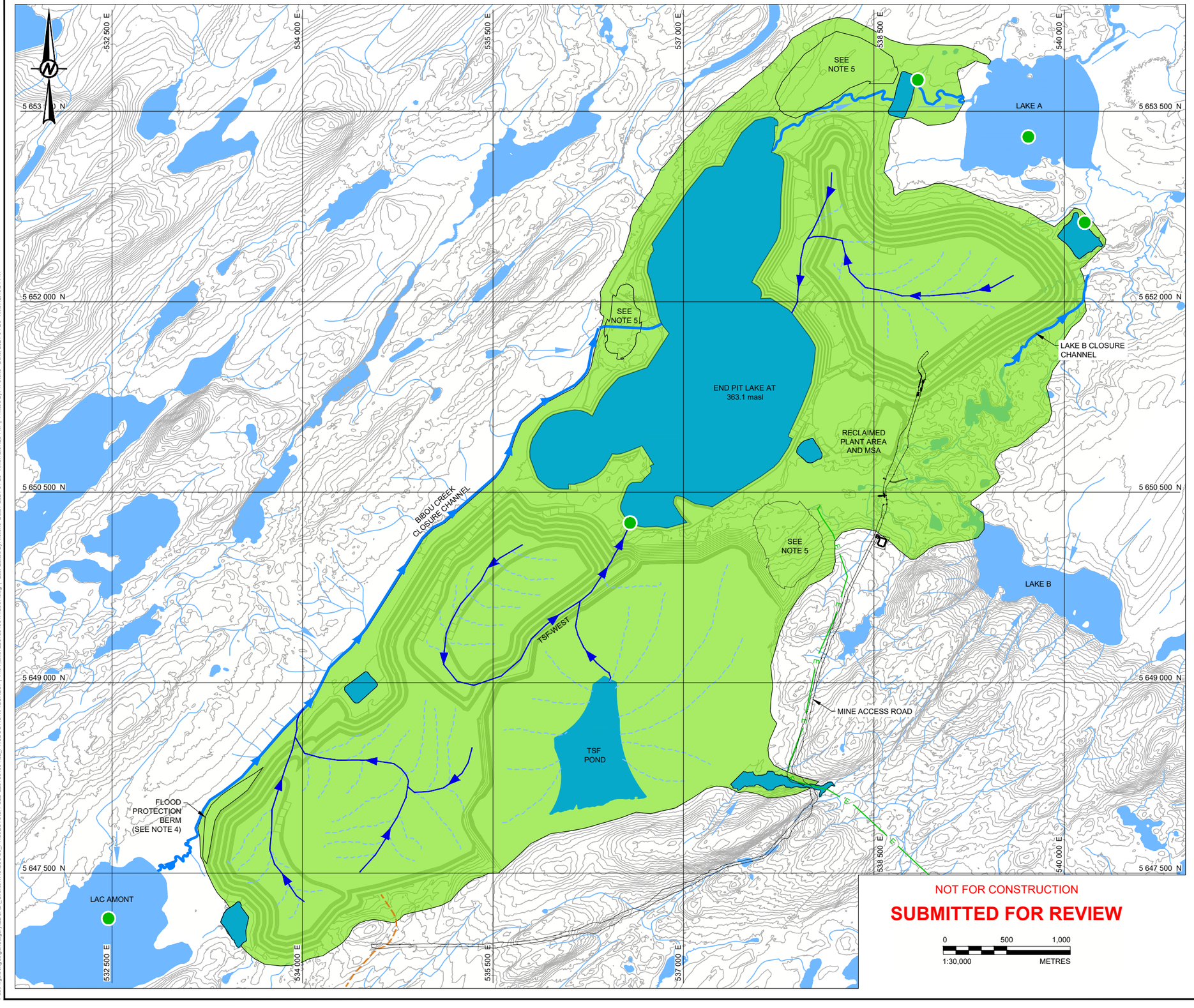

WATER MANAGEMENT

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- DIVERSION CHANNEL (NON-CONTACT WATER)
- FLOW DIRECTION
- NATURAL WATERCOURSES
- NATURAL LAKES
- CLOSURE WATER BODY / CLOSURE WETLAND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- DRAINAGE PATH

MINE INFRASTRUCTURE

- RECLAIMED AREA
- MINE PIT
- E — RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END-OF-MINE-LIFE SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
4. FLOOD PROTECTION BERM MERGED WITH WASTE DUMP AND RECLAIMED.
5. OVERBURDEN DUMPS REMOVED AT CLOSURE AND USED AS SOURCE OF RECLAMATION MATERIAL.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN SCHEMATIC CLOSURE CLOSURE

CONSULTANT

wsp

YYYY-MM-DD	2024-04-26
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO.	CONTROL	REV.	FIGURE
2257554004		A	09

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

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APPENDIX C

Climate and Hydrology

1.0 CLIMATE BASELINE ANALYSIS

1.1 Objectives

WSP prepared a climate baseline analysis in support of the Troilus Project water management plant (WMP) feasibility study. The objectives of the analysis included:

- Supporting the design of water management structures.
- Supporting the site-wide water balance analysis.

The climate baseline analysis is presented in the following sections. Both normal and extreme climate statistics were estimated and are presented for both historical climate conditions and climate change projections.

1.2 Historical Climate Analysis

1.2.1 Data Sources

Table 1 below lists the Environmental and Climate Change Canada (ECCC) climate stations in the vicinity of the Site with available historic climate records. The available length of record and the justification for their selection are included. WSP chose to compile two sets of records:

- One for the Chibougamau-Chapais A stations, extending between October 1982 to August 2023. There are valid air temperature and precipitation records for 88% of the days in this time interval. The data gaps are primarily grouped between 1992 and 1994 and between 2013 and 2017, such that close to 31 years of complete air temperature and precipitation timeseries were constructed after infilling the remaining small data gaps. These timeseries were the main source of information for air temperature and precipitation statistics.
- One for Chapais 2, extending between May 1962 and April 2004. There are valid air temperature and precipitation records for 91% of the days in this time interval. The data gaps are primarily grouped in 1962 and between 1999 and 2004, such that close to 37 years of complete air temperature and precipitation timeseries were constructed after infilling the remaining small data gaps. These timeseries were used as a secondary source of information for air temperature and precipitation statistics and used as a comparison for the Chibougamau-Chapais A statistics. In certain cases, which are documented in this report, WSP decided to use statistics determined using the Chapais 2 values.

Table 1: ECCC Climate Stations in the Vicinity of the Troilus Site

Station Name	Station ID	Distance from the Project Site (km)	Ground elevation (masl)	Orientation relative to the site	Period with Historical Data [(a)]	Selected in Support of the Project Climate Baseline
Mistassini Post	7095000	77.3	397.8	Southeast	1885 to 1980	No: data records stopped in 1980, numerous data gaps
Lac Albanel	709CENL	101.3	396.2	East	1973	No: short period of record
Rivière Temiscamie	7096669	101.4	411.5	East	1973 to 1977	No: short period of record
Chibougamau	7091400	120.7	379.8	South	1936 to 1975	No: data records stopped in 1975. 1951 to 1960 data gap
Cache Lake	7090960	129.8	381.9	South	1951 to 1960	No: short period of record
Lac Cache	7093585	131.6	350.5	South	1963 to 1973	No: short period of record

Table 1: ECCC Climate Stations in the Vicinity of the Troilus Site

Station Name	Station ID	Distance from the Project Site (km)	Ground elevation (masl)	Orientation relative to the site	Period with Historical Data [(a)]	Selected in Support of the Project Climate Baseline
Chibougamau A	7091401	131.7	401.7	South	1971 to 1982	No: short period of record
Chapais	7091299	135.6	381.1	South	2001 to 2023	No: no snowfall records
Chibougamau-Chapais	7091410	136.0	381.0	South	2017 to 2023	**Yes: records used to create a Chibougamau-Chapais A merged record database**
Chibougamau-Chapais A	7091409	136.6	387.1	South	2018 to 2023	No: 7091410 station was preferred because it includes snow cover depth measurements
Chibougamau-Chapais A	7091405	136.6	387.1	South	2014 to 2016	No: only day-time hourly data, no precipitation data
Chibougamau-Chapais A	7091399	137.2	387.1	South	1994 to 2005	**Yes: records used to create a Chibougamau-Chapais A merged record database**
Chibougamau-Chapais A	7091404	137.2	387.1	South	1982 to 2014	**Yes: records used to create a Chibougamau-Chapais A merged record database**
Nemiscau A	7095412	137.8	244.5	West	1994 to 2015	No: only day-time hourly data, no precipitation data
Chapais 2	7091305	137.8	396.2	South	1962 to 2004	**Yes: relatively recent, long period of record with few gaps (quasi complete records between 1963 and 1999)**
Chapais	7091295	138.0	402.0	South	1962 to 1971	No: short period of record
Opemiska	7095740	138.0	314.6	South	1955 to 1956	No: short period of record

Note:
(a) Most stations include data gaps in the indicated interval; see ECCC (2023a).

The considerations above are valid mainly for continuous air temperature and precipitation records. Historical snow cover depth statistics were extracted from the (ECCC 2023a) records available at the same Chibougamau-Chapais A and Chapais 2 stations. Additional applied sources of information include:

- ECCC (2023b) for intensity-duration-frequency datasets for both rain and rain on snow events.
- The Canadian Snow Water Equivalent Database (ECCC 2009) for discrete snow cover density measurements at Chapais and Chibougamau-Chapais A. 547 discrete values are available.
- ECCC (2010) for pan and lake evaporation records. Historical records from two stations (Amos – 377 km to the southwest of the Troilus Site, and Nitchequon, 346 km to the northeast of the Troilus Site) were used in the analysis.

- The Canadian Ice Database (Lenormad, Duguay and Gauthier, 2002) for lake ice records (maximum annual ice thickness, dates of ice formation and thaw) at a number of stations around the Troilus Site. Historical records from Nitchequon Lake (346 km to the northeast of the Troilus Site) and Doré Lake, Gilman Lake, and Cache Lake (136 to 138 km south of the Troilus Site) were used in the analysis.
- A study was undertaken on behalf of the Québec's *Centre d'expertise hydrique* (SNC Lavalin [SNC] 2004) for probable maximum precipitation (PMP) statistics.
- The results of an extreme wind velocity analysis per direction for the Chibougamau-Chapais A station for the period 1983 to 2012; the analysis was prepared by ECCC (2023c).

When selecting to use the data from the Chibougamau-Chapais A and Chapais 2 stations, WSP considered that the ground elevations of the ECCC stations are comparable (387 metres above sea level [masl] for Chibougamau Chapais A, 396 masl for Chapais) with the elevations at the Troilus Site (generally 370 to 500 masl within the local watershed). WSP estimated that:

- The historical observations at the ECCC climate stations around Chibougamau and Chapais provide a reasonable estimate for extracting extreme wet climate statistics as input to the design of the Project surface water management structures. Furthermore, the approach is judged to be mostly conservative as short-term strong precipitation events are expected to be somewhat less intense at the Troilus Site than at the ECCC climate stations (Ouranos 2024).
- The historical observations at the ECCC climate stations around Chibougamau and Chapais provide a reasonable basis for the Project's site-wide water balance model. Before their application, the historical observations were adjusted using multi-annual average, seasonally-based differences between the stations' location and the Site; the differences were extracted from the regional 1981-2010 climate normal maps published by Ouranos (2024). Ouranos (2024) regional climate maps suggest that, on average, the climate at the Troilus Site is colder (approximately 1.2°C in mean annual temperature), with drier winter (approximately 16% less precipitation) and spring (approximately 4% less) seasons, but wetter summer seasons (13% more precipitation) than at the locations of the ECCC climate stations in Chibougamau and Chapais (see also Table 2).

Table 2: Air Temperature and Precipitation Adjustments between Chibougamau-Chapais A to Troilus Site. Extracted from Ouranos (2024) for 1981 to 2020 Averages.

Season	Increment - Daily Air Temperature			Multiplier – Daily Total Precipitation
	Minimum (°C)	Average (°C)	Maximum (°C)	
Winter: Dec. to Fall	-2.3	-2.0	-1.9	0.84
Spring: Mar. to May	-1.7	-1.6	-1.6	0.96
Summer: Jun. to Aug.	-0.3	0.2	0.8	1.13
Fall: Sep. to Nov.	-1.4	-1.1	-1.0	1.00

1.2.2 Air Temperature

Table 3, Figure 1, and Figure 2 present the extracted air temperature statistics, which are based on 1982 to 2023 Chibougamau-Chapais A daily average records:

- At Chibougamau-Chapais A, the mean annual temperature is 0.1°C, varying between -18.6°C in January and 16.4°C in July (mean monthly daily temperatures). The historical minimum temperature is -44.5°C (January 1984), and the historical maximum temperature is 34.1°C (July 2002). Temperatures stay below zero, on average, between mid-October to mid-April.
- At the Troilus Site, after adjustment (see Table 2 for adjustment factors) of the Chibougamau-Chapais A records, the mean annual temperature is -1.0°C, varying between 16.6°C in July and -20.6°C in January (mean monthly daily temperatures).

Table 3: Air Temperature Statistics Based on Chibougamau-Chapais A Climate Records

Month	Chibougamau-Chapais A					Statistics Adjusted to the Troilus Site
	Monthly Average			Daily Average		Mean Monthly Average (°C)
	Minimum (°C)	Mean (°C)	Maximum (°C)	Historical Minimum (°C)	Historical Maximum (°C)	
Jan	-24.3	-18.6	-12.3	-44.5	8.4	-20.6
Feb	-20.8	-16.7	-8.6	-42.7	7.6	-18.7
Mar	-14.8	-10.0	-4.7	-40.8	22.0	-11.6
Apr	-5.2	-0.5	3.5	-30.5	27.4	-2.1
May	3.7	7.4	11.3	-14.8	32.4	5.8
Jun	9.5	13.7	16.1	-4.5	33.4	13.9
Jul	14.9	16.4	19.1	0.0	34.1	16.6
Aug	13.2	15.1	17.9	-0.3	30.9	15.3
Sep	7.2	10.1	13.1	-6.3	30.7	9.0
Oct	-0.3	3.4	8.1	-15.6	24.9	2.3
Nov	-9.4	-4.8	0.0	-32.3	17.8	-5.9
Dec	-22.6	-14.0	-7.6	-40.7	11.0	-16.0
Year		*0.1*		*-44.5*	*34.1*	*-1.0*

Notes: Values extracted from 1982 to 2023 records at Chibougamau-Chapais A stations.

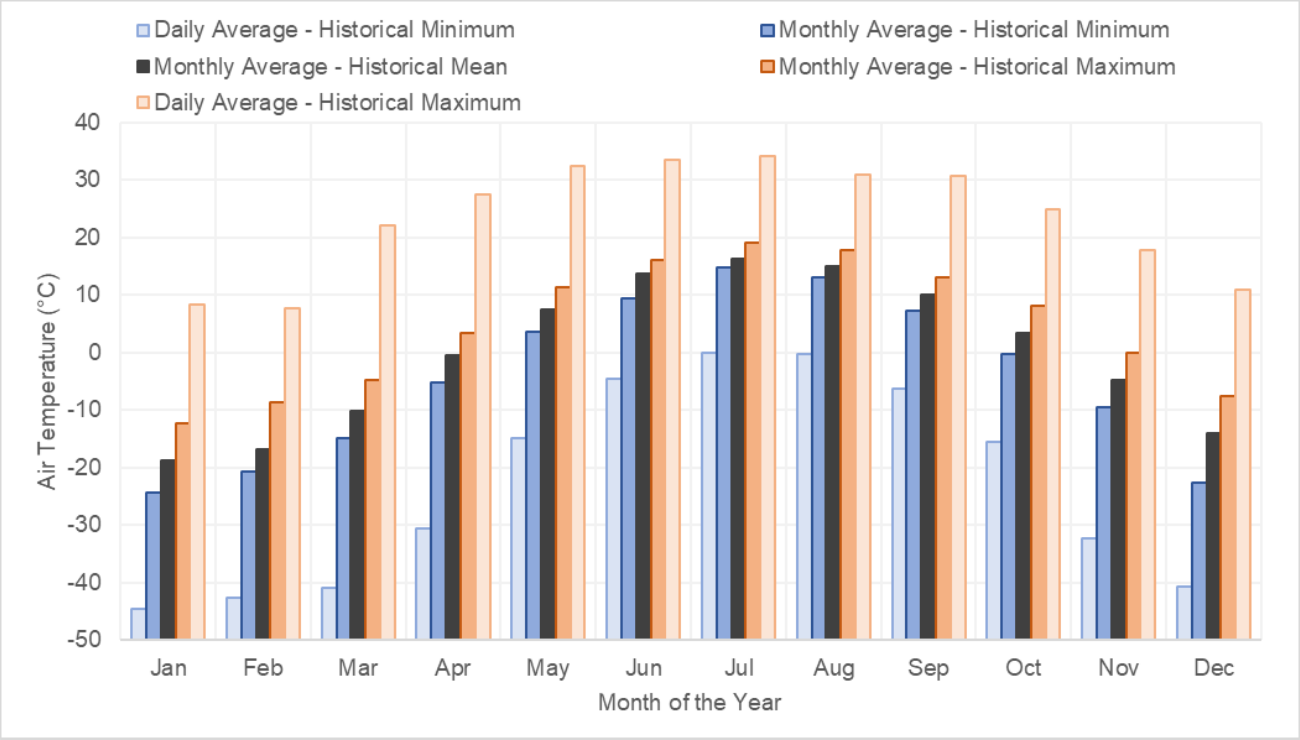


Figure 1: Air Temperature Statistics for Chibougamau-Chapais A, 1982 - 2023

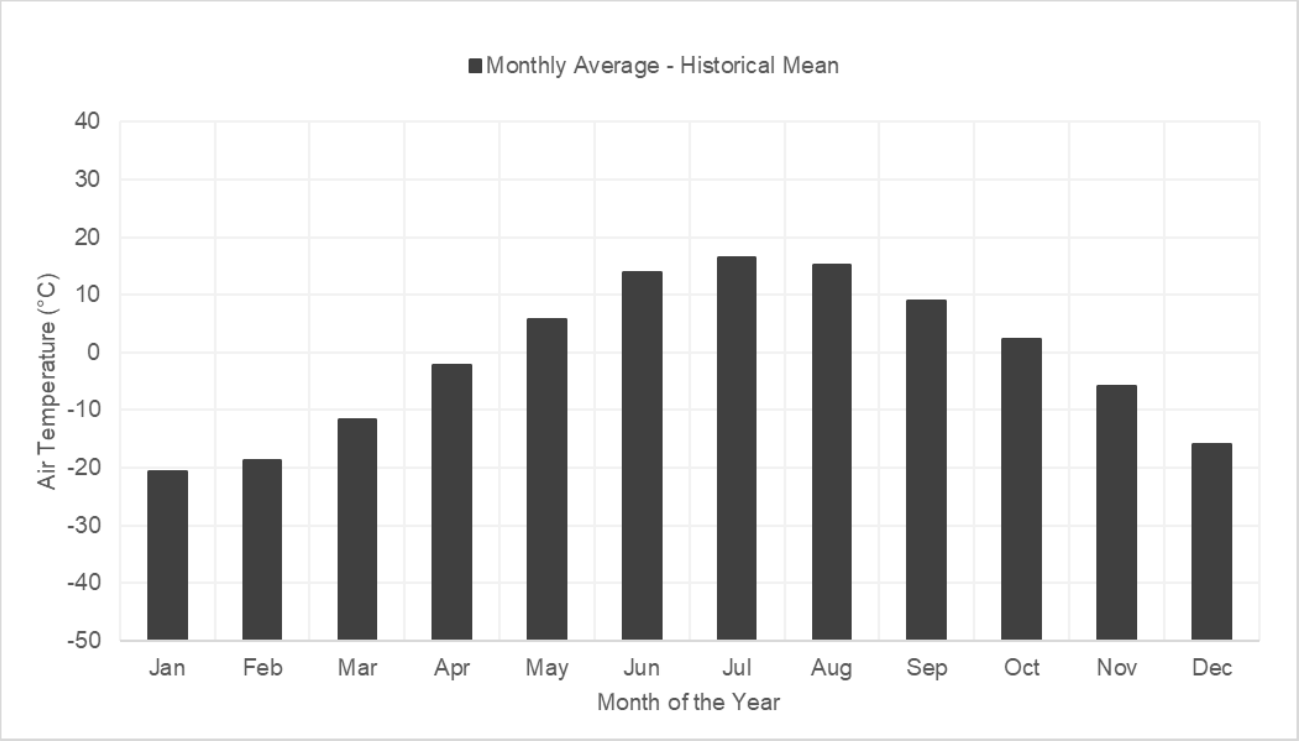


Figure 2: Air Temperature Statistics for Troilus Site after Adjustment of Values at Chibougamau-Chapais A, 1982 - 2023

1.2.3 Precipitation

Monthly and Annual Statistics

Table 4, Table 5, Figure 3, and Figure 4 present total precipitation statistics based on the analysis of Chibougamau-Chapais A, 1982 to 2023 records:

- Historically, the mean total annual precipitation at Chibougamau-Chapais A is 953 mm. On average, February is the driest month of the year (44 mm average precipitation), and September is the wettest month of the year (120 mm). The cold part of the year, from November to April, sees 38% of the total precipitation, while the rest falls (mostly as rain) between May and October. The wettest month on record is September 1990, with 258 mm. Monthly precipitation exceeded 150 mm 17 times over the period of record (out of 378 valid values); the 17 values were all between June and October, and 8 of them were in September alone.
- Mean total annual precipitation at the Troilus Site, based on adjustment of Chibougamau-Chapais A records (see Table 2 for adjustment factors) was estimated to be 960 mm. The adjustment accentuated the trend of a drier cold season (34% of the annual precipitation) versus a wetter warm season (66% of the annual precipitation).
- A frequency analysis over historical annual precipitation at Chibougamau-Chapais A estimated:
  - For wet years, annual precipitation varies between 952 mm (2 years return period), 1,254 mm (100 years return period), and 1,374 mm (1,000 years return period).
  - For dry years, annual precipitation varies between 952 mm (2 years return period), 728 mm (100 years return period), and 668 mm (1,000 years return period).
  - In the absence of local Troilus Site records, WSP judges that these statistics are applicable for the Troilus Site. Ouranos (2024) suggests that there are only minor differences between the annual precipitation at Chibougamau-Chapais A and the Troilus Site (see Table 2).

Table 4: Total Precipitation Statistics Based on Chibougamau-Chapais A Climate Records

Month	Chibougamau-Chapais A				Statistics Adjusted to the Troilus Site
	Monthly Totals			Daily Total	Mean Monthly Total Precipitation (mm)
	Minimum (mm)	Mean (mm)	Maximum (mm)	Historical Maximum (mm)	
Jan	11	50	85	47	42
Feb	11	44	94	21	38
Mar	13	53	93	33	50
Apr	15	55	97	30	52
May	21	72	130	53	69
Jun	33	92	163	45	104
Jul	45	115	190	53	130
Aug	25	101	202	73	114
Sep	52	120	258	82	120
Oct	38	95	175	49	95
Nov	32	84	133	40	84
Dec	30	73	144	44	61
Year		*953*		*82*	*960*

Notes: Values extracted from 1982 to 2023 records at Chibougamau-Chapais A stations.

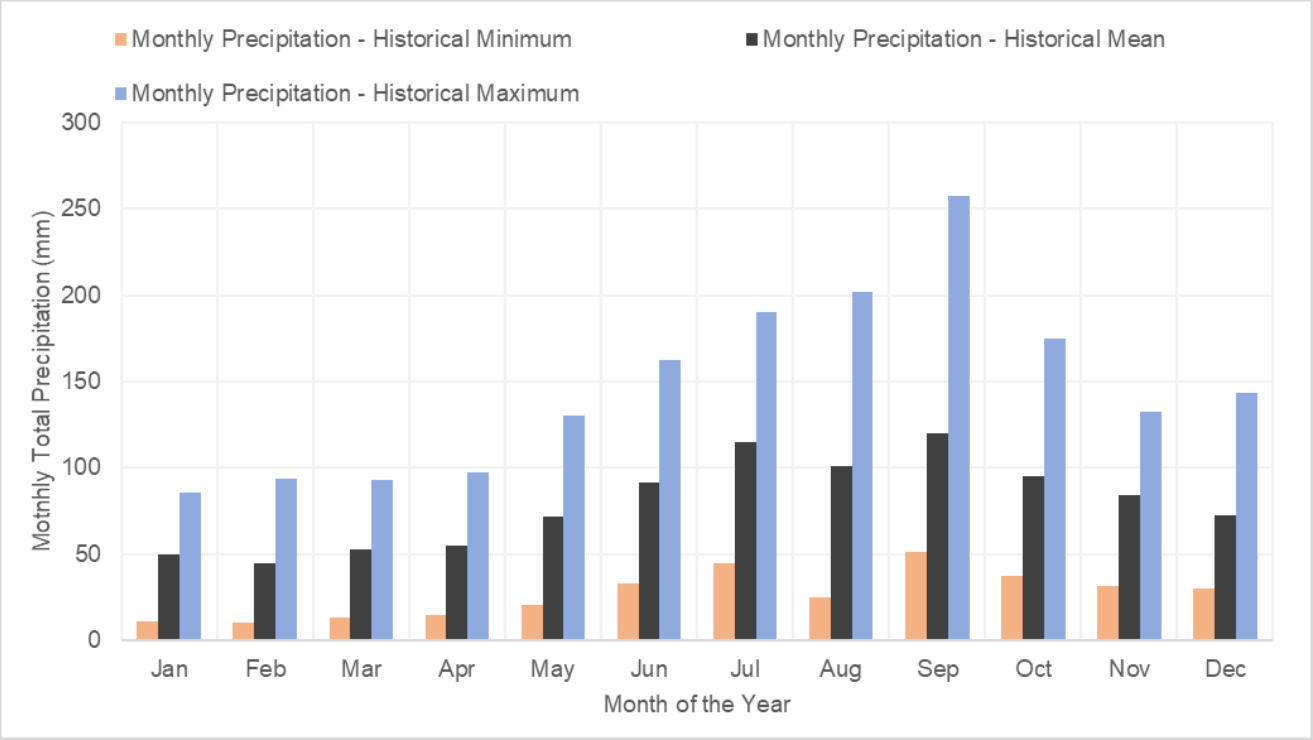


Figure 3: Total Precipitation Statistics for Chibougamau-Chapais A, 1982 - 2023

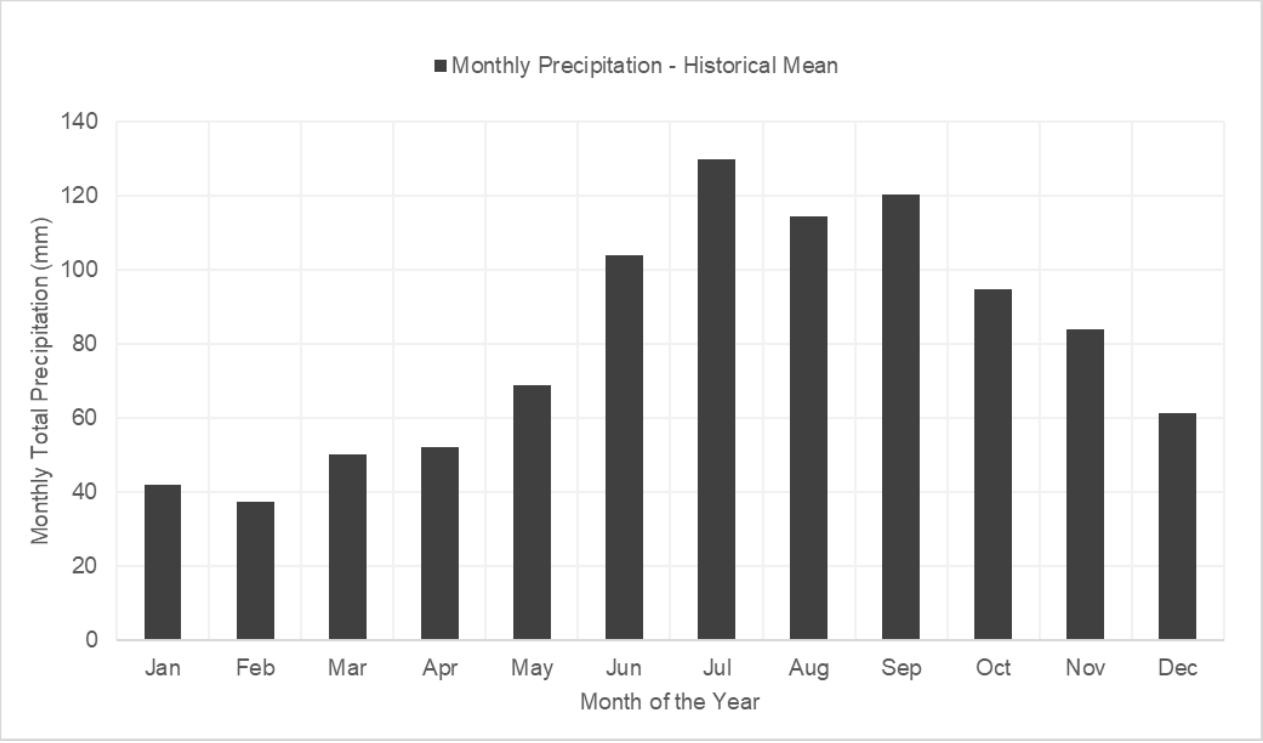


Figure 4: Total Precipitation Statistics for the Troilus Site after Adjustment of Values at Chibougamau-Chapais A, 1982 - 2023

Table 5: Extreme Annual Precipitation Based on Chibougamau-Chapais A Climate Records

Return Period (years)	Total Precipitation (mm)	
	Wet Years	Dry Years
2	952	952
5	1,051	864
10	1,107	821
20	1,171	778
50	1,214	751
100	1,254	728
1,000	1,374	668

Notes: Values are results of a frequency analysis using the Log Pearson III distribution and the 1982 to 2023 Chibougamau-Chapais A records. Out of the 1982 to 2023 records, there were 30 valid annual precipitation values. WMO validity test was used: for each month on record, no more than five record missing days and no more than three record missing consecutive days.

Extreme Rainfall Events

Table 6 and Figure 5 present the results of a frequency analysis for sub-daily (5 minutes to 24 hours) extreme rainfall events:

- The measured data was extracted from ECCC (2023b) and it includes, for each duration, 52 years of annual maxima stretching from 1964 to 2021. The data is labelled as Chapais (the station's ECCC ID is 7091299), but WSP understands that ECCC consolidated data from multiple stations to generate the datasets.
- WSP used an in-house frequency analysis software to generate the extreme rainfall intensities for return periods between 2 and 10,000 years.
- 1:2 year rain amounts vary between 6.9 mm in 5 minutes to 45.7 mm in 24 hours.
- 1:100 year rain amounts vary between 16.9 mm in 5 minutes to 90.4 mm in 24 hours.
- 1:10,000 year rain amounts vary between 27.1 mm in 5 minutes to 125.4 mm in 24 hours.

Table 6: Sub-Daily Intensity-Duration-Frequency Curves Based on ECCC (2023b) Data at Chapais

Return Period (Years)	Rainfall Event Duration								
	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
2	6.9	10	12.3	16.5	20.6	23.3	32	36.7	45.7
5	9.5	14	16.7	21.6	27.4	31.4	41.8	48.5	59.3
10	11.3	16.6	19.6	24.4	31.2	36.4	48.2	56.3	67.7
20	13	19	22.2	26.8	34.4	40.9	54.3	63.7	75.2
50	15.2	22	25.4	29.6	38.2	46.3	62.1	72.9	84.2
100	16.9	24.2	27.6	31.4	40.7	50.1	68	79.5	90.4
1,000	22.1	30.9	34.5	36.7	48	61.5	87.9	100.2	109
2,000	23.6	32.8	36.4	38.1	49.9	64.7	94.1	106	114.1
10,000	27.1	37.1	40.6	41.1	54.1	71.7	108.8	119.3	125.4

Notes: Values are results of a frequency analysis using Weibull distribution and the 1964 to 2021 Chapais composite records published by ECCC (2023b). There were 52 valid annual maximum rainfall values for each duration. WSP understands that ECCC (2023b) combined extreme rainfall records from multiple stations around Chapais and Chibougamau to create this data set.

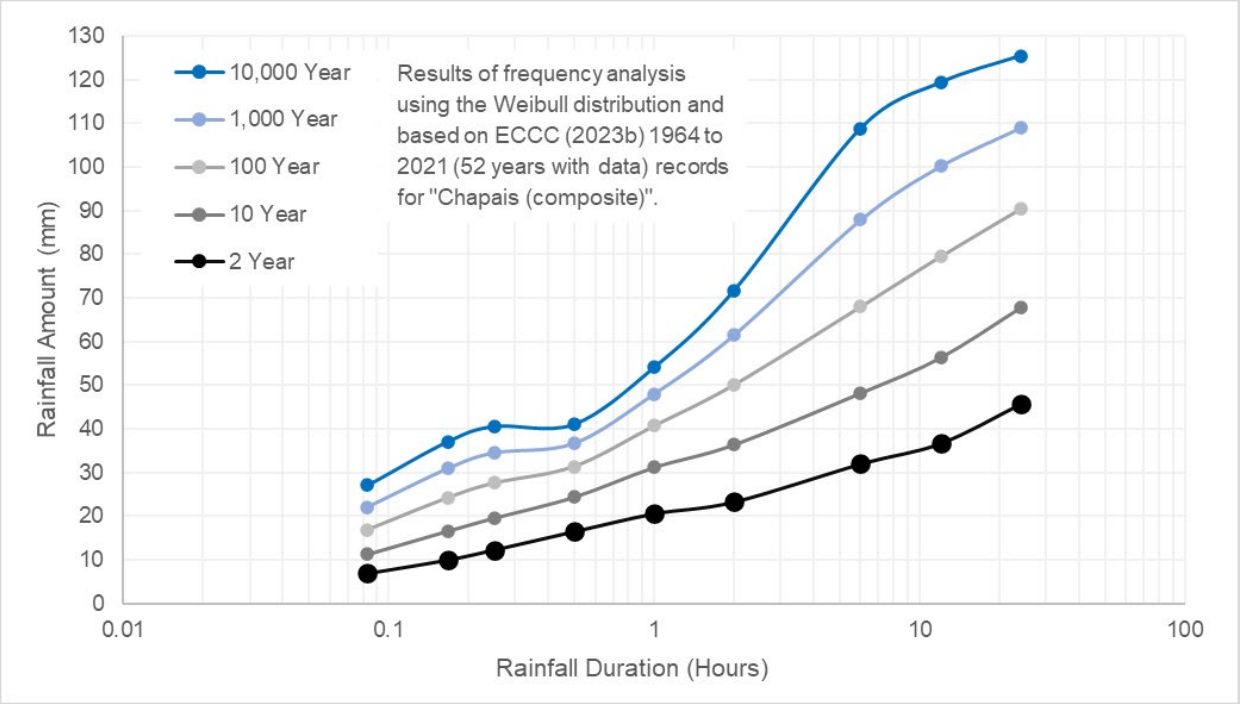


Figure 5: Sub-Daily Intensity-Duration-Frequency Curves Based on ECCC (2023b) Data at Chapais

Figure 6 compares the sub-daily rainfall distribution resulting from the frequency analysis with a standard Soil Conservation Service (SCS) Type II distribution, which (Ministère de l'Environnement et de la Lutte contre les changements climatiques du Québec, de la Faune et des Parcs (MELCCFP) (2023), among others, indicates as being consistent with the Québec climate. The comparison confirms the good match and supports the use of the SCS Type II distribution in the Troilus Project engineering studies.

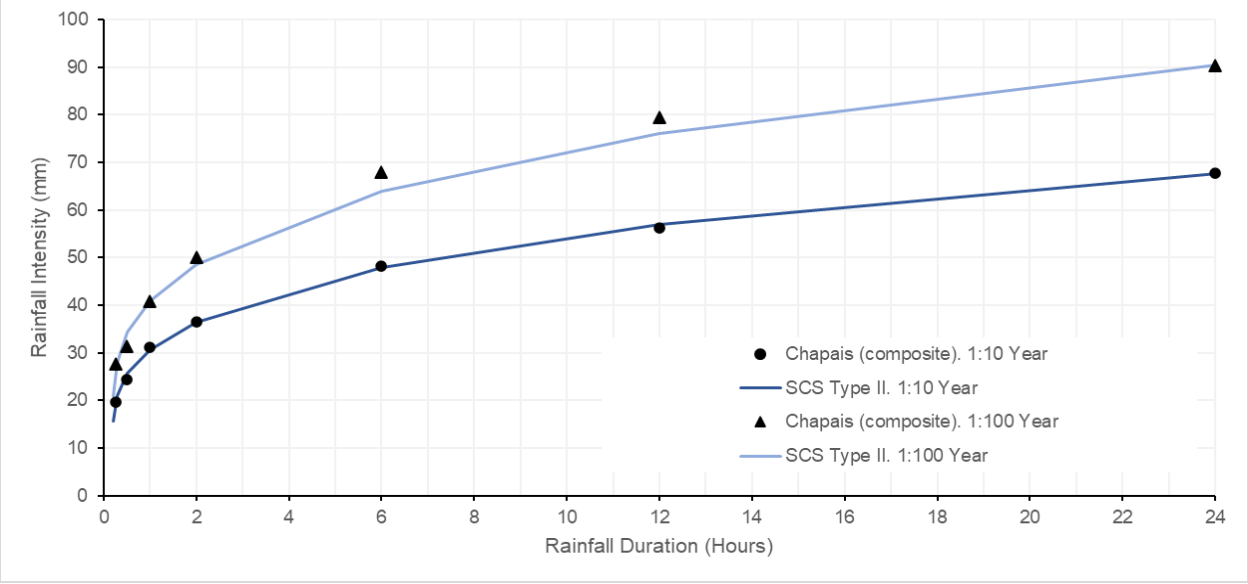


Figure 6: Sub-Daily Intensity-Duration Extreme Rainfall Curves. Comparison between the ECCC (2023b) Values and the SCS Type II Distribution

A similar extreme rainfall analysis was conducted for rainfall of durations between 2 and 30 days:

- WSP prepared the analysis for both the composite Chapais 2 dataset (1962 to 2004 records) and the composite Chibougamau-Chapais A dataset (1982 to 2022). Based on the goodness of the statistical fit and on the more conservative results (higher rainfall intensities), WSP selected the Chapais 2 results for use in the design. In addition, the obtained rainfall intensities were adjusted using the ECCC (2023b) recommended factors to account for historical storm events overlapping the day boundary; these factors vary from 1.04 for 2-day events to 1.0 for events longer than 15 days.
- Figure 7 and Table 7 present the results of the analysis, which used an in-house frequency analysis software.
- 1:2 year rain amounts vary between 47 mm in 2 days to 165 mm in 30 days.
- 1:100 year rain amounts vary between 107 mm in 2 days to 305 mm in 30 days.
- 1:10,000 year rain amounts vary between 233 mm in 2 days to 545 mm in 30 days.

Table 7: Intensity-Duration-Frequency Curves for Rainfall Events up to 30 Days Based on ECCC (2023b) Data at Chapais 2

Return Period (Days)	Rainfall Event Duration (Days)											
	2	3	4	5	6	7	8	9	10	15	20	30
2	47	53	58	63	69	75	81	83	87	108	127	165
5	59	70	75	81	89	96	104	106	110	134	158	198
10	69	82	88	94	103	112	119	122	126	153	181	222
20	83	100	108	112	122	133	140	143	149	179	211	254
50	95	115	124	127	138	149	156	159	167	201	236	279
100	107	132	143	143	154	166	172	176	186	224	261	305
1,000	160	203	208	206	215	228	228	236	259	313	358	399
2,000	179	229	231	229	236	247	247	255	285	345	391	439
10,000	233	291	291	288	291	291	291	304	351	428	476	545

Notes: Values are results of a frequency analysis using General Extreme Value distribution and the 1964 to 2001 Chapais 2 records published by ECCC (2023b). There were 38 valid annual maximum rainfall values for each duration. Includes adjustments for the use of daily records based on Conseil national de recherche Canada (CNRC) (1990) and ECCC (2001).

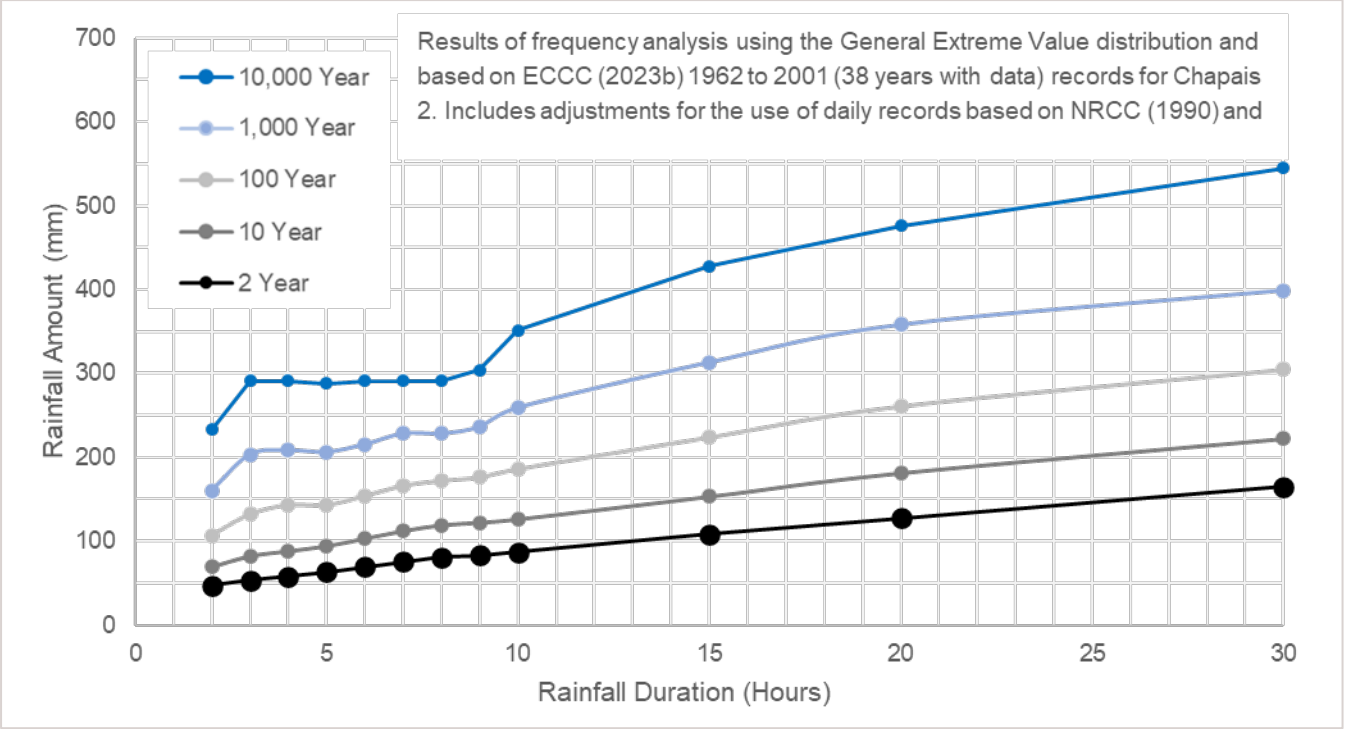


Figure 7: Intensity-Duration-Frequency Curves for up to 30 Day Rainfall Events Based on ECCC (2023b) Data at Chapais

Extreme Rainfall and Snowmelt Events

A similar analysis for extreme rainfall events was conducted for extreme rain-on-snow events; these are spring events combining rainfall and snowmelt intensities:

- WSP applied a snow accumulation and snowmelt model documented by ECCC (2023b) for “forested, Eastern Canada watersheds” and verified the results relative to regionally available snow cover data. ECCC (2009) includes 547 daily records of snow water equivalent measured at Chapais or Chibougamau-Chapais between 1965 and 1992.
- The snow accumulation and snowmelt model, which used precipitation and air temperature records as input, reproduced much better the measured snow water equivalent records when using Chibougamau-Chapais data. Figure 8 and Figure 9 present the results of the verification.
- Using the modelled rain-on-snow timeseries, a frequency analysis over annual maximum rain-on-snow values was conducted for durations between 1 and 30 days. Figure 10 and Table 8 present the results of the analysis, which used an in-house frequency analysis software. In addition, the obtained intensities were adjusted using the ECCC (2023b) recommended factors to account for historical storm events overlapping the day-boundary; these factors vary from 1.13 for 1-day events, 1.04 for 2-day events to 1.0 for events longer than 15 days.
- 1:2 year rain-on-snow amounts vary between 36 mm in 1 day to 273 mm in 30 days.
- 1:100 year rain amounts vary between 70 mm in 1 day to 395 mm in 30 days.
- 1:10,000 year rain amounts vary between 103 mm in 1 day to 456 mm in 30 days.

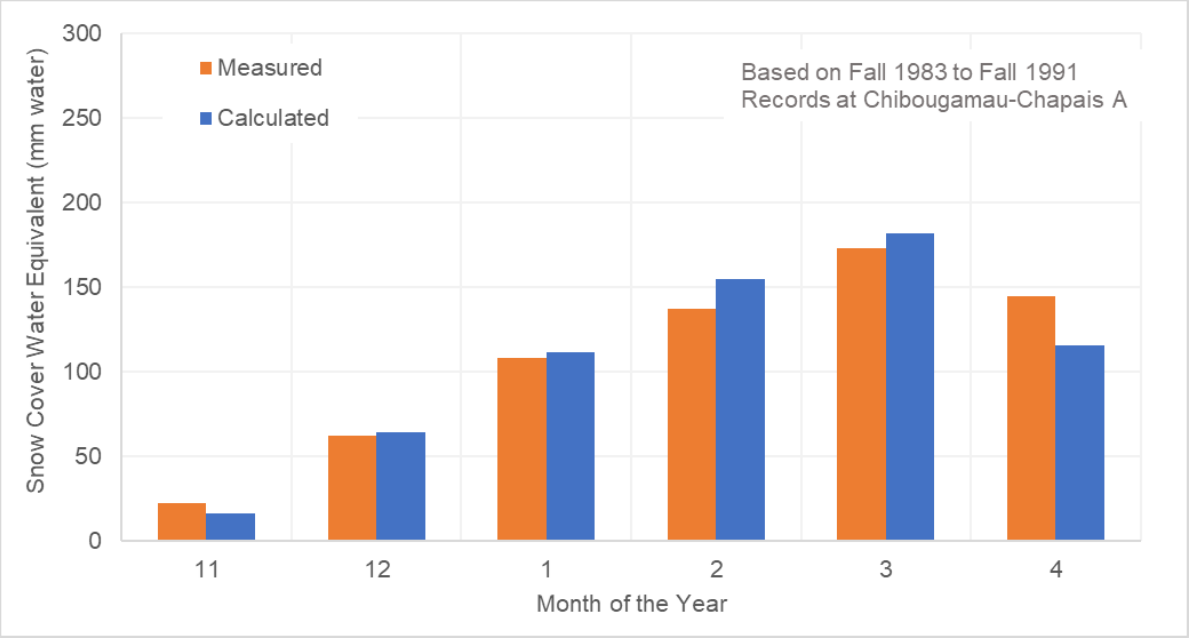


Figure 8: Comparison of Measured and Calculated Snow Water Equivalents Using Chibougamau-Chapais A Climate Records – Mean Monthly Averages

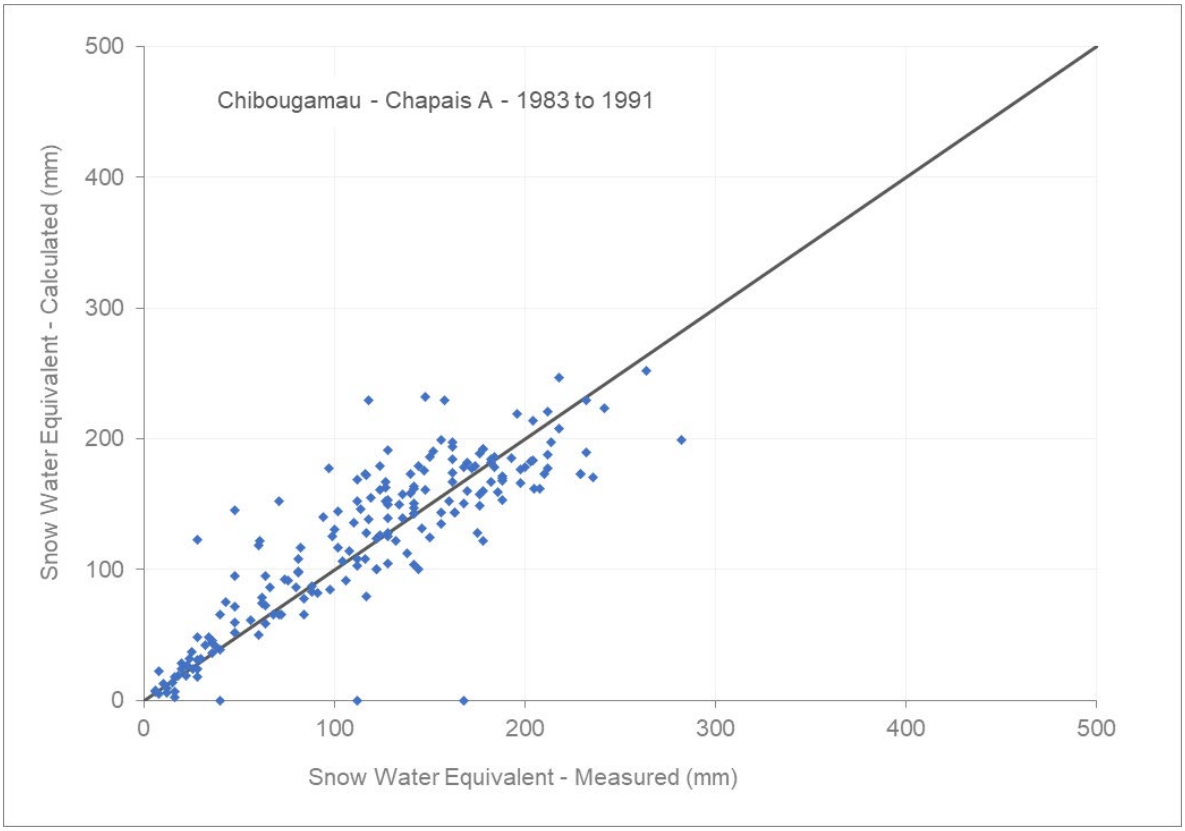


Figure 9: Comparison of Measured and Calculated Snow Water Equivalents Using Chibougamau-Chapais A Climate Records – Daily Values

Table 8: Intensity-Duration-Frequency Curves for Rain-on-Snow Events up to 30 Days Based on ECCC (2023a) Data at Chibougamau-Chapais A

Return Period (Days)	Rain-on-Snow Event Duration (Days)												
	1	2	3	4	5	6	7	8	9	10	15	20	30
2	36	56	74	90	103	114	128	139	148	158	189	222	273
5	45	69	92	110	124	137	152	164	174	185	225	260	320
10	51	77	102	122	137	151	165	179	189	199	244	279	343
20	59	85	114	135	151	166	180	195	205	215	264	299	367
50	64	91	122	145	161	177	190	205	216	225	277	312	382
100	70	96	130	153	170	187	200	215	226	235	289	323	395
1,000	87	110	151	179	197	215	226	243	254	260	321	353	429
2,000	92	114	157	186	204	223	233	250	262	267	329	361	438
10,000	103	122	170	201	220	240	248	267	278	281	346	377	456

Notes: Values are results of a frequency analysis using General Extreme Value distribution and a snow accumulation and snowmelt model using the 1982 to 2023 Chibougamau-Chapais A records published by ECCC (2023a). There were 32 valid annual maximum values for each duration. In addition, the obtained intensities were adjusted using the ECCC (2023b) recommended factors to account for historical storm events overlapping the day-boundary.

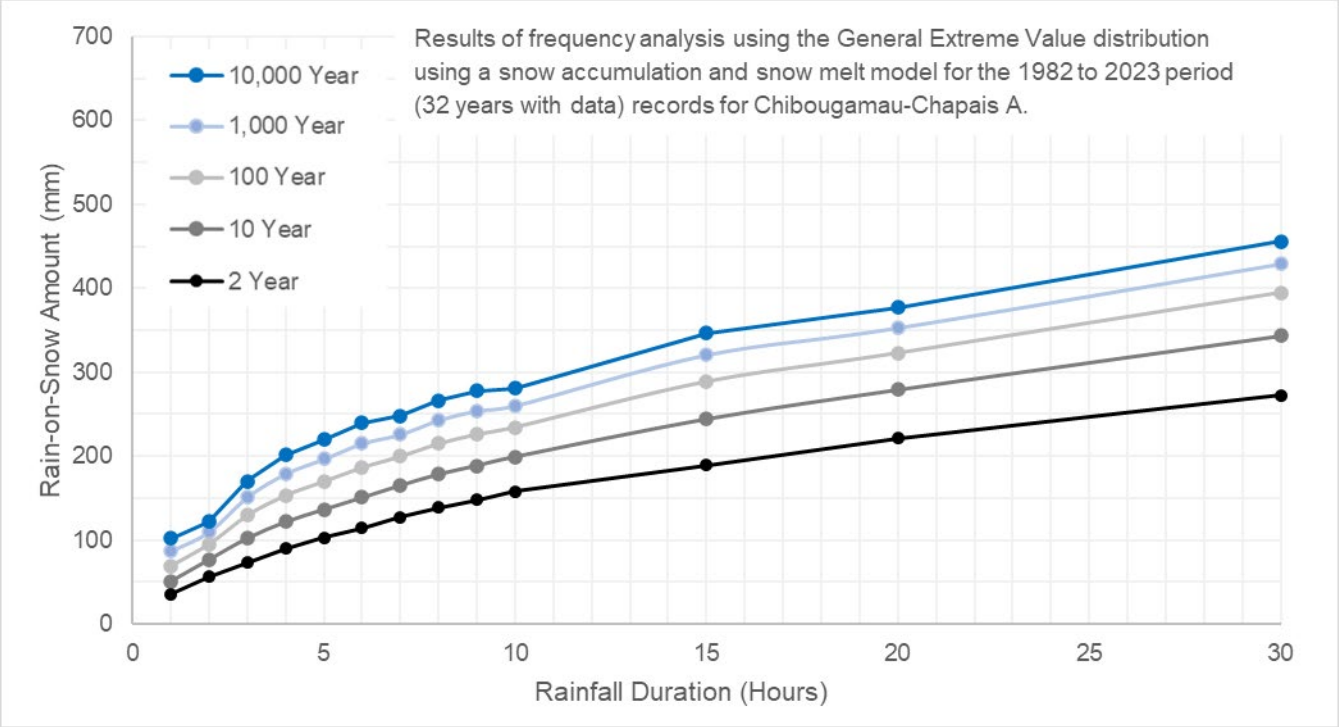


Figure 10: Intensity-Duration-Frequency Curves for Rain-on-Snow Events up to 30 Days Based on ECCC (2023a) Data at Chibougamau-Chapais A

1.2.4 Snow Cover

Table 9 presents the results of a frequency analysis to determine the maximum annual thickness of the snow cover:

- Similar to the rain-on-snow analysis, the 1982 to 2023 records from Chibougamau-Chapais A station were used since the snow accumulation and snowmelt model at this station reproduced better the available measured snow water equivalent data (ECCC 2009). Also, there were 26 years with valid snow cover data at this station vs only 20 years at the Chapais 2 station.
- The snow cover thickness, in cm snow, was transformed into snow water equivalent, in mm water, using a constant 0.28 mm water/cm snow density, which is the average density for the month of March based on the ECCC (2009). The annual maximum snow cover is typically measured in March, before the start of the snowmelt.
- The 1:2 year maximum annual snow cover was estimated to 80 cm snow or 225 mm water.
- The 1:100 year maximum annual snow cover was estimated to 134 cm snow or 375 mm water,

Table 9: Frequency Analysis for Maximum Snow on the Ground. Based on ECCC (2023a) Data at Chibougamau-Chapais A

Return Period (years)	Maximum Snow on the Ground	
	cm Snow	mm Snow Water Equivalent
2	80	225
5	96	270
10	106	298
20	118	331
50	126	354
100	134	375
1 000	157	440
2 000	163	457
10 000	176	494

Notes: Values are results of a frequency analysis using General Extreme Value distribution and a snow cover thickness from 1982 to 2023 Chibougamau-Chapais A records published by ECCC (2023a). There were 27 valid annual maximum values for each duration. A constant 0.28 mm water/cm snow density was used, which is the average density for the month of March based on the ECCC (2009).

1.2.5 Lake Evaporation

ECCC (2010) includes a dataset of lake evaporation values at climate stations around Canada. Between the 1960s and the 1990s, ECCC measured daily evaporation by operating a network of pan evaporators. The measured values were converted to lake evaporation using equations accounting for the air temperature and the wind conditions; the ECCC (2010) includes the results of this conversion.

WSP selected the ECCC (2010) records at Amos (station ID 7090120, 377 km south of the Troilus Site) and Nitchequon (station ID 7095480, 346 km northeast of the Troilus Site) for the current analysis; the selection was based on the relative vicinity to the Troilus Site:

- The two stations have partial records from 1966 to 1994. There are 4086 valid daily records at Amos and 2267 valid daily records at Nitchequon during this period, during the May to October open water period.

- Figure 11 presents the comparison of concurrent monthly lake evaporation values at the two stations. They are well correlated, with smaller values at Nitchequon, which has a colder, more northern climate. The correlation supports interpolating the two datasets to the Troilus Site. The interpolation was weighted with the inverse of the distance to the site. Figure 12 presents the interpolation results.
- Using the interpolated results, a regression model was developed separately for each month of the year to correlate the lake evaporation to the air temperature at the Troilus Site. Figure 13 and Table 10 present the results of this model for the 1982 to 2023 period, the same which was used for most temperature and precipitation statistics in previous sections.
- WSP estimated 1982 to 2023 mean annual lake evaporation to 515 mm. However, the actual value may be smaller since the estimate includes April and May values, which may not be applicable if an ice cover is present. The maximum monthly lake evaporation is in July, with a mean of 116 mm, during the warmest month of the year.

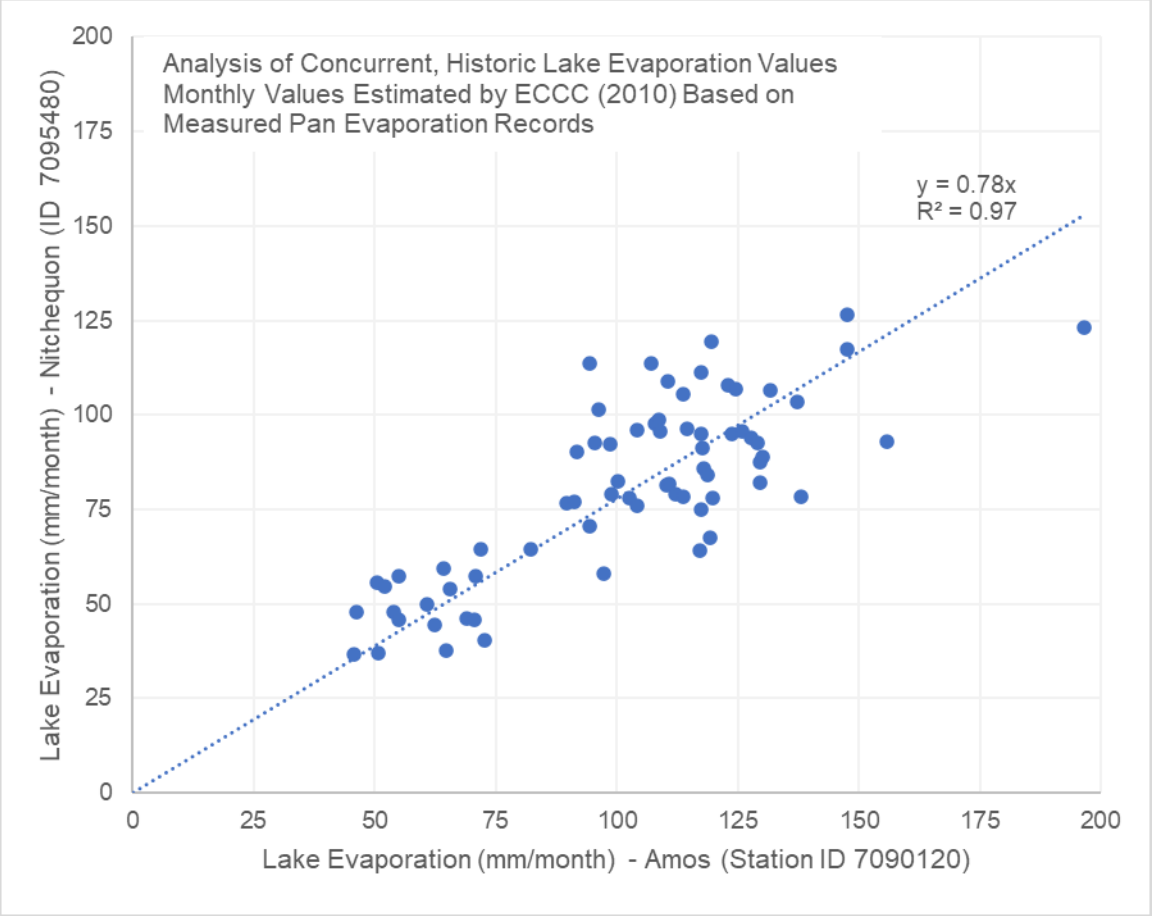


Figure 11: Comparison of Concurrent 1966 to 1944 Historic Lake Evaporation Values (ECCC 2010) at two Stations in the Vicinity of the Troilus Site

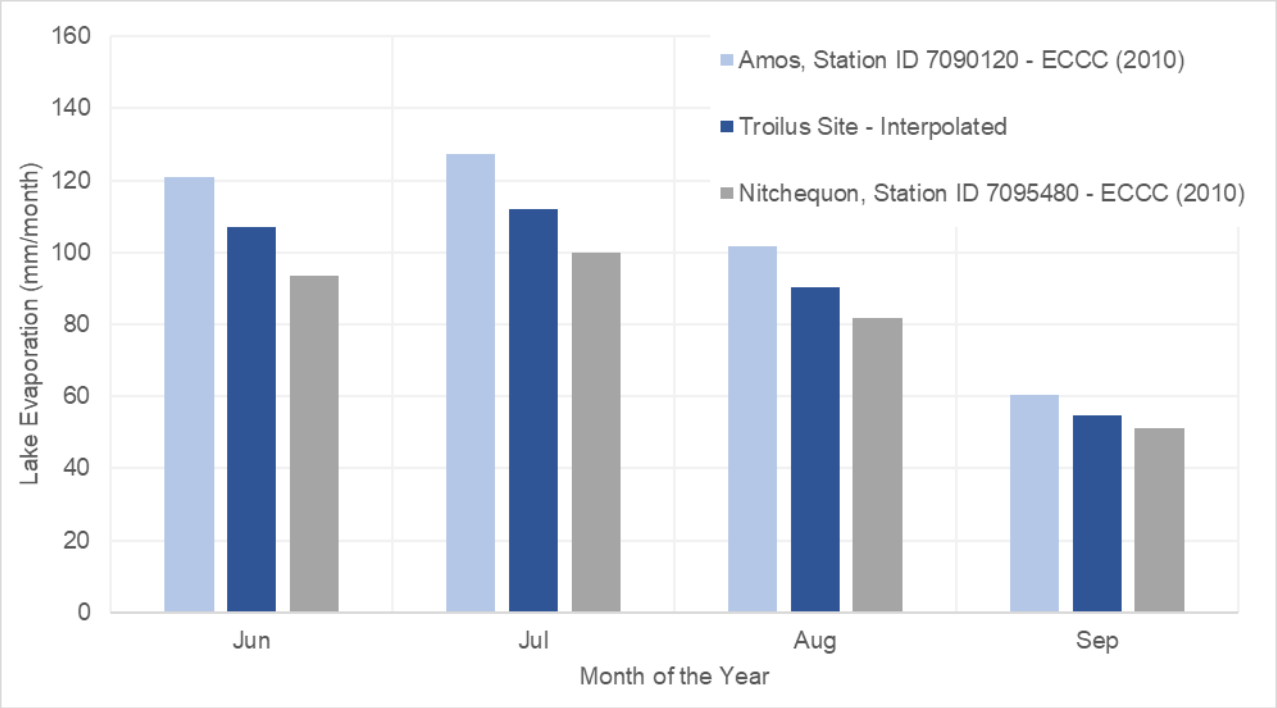


Figure 12: Interpolation of 1966 to 1994 Historic Lake Evaporation Values (ECCC 2010) to the Troilus Site

Table 10: Estimated Lake Evaporation Statistics for the Troilus Site for the Period 1982 to 2023

	Monthly Lake Evaporation (mm/month)		
Month	**Historical Minimum**	**Historical Mean**	**Historical Maximum**
Jan	0	0	0
Feb	0	0	0
Mar	0	0	0
Apr	0	2	27
May	66	97	116
Jun	98	113	141
Jul	102	116	132
Aug	82	94	110
Sep	42	56	69
Oct	32	36	38
Nov	0	0	0
Dec	0	0	0
Annual		515	

Notes: Values are results of a regression analysis with the daily air temperature as a parameter. The regression equations were calibrated for each month using lake evaporation rates interpolated to the Troilus Site based on available historic values at Amos and Nitchequon climate stations (ECCC, 2010).

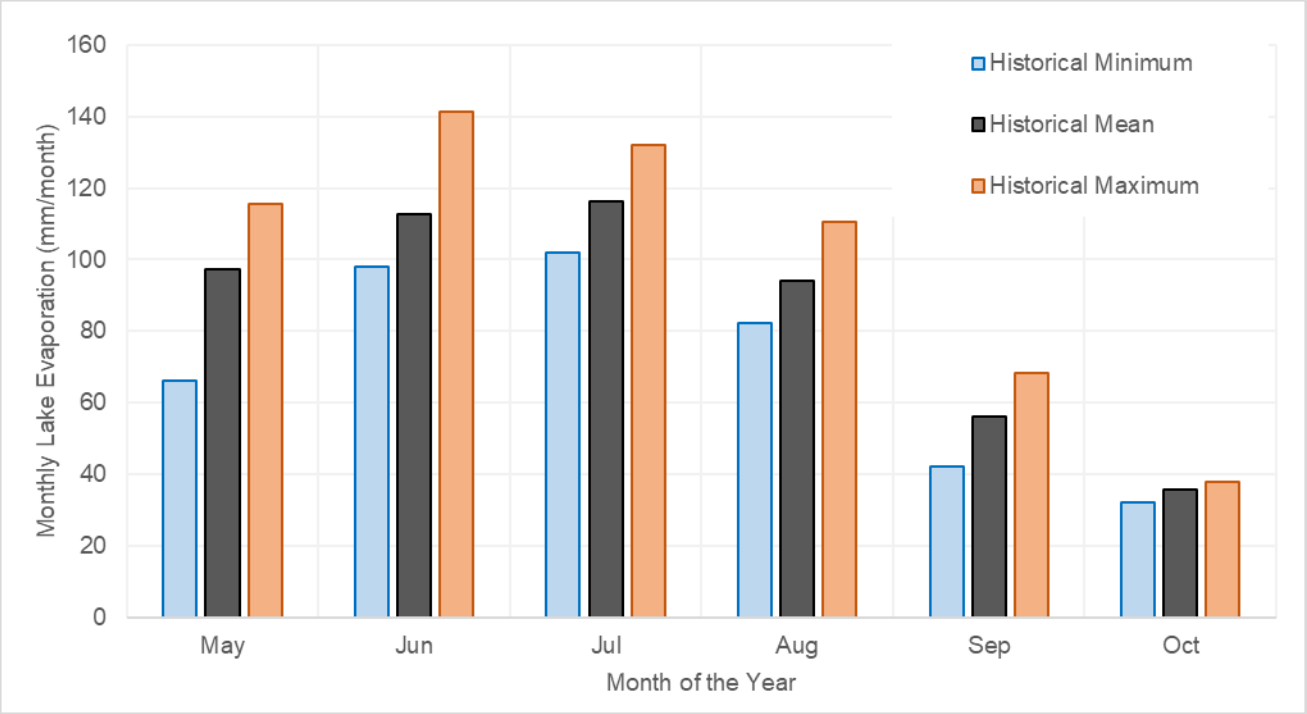


Figure 13: Estimated Lake Evaporation Statistics for the Troilus Site for the Period 1982 to 2023

1.2.6 Potential Evapotranspiration

WSP used the Haargreveas-Samani (1982) method to estimate potential evapotranspiration rates at the Troilus Site for the period 1982 to 2023. The input parameters included the minimum and maximum daily temperature as well as the site location. Table 11 and Figure 14 summarise the results of the analysis:

- Values are provided for all months of the year with a 661 mm annual mean. Statistics during the winter months should be used with care, as they do not account for the presence of snow or ice cover on the surface. It follows that the actual potential evapotranspiration would be smaller.
- For an average year, the maximum monthly potential evapotranspiration was estimated at 144 mm for July.

Table 11: Estimated Potential Evapotranspiration Statistics for the Troilus Site for the Period 1982 to 2023

	Monthly Potential Evapotranspiration (mm/month)		
Month	Historical Minimum	Historical Mean	Historical Maximum
Jan	0	1	3
Feb	0	3	8
Mar	8	16	28
Apr	32	47	67
May	69	97	119
Jun	122	139	155
Jul	127	144	164
Aug	59	112	125
Sep	49	62	72

Table 11: Estimated Potential Evapotranspiration Statistics for the Troilus Site for the Period 1982 to 2023

	Monthly Potential Evapotranspiration (mm/month)		
Month	Historical Minimum	Historical Mean	Historical Maximum
Oct	21	27	36
Nov	6	9	12
Dec	0	2	4
Annual	608	661	718

Notes: Values were estimated by the Haargreveas-Samani method using the minimum and maximum daily temperature, and the site location as parameters.

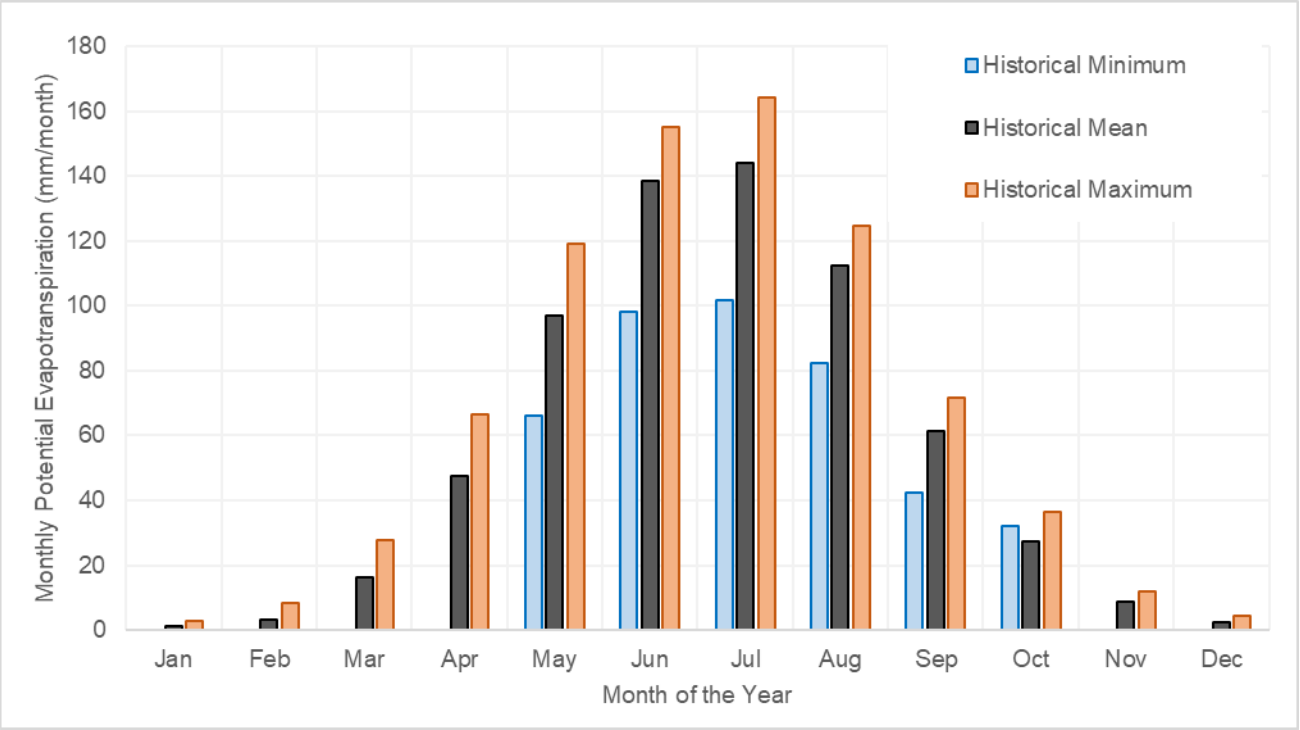


Figure 14: Estimated Potential Evapotranspiration Statistics for the Troilus Site for the Period 1982 to 2023

1.2.7 Ice Cover

Lenormand et al. (2009) documents a database of ice cover monitoring for lakes across Canada. Among the monitored variables are: the annual maximum ice thickness, the date of the first permanent ice, the date of the complete freeze over, the date of the ice melt start, and the date of the ice melt end. In the vicinity of the Troilus Site, the database includes records for Nitchequon Lake (346 km northeast of the Site, 40 years of records) and Caché Lake (approximately 137 km south of the site, 33 years of records), Doré Lake (approximately 138 km south of the site, one year of records), and Gilman Lake (approximately 137 km south of the site, one year of records) for the period 1946 to 1988. WSP interpolated the dates and the ice thickness to the Site using weighting factors that are inversely proportional to the distance to the Site. The results of the analysis are summarised below:

- The annual maximum ice cover thickness is, on average, 0.82 m. Overall records at the lakes mentioned above, the thickness varied between 0.43 m and 1.19 m.
- On average, a complete ice cover is formed between November 4 (average date of the first permanent ice) and November 14.
- On average, the ice cover melts between May 3 (average date for the start of the melt) and May 23 (average date for the end of the melt).

As an important limitation, these records are valid for large, natural lakes, which are typically deeper than ponds on a mine site. Their applicability to mine ponds should be studied on a case-by-case basis. The larger depth leads to more thermal buffering, which means that the mine ponds may experience earlier ice formation and larger ice thickness.

1.2.8 Wind

ECCC (2020) prepared a wind rose based on 1983 to 2017 hourly data at Chibougamau-Chapais A station (Figure 15). Winds from the northwest are most common for the spring (March to May) period. Winds from the northwest, west, southwest, and south are most common for the summer and fall periods (June to November).

ECCC (2023c) used 1983 to 2012 hourly data from the same Chibougamau-Chapais A station to extract maximum annual hourly velocities for different directions. Figure 16 and Table 12 summarize the results of a frequency analysis to extract extreme hourly velocities:

- 2-Year hourly velocities vary between 23.3 km/h (wind from the East) to 42.6 km/h (wind from the South or Southwest).
- 10-Year hourly velocities vary between 38.9 km/h (wind from the northeast) to 50.4 km/h (wind from the South).
- 100-Year hourly velocities vary between 48.3 km/h (wind from the North) to 69.6 km/h (wind from the South).

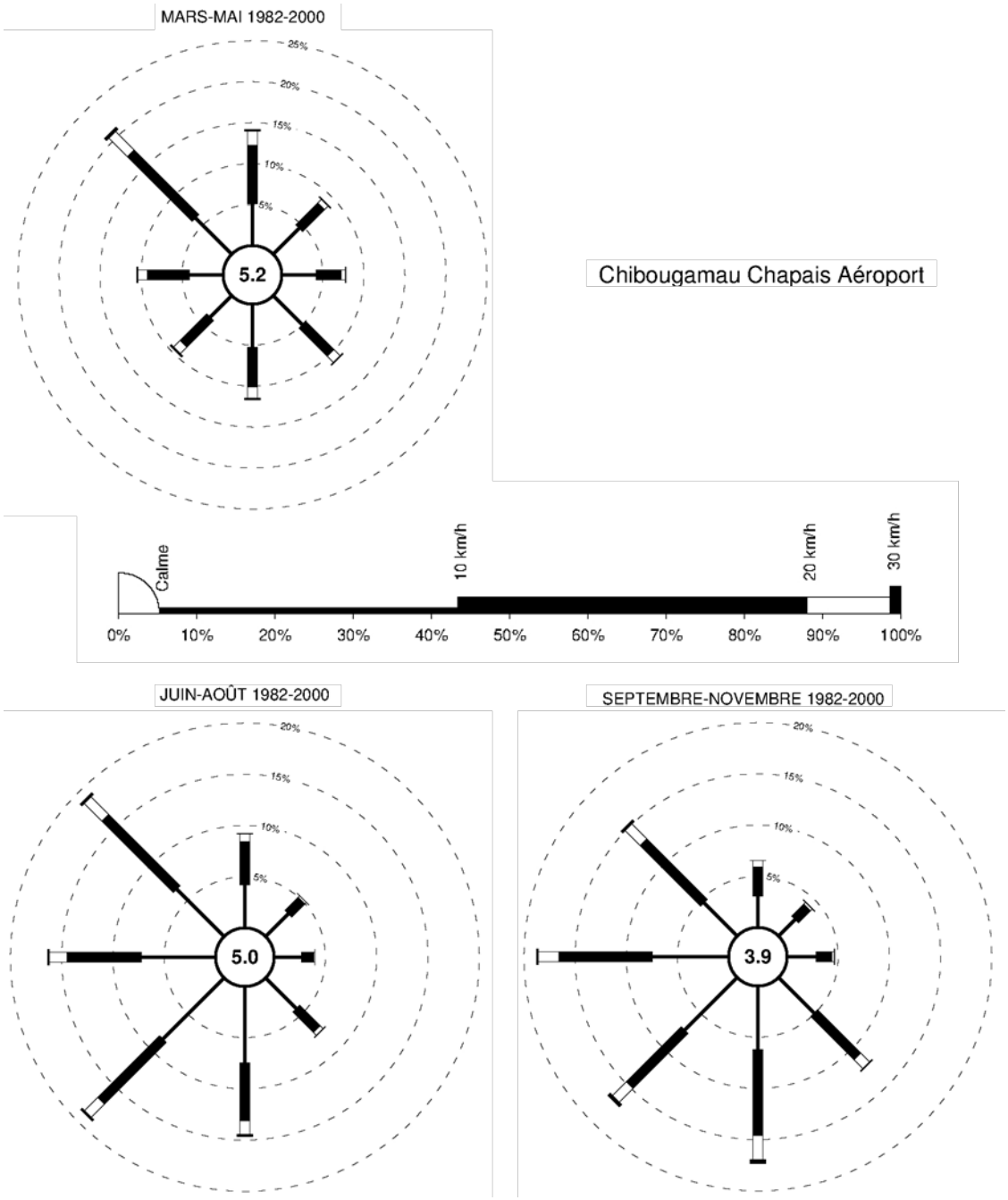


Figure 15: Chibougamau-Chapais Airport Wind Rose Based on 1982-2000 Hourly Records (ECCC 2020a)

Table 12: Intensity-Duration-Frequency Curves for Extreme Hourly Wind Velocities Based on ECCC (2023c) 1983-2012 Data at Chibougamau-Chapais A

Return Period (Days)	Extreme Hourly Wind Velocities (km/h) for Different Directions							
	North	Northeast	East	Southeast	South	Southwest	West	Northwest
2	34.0	32.6	32.3	36.7	42.6	42.6	38.0	38.3
5	37.9	36.0	37.5	40.5	47.3	47.2	42.5	42.1
10	40.4	38.9	40.9	43.0	50.4	50.3	45.8	44.6
20	42.8	42.0	44.2	45.4	53.4	53.3	49.0	47.1
50	45.9	46.0	48.4	48.6	57.2	57.2	53.2	50.3
100	48.3	49.0	51.6	51.4	60.1	60.1	56.4	52.7
1,000	56.0	58.9	62.1	61.3	69.6	69.6	66.9	60.5

Notes: Values are results of a frequency analysis using the Generalised Extreme Value Type 1 (Gumble) distribution and 1983 to 2012 annual maxima extracted by ECCC (2023c).

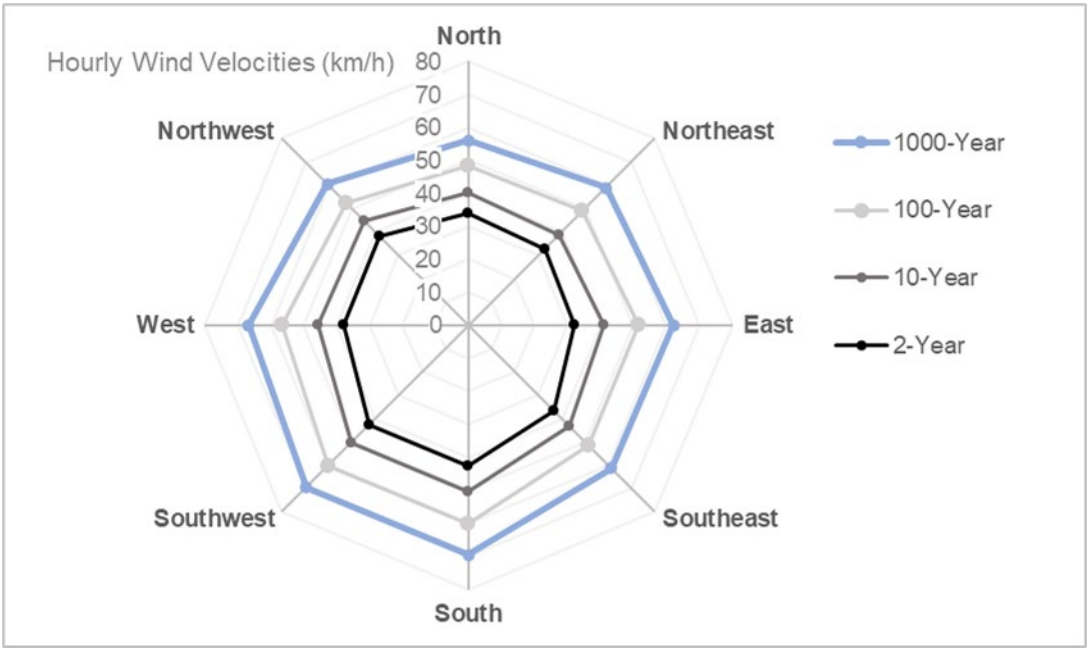


Figure 16: Chibougamau-Chapais Airport Wind Rose Based on 1983-2012 Hourly Records (ECCC 2023c)

1.3 Climate Change Analysis

Current regulatory and professional standards require the climate change impact to be considered in the design of water management structures and when preparing the mine water balance analysis (see, for example, the Québec storm water drainage guidelines, MELCCFP 2023, the Code of Practice for Metal Mines, ECCC 2009, the Strategic Assessment of Climate Change, ECCC, 2020b, or the Global Industry Standard on Tailings Management, Global Tailings Review 2020). WSP Golder extracted available information to adjust the climate statistics provided above:

- Ouranos (2024) summarises climate change projections for mean monthly temperature and precipitation for the Troilus Site region. This is provided in Section 1.3.1 below for one greenhouse gas emission scenario.
- ECCC (2023d) provides recommendations to adjust intensity-duration-frequency extreme rainfall data to account for climate change. The recommendations and their application to the extreme event design information are presented in Section 1.3.2 below.
- WSP compiled additional projection data in support of the site-wide water balance analysis. This is presented in Section 1.3.3 below.

The sections below use several scenarios for greenhouse gas emissions. WSP used the data and definitions shared by Intergovernmental Panel on Climate Change (2021) to analyze and manage the climate change projections associated with these scenarios.

1.3.1 Ouranos (2024) - Overview of Climate Change Projections

Table 18 presents a summary of projected climate changes for the Troilus Site, as extracted from Ouranos (2024):

- WSP extracted statistics for one greenhouse gas emission scenario (SSP2-4.5 – moderate emissions) for the current overview. Generally, scenarios including more emissions result in larger changes relative to historical data, and scenarios including fewer emissions result in smaller changes. The changes statistics were extracted for the 2021-2050 time horizon, which includes the Troilus Project operational life:
- The mean air temperature increases for all scenarios and all seasons. The changes are largest over the inter months. The median annual projected temperature increase is 1.4°C.
- The total precipitation is expected to increase over the next decades. Median annual increase is 6%, with the increase over the winter being much larger than those over the summer (11% vs 4%).
- Even for the same emission scenarios, there is a large variability of results among the different projections. The absolute difference between the 10th and the 90th percentile projections is as large as 40% to over 100% of the absolute 50th percentile change to the air temperature and total precipitation. Nevertheless, the overall projected trends –warmer and wetter weather, especially during the winter season – appear robust despite the large uncertainty of the projections.

Table 13: Projected Climate Change Impact to Seasonal Average Precipitation and Temperature for the Troilus Site Region (Ouranos 2024)

	Changes for the Period 2021-2050 Relative to 1991-2020 *					
	Change to Average Daily Temperature (°C)			Change to Total Precipitation (mm)		
	10%	50%	90%	10%	50%	90%
Dec. to Feb	1.5	1.9	2.8	10%	11%	15%
Mar. to May	0.6	1.2	1.8	0%	7%	13%
Jun. to Aug	0.7	1.2	1.7	-1%	4%	4%
Sep. to Nov	1.1	1.2	1.6	4%	5%	9%
Annual	1.1	1.4	1.8	4%	6%	8%

Notes: *The presented changes are statistics (10, 50, and 90 percentiles) over multiple climate projections, they are average over the simulation periods, and they are applicable for one greenhouse gas emission scenario (SSP2-4.5 – moderate emissions). The values are calculated using data extracted from Ouranos (2024)

1.3.2 Adjustment of Extreme Rainfall and Rain-on-Snow Events

Ouranos (2024) also indicates a projected trend of increasing short-term precipitation. ECCC (2023d) provides intensity-duration-frequency data that incorporates climate change statistics for a number of climate stations, including Chapais (Station ID 7091299). Table 19 presents the projected changes for three emission scenarios and for three different percentiles (10th, 50th – median, and 90th) for the 24-hour extreme rainfall; the changes were extracted for the 2021-2050 period, which includes the Troilus Project operational life, relative to the 1991-2020 historical period:

- Overall, the projections indicate an increase between 11% and 33%, depending on the return period and the emission scenario.
- WSP selected an 18% increase as a reasonable extreme rainfall adjustment in support of the WMP for the Troilus Project feasibility study. The value is the largest among the 50th percentile values for the 100-Year, 24-hour rainfall event over all emission scenarios. The 100-Year event is the main design event for contact water and diversion structures.
- WSP recognizes the large uncertainty associated with climate change projections as projected changes to extreme events will continue to evolve over the next years. During the future engineering phases, the design and the mine operation itself will need to stay informed as to this evolution and adapt and mitigate the identified risks as required.

Table 19: Projected Changes to Extreme 24-Hour Rainfall for the Chapais Climate Station (ECCC 2023d)

% Changes to the 24-Hour Extreme Rainfall Event between the 2021-2050 Horizon and the 1991-2020 Reference Period as a Function of the Event's Return Period (Years)						
	2 Years	5 Years	10 Years	25 Years	50 Years	100 Years
SSP1-2.6 (low emission scenario)						
10%	11%	13%	11%	13%	11%	10%
50%	16%	17%	14%	16%	14%	15%
90%	26%	25%	25%	25%	26%	26%

Table 19: Projected Changes to Extreme 24-Hour Rainfall for the Chapais Climate Station (ECCC 2023d)

% Changes to the 24-Hour Extreme Rainfall Event between the 2021-2050 Horizon and the 1991-2020 Reference Period as a Function of the Event's Return Period (Years)						
	2 Years	5 Years	10 Years	25 Years	50 Years	100 Years
SSP2-4.5 (moderate emission scenario)						
10%	11%	13%	14%	13%	14%	13%
50%	16%	17%	14%	16%	17%	15%
90%	26%	25%	25%	28%	26%	26%
SSP-5-8.5 (high emission scenario)						
10%	16%	13%	14%	13%	14%	13%
50%	21%	17%	18%	19%	20%	18%
90%	32%	33%	32%	31%	31%	31%

Notes: Values calculated from ECCC (2024) extreme rainfall amounts.

For the current feasibility study, WSP applied the 18% increase to all extreme rainfall statistics, including for multi-day events. For rain-on-snow events, WSP applied the 18% increase for event duration of up to two days; beyond two days, the event is dominated by snowmelt volume, such that no increase was applied.

1.3.3 Extraction of Continuous Climate Projection Timeseries

To simulate the potential impact of climate change on the Troilus Project site-wide water balance model, WSP extracted projected daily timeseries for the period 2021 to 2050 for the following variables:

- Precipitation, mean, minimum, and maximum air temperature were extracted from the available climate change databases, as explained in this section below.
- Lake evaporation and potential evapotranspiration were calculated as a function of the mean, minimum, and maximum air temperature using the approach explained in Section X of this report.

For each of the variables above, 78 daily timeseries were extracted corresponding to 26 different projection models and three greenhouse gas emission scenarios (SSP1-2.6 – low emissions, SSP2-4.5 – moderate emissions, and SSP5-8.5 – high emissions).

Data Collection

WSP downloaded the initial projection data from ECCC (2023e). The data is comprised of global circulation model outputs, which are statistically downscaled using Bias Correction/Constructed Analogues with Quantile mapping reordering (BCCAQ) version 2 provided by the Pacific Climate Impacts Consortium (PCIC) to correct for systematic biases in temperature (systematic over or underestimation) and precipitation (frequent drizzle and underestimation of extremes).

Data Bias Correction

At a daily timescale, the limited spatial and temporal resolution and approximation of physical processes used in climate models can result in systematic errors when compared to observations. These systematic errors are commonly referred to as model 'bias'. Examples of bias in climate models include temperatures that are consistently too high or low, excessive days with low-intensity rainfall (drizzle), underestimation of rainfall extremes, and incorrect simulation of seasonal storms resulting in wet seasons that can start too early or late. Direct input of climate projections into water balance and hydrologic models is not recommended, as impacts associated with both high and low flow events may be underestimated.

Although significant levels of bias may be present in climate model outputs, relative changes (absolute difference or percentage changes) are often used between baseline and future periods to mitigate bias. Bias becomes an issue when timeseries are needed from climate model outputs. For example, if climate model projections are to be used in water balance or continuous hydrologic modelling simulations, a timeseries may be required as opposed to relative changes in aggregated climate statistics. Because of this, methods to correct climate model bias are needed to provide more realistic timeseries inputs to climate change impact models.

Observational data applicable to the watershed or site of interest can be used to greatly improve climate projections for water balance and/or hydrologic modelling applications by correcting future climate projections based on how they compare to observations under current climate conditions. For the Troilus Site, Chibougamau-Chapais A 1982 to 2023 climate records (see Section 1.2) have been used to apply corrections to the climate projections provided by ECCC (2023e).

The corrections are performed using the Quantile Delta Mapping (QDM) method of Cannon (2015). The proposed approach involves building a statistical relationship between downscaled climate projections over a site and a representative set of observations over a common time period for precipitation and temperature variables. This relationship is then applied to both historical and future projections of climate change to correct the projections considering what has been observed on-site. This process is illustrated in Figure 20 by comparing cumulative probability distributions of daily total precipitation for both the climate model projections and observations over the same time period. Typically, climate projections show a larger number of wet days than what is observed (lower cumulative probability of dry days) and tend to underestimate extreme precipitation amounts (lower precipitation amounts at the high-end of cumulative probability). The QDM method calculates the differences in total precipitation (Δ) across the cumulative probability distribution (example in Figure 20) and then applies these differences as correction factors for both historical and future climate projections. This process of applying corrections based on differences in modelled and observed climate assumes that these differences will persist in the future.

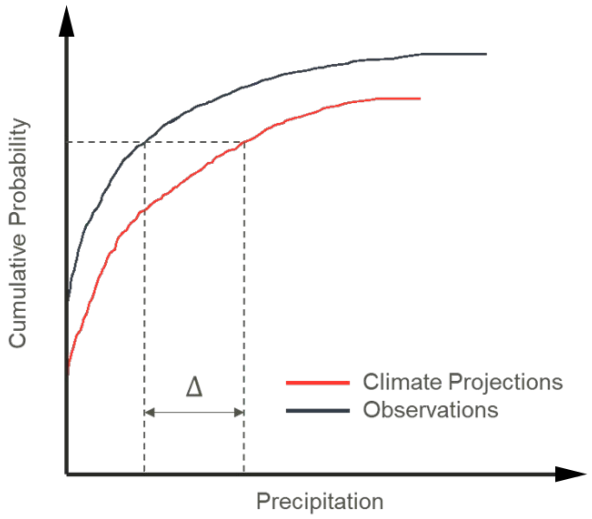


Figure 17: Simplified Illustration of Quantile Delta Mapping Process for Correction of Climate Projections

The QDM bias correction was applied using a monthly timescale, allowing for seasonal bias to be corrected. Linear interpolation of correction factors will be used between months to avoid introducing large discontinuities of climate variables near the boundary between months or seasons. The method is applied using the following steps:

1) For a given calendar month (e.g., January), subset the data for all years.

2) Extract a set of Q_i evenly spaced quantiles from the observed and climate model datasets over a common period over a range of non-exceedance probabilities, P_i.

3) Compute bias-correction factors, Δ_i for each Q_i, by taking the difference between those obtained from Step 2.

4) Apply linear interpolation of Δ_i correction factors to daily correction factors (for each day of the year) from the center day of each month, resulting in the set of correction factors CF_{d_i}.

5) For each day in the future projected dataset, find the closest probability to those in the set of P_i from Step 2, and apply the corresponding Δ_i using addition.

6) Repeat Steps 1 to 4 for each day of the year.

7) Repeat Steps 1 to 6 for each climate model and scenario within the ensemble from ECCC (2023e).

The calculation (Step 3) and application (Step 5) of additive correction factors allow for wet and dry day frequencies to be corrected, as multiplicative correction factors would not be able to account for regions of the precipitation distribution where there are all zeros in either the observed or climate model datasets. Anandhi et al. (2011) recommends that when using additive correction factors, the set of evenly spaced quantiles should be greater than 25 to minimize differences between additive and multiplicative correction factors. In this work, 50 evenly spaced quantiles (Q_i) are used to correct for bias in precipitation and temperature to capture the extremes.

1.4 Climate Input to Directive 019 Project Flood and the Probable Maximum Flood

The following paragraphs present the climate statistics required for quantifying the Directive 019 “project flood” event and the probable maximum flood event. The climate change adjustments make the statistics applicable for the Troilus Project operational period.

1.4.1 Directive 019 Event

Directive 019 for the mining industry (MELCCFP 2012) indicates that tailings storage facilities with water retention should be able to contain without uncontrolled discharge to the environment the “project flood event”. The event consists of the 100-year snow accumulation melting over 30 days superposed to the 1,000-year 24-hour rainfall event. The rainfall event’s return period is 2,000 years for high-risk tailings, which is not the case for the Troilus Tailings Storage Facility (TSF) (Troilus, 2024). The project flood event is equivalent, in terms of its role in the TSF design and operation, to the environmental design flood (EDF) event (see for example, Canadian Dam Association [CDA], 2019).

Based on the climate statistics presented in Sections 1.2 and 1.3, the project flood event has a total depth of 504 mm over 30 days, composed from a 24-hour rainfall of 129 mm and a 375 mm snow water content. As discussed in Section 1.3, climate change adjustments were applied to the rainfall event (18%), but the snow water content was kept unchanged from the historical value.

1.4.2 Climate Input to Probable Maximum Flood

The probable maximum flood (PMF) is the largest conceivable flood. Theoretically, no return period is associated with the PMF. However, in practice, the PMF has a return period of at least, and sometimes much more than, 10,000 years.

CDA (2013) proposes three definitions for developing the PMF:

- A summer-fall PMF generated by a summer-fall PMP
- A spring PMF generated by the superposition of a 100-year spring rainfall and the probable maximum snow accumulation
- A spring PMF generated by the superposition of a spring PMP and the 100-year maximum snow accumulation.

SNC (2004), a study commissioned by *Centre d’expertise hydrique du Québec*, prepared statistics in support of developing PMF events for several Québec regions. Table 20 below presents the values extracted from this document for the Troilus Project location:

- Rainfall events were extracted for both 24 hours and 72 hours duration. Typically, 72 hour durations are applied when the event’s total water volume is critical for the design, and the 24-hour durations are applied when the event’s peak intensity is critical for the design.
- An 18% adjustment on the rainfall was applied to account for the potential effects of climate change. As discussed in Section 1.3, the value considers ECCC (2023d) and the 50th percentile (the median) projections for the SSP 2-4.5 (moderate) and SSP5-8.5 (high) greenhouse gas emissions scenario. The snow cover

water content were kept constant, since higher temperatures are expected to decrease the length of the cold season and the associated extreme snow accumulation.

- To create sub-daily PMF hydrographs WSP used the approaches recommended by SNC (2004) for both the summer-fall and the spring events. For the rainfall events, WSP used the SCS type II distribution for the most intense six hours of the event.

Table 14: Climate Input for Developing the Probable Maximum Flood

Climate Variable	Value (mm) – Historical	Values (mm) - adjusted for climate change for the operational period [(c)]
Summer-Fall Event: Probable Maximum Precipitation (Rainfall)		
24-Hour Summer Rainfall	335 [(a)]	395
72-Hour Summer Rainfall	372 [(a)]	439
Spring Event: 100-Year Rainfall + Probable Maximum Snow		
24 Hour 100-Year Spring Rainfall	38 [(a)]	45
72-Hour 100-Year Spring Rainfall	51 [(a)]	61
Probable Maximum Snow (Water Content)	750 [(a)]	750
Spring Event: Spring Probable Maximum Rainfall + 100-Year Snow		
24 Hour PMP Spring Rainfall	180 [(a)]	212
72-Hour PMP Spring Rainfall	238 [(a)]	280
100-Year Snow Cover (Water Content)	375 [(b)]	375

Notes:

(a) Values extracted from SNC (2004)

(b) Value extracted from analysis on Section 1.2.4

(c) Rainfall amounts were increased by 18% to account for potential climate change impacts. Snow cover water contents were not adjusted. See Section 1.3.

2.0 HYDROLOGY BASELINE ANALYSIS

2.1 Objectives

The current section documents compiled hydrology information and analysis in support of the feasibility study design of the Troilus Project WMP. This includes:

- An overall overview of the hydrological (surface drainage) system around the Troilus Site.
- Extracting reference flow statistics based on regional and local data.
- Presenting used hydrological design parameters.

2.2 Regional Hydrology

To characterize runoff from natural, undisturbed areas, the historical streamflow records from the regional Broadback River station (9,855 km^2 drainage area, Centre d'expertise hydrique du Québec [CEHQ] ID 080809, CEHQ 2024) were analyzed. Figure 21 presents a summary of the analysis. The mean annual runoff over the 1980 to 2010 period is 567 mm. Mean monthly values vary between 16 mm in March, before the freshet, and 101 mm in May, the main freshet month. In the context of the concurrent Chapais climate station average precipitation, this is equivalent to a volumetric annual runoff coefficient of 57%. The value should be used with caution since the Chapais climate records are not necessarily an accurate representation of the average climate conditions over the 9,855 km^2 Broadback River watershed.

Statistical analysis of valid annual averages between 1972 and 2023 records led to the estimation of 476 mm and 417 mm for annual runoff under 10-year dry and 100-year dry conditions, respectively, and 668 mm and 772 mm for annual runoff under 10-year dry and 100-year dry conditions, respectively (see Table 21).

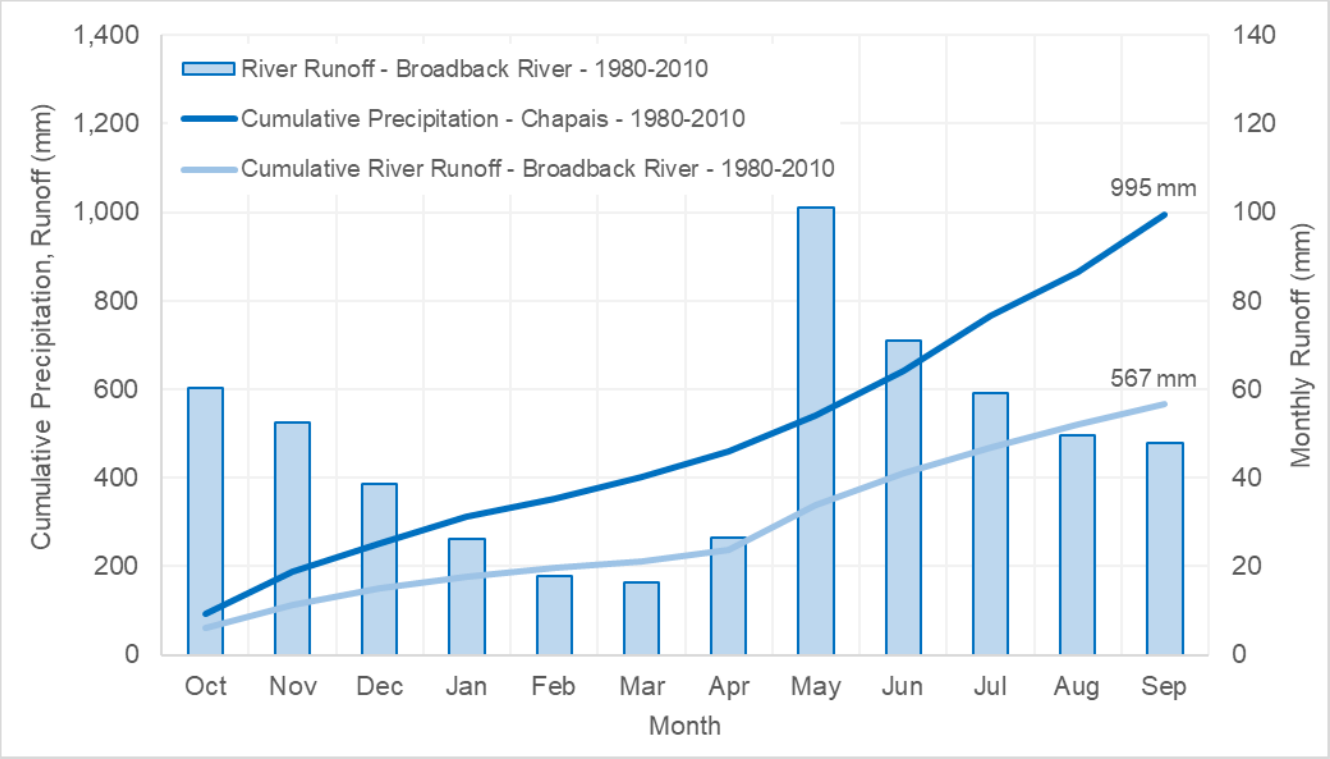


Figure 18: 1980-2010 Mean River Runoff at the Broadback River Station (CEHQ ID 080809)

Table 15: Frequency Analysis on 1972-2023 Annual Runoff at Broadback River Station (CEHQ 080809)

Return Period	Dry Years	Wet Years
2	562	562
10	476	668
25	448	713
50	431	743
100	417	772

In addition to the analysis of streamflow records at the existing gauging stations, the *Atlas hydroclimatique du Québec méridional* (CEHQ 2023) publishes reconstituted, historical streamflow timeseries for rivers and river segments for the period 1970 to 2023 for a large part of southern Québec; the timeseries are the results of numerical simulations based on historical climate data. Although the Troilus Site and its surroundings are not included in the covered area, WSP identified several river segments included in CEHQ (2023) database that are just east of Lac Mistassini and approximately 95 – 140 km distance from the Troilus Site. Selected river segments are five to eleven kilometres long and convey flow between lakes. WSP judges that the differences between the Troilus Site and these watersheds should be small enough that statistics extracted for these river segments give valuable information for the Troilus Site streams; this judgment was verified using local flow data collected at the Troilus Site.

Figure 22 and Figure 23 present the selected river segments and their location relative to the Troilus Site. Table 22 documents the extracted flow statistics (annual average, open-water, and winter averages, 14Q2 high flow, and 7Q10 low flow) for these river segments. Figure 24, Figure 25, and Figure 26 present graphically the same flow statistics and propose regression equations to apply the values to other watersheds.

Figure 19: Selected CEHQ (2023) Database Locations Used to Estimate Regional Flow Statistics

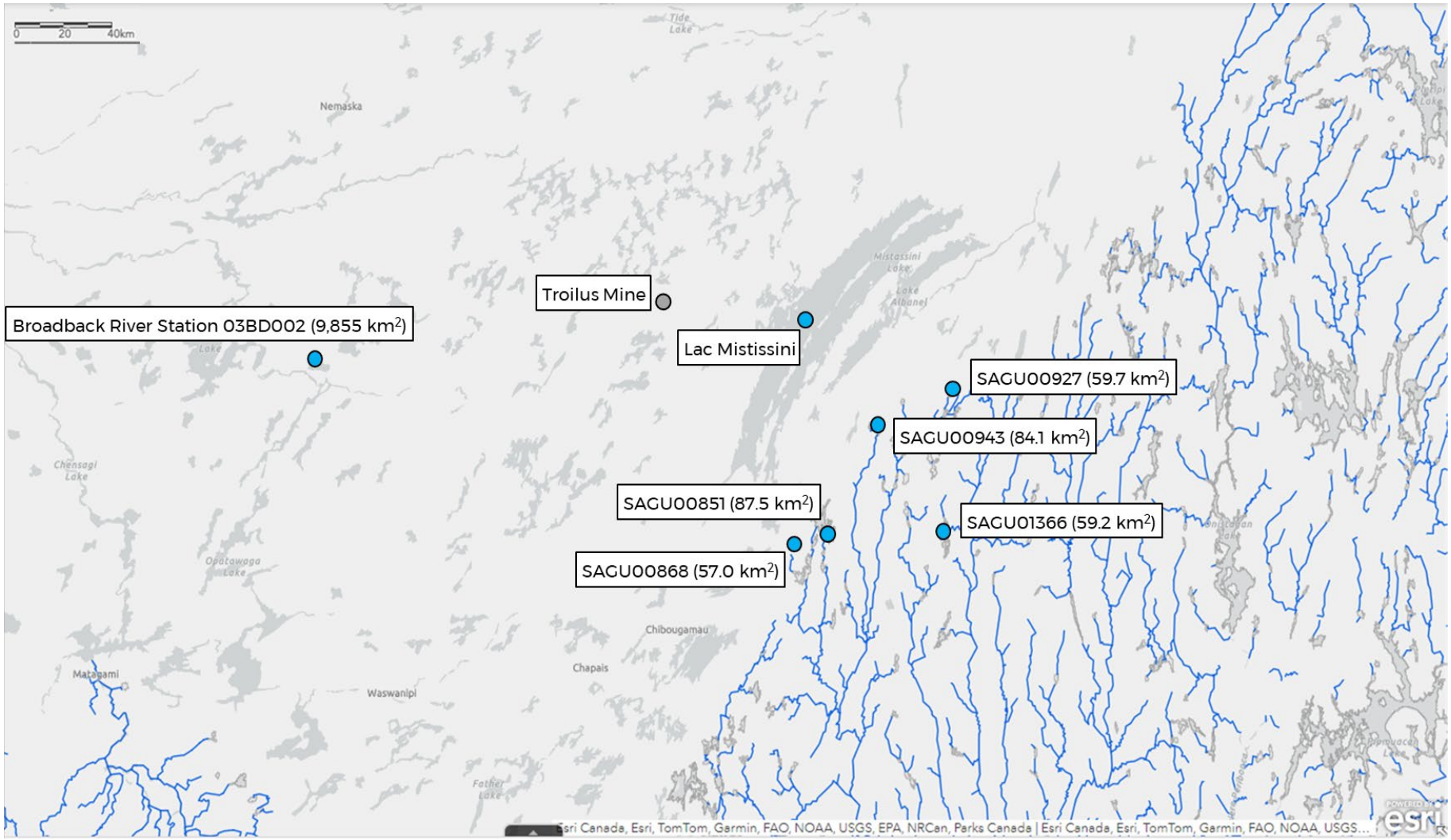


Figure 20: Selected CEHQ (2023) Database Streamlines used to Estimate Regional Flow Statistics

Table 16: 1970-2023 Flow Statistics Extracted from Selected CEHQ (2023) River Segments

Variable	Unit	Value for Selected CEHQ (2023) River Segments				
		SAGU00927	SAGU01366	SAGU00851	SAGU00868	SAGU00943
Drainage Area	km^2	59.7	59.2	87.5	57.0	84.1
Average Annual Flow	m^3/s	1.21	1.26	1.74	1.11	1.69
Average Open-Water Flow	m^3/s	1.74	1.88	2.38	1.60	2.50
Average Winter Flow	m^3/s	0.67	0.62	1.08	0.62	0.87
14Q2 High Flow	m^3/s	3.55	4.52	3.77	3.84	5.66
7Q10 Low Flow	m^3/s	0.42	0.40	0.92	0.33	0.54

Notes: River segment names as used by CEHQ (2023). Flow statistics extracted based on 1970 – 2023 daily timeseries in CEHQ (2023) database. Open-Water Period = May 1 to October 31. Winter Period = November 1 to April 30. 14Q2 = the 14-day average high flow with a 2-year return period. 7Q10=the 7-day average low flow with a 10-year return period.

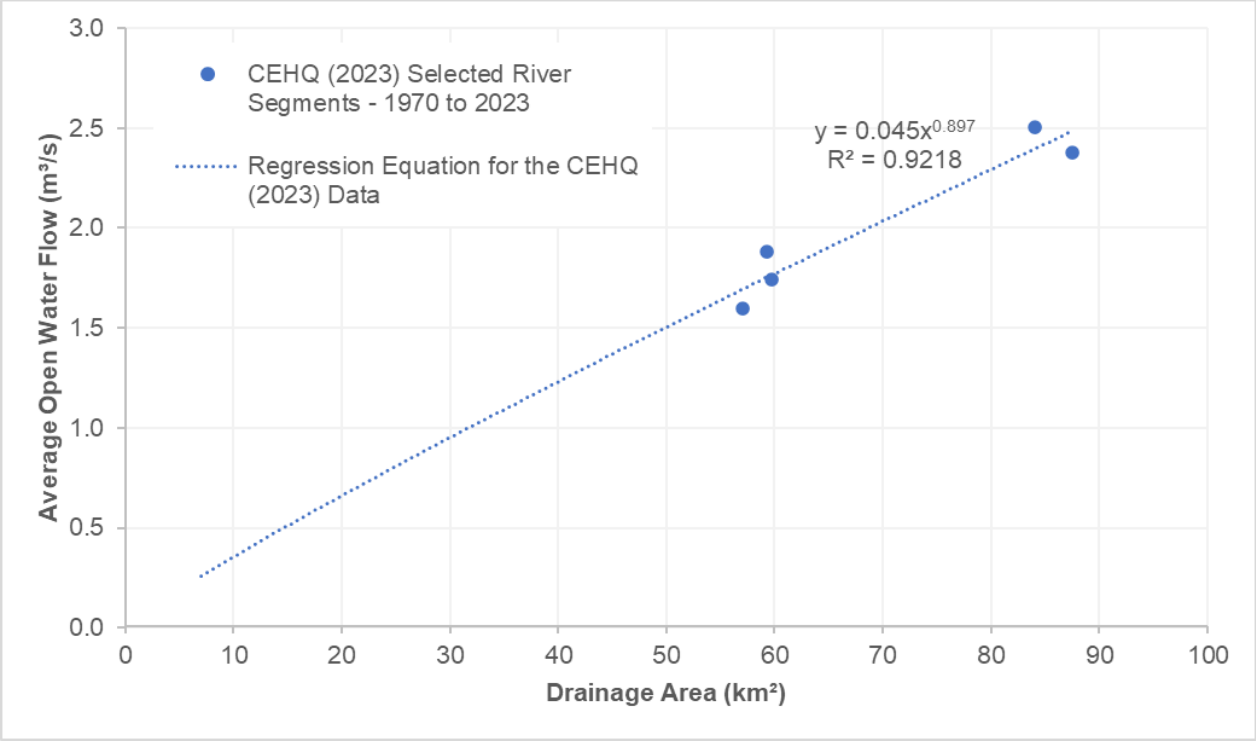


Figure 21: Average Open-Water Flow Statistics Based on Selected CEHQ (2023) 1970 - 2023 Data

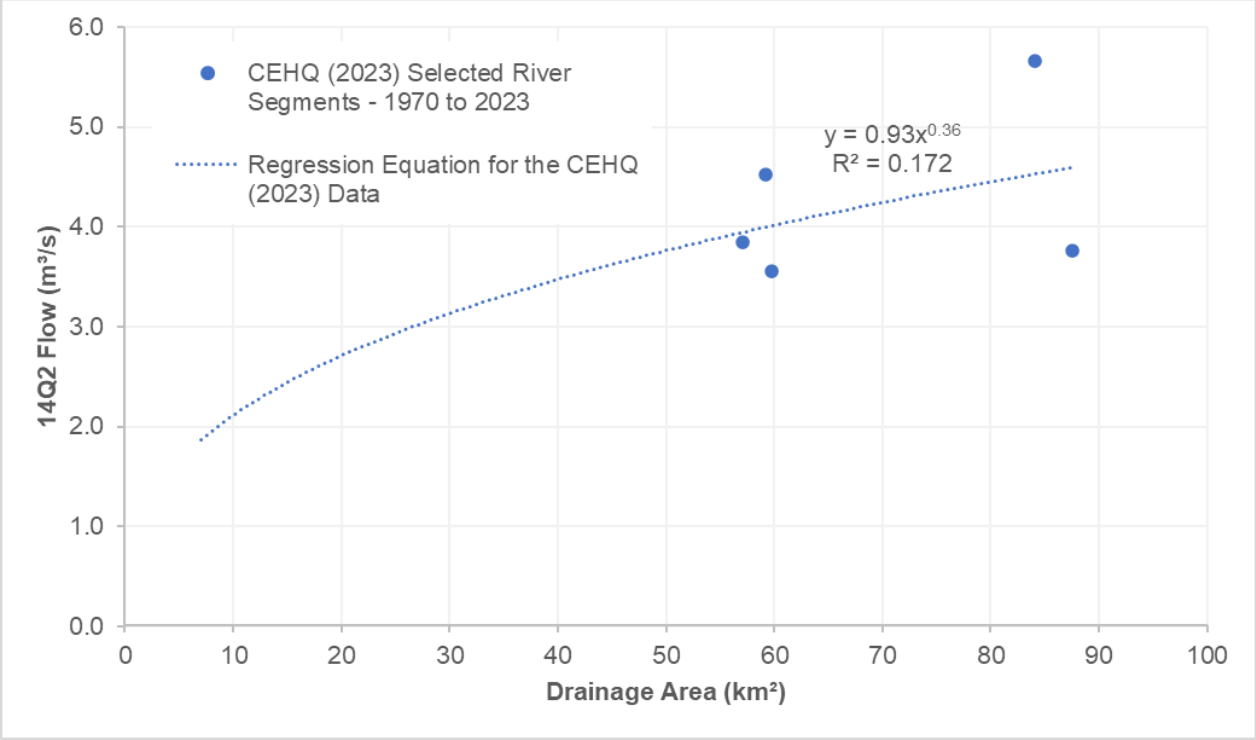


Figure 22: Average 14Q2 High Flow Statistics Based on Selected CEHQ (2023) 1970 - 2023 Data

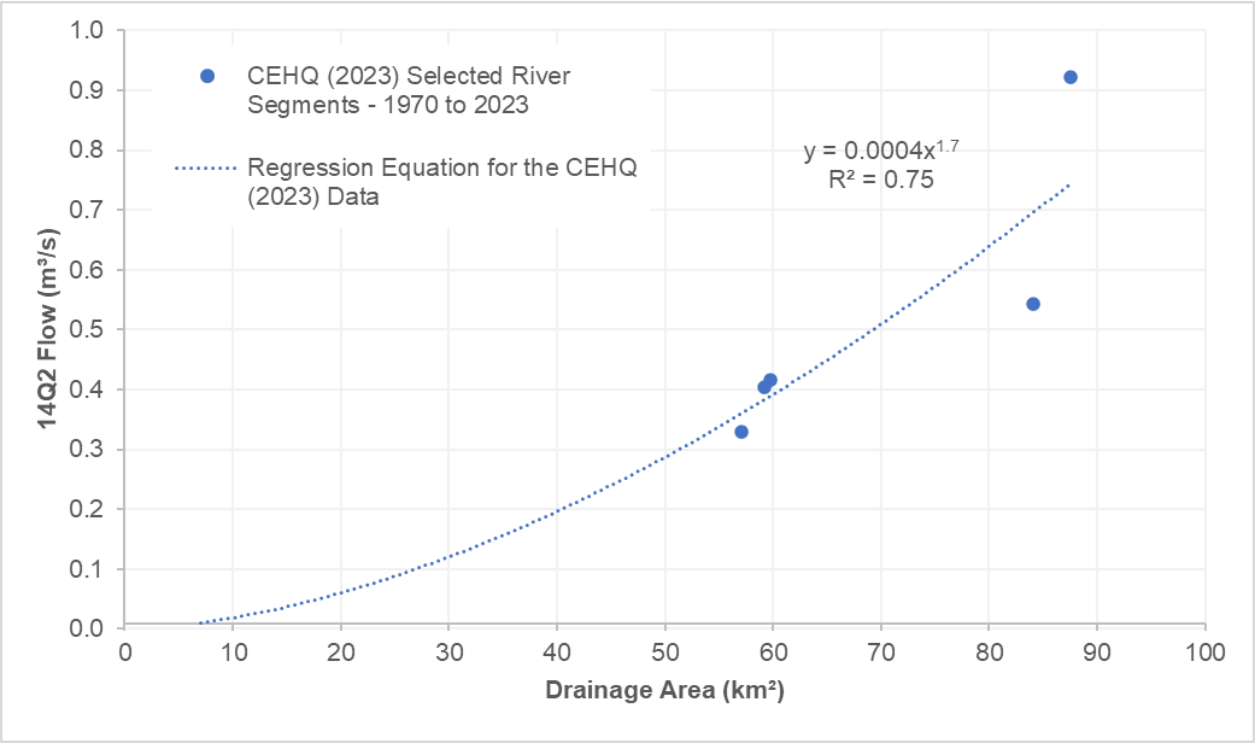


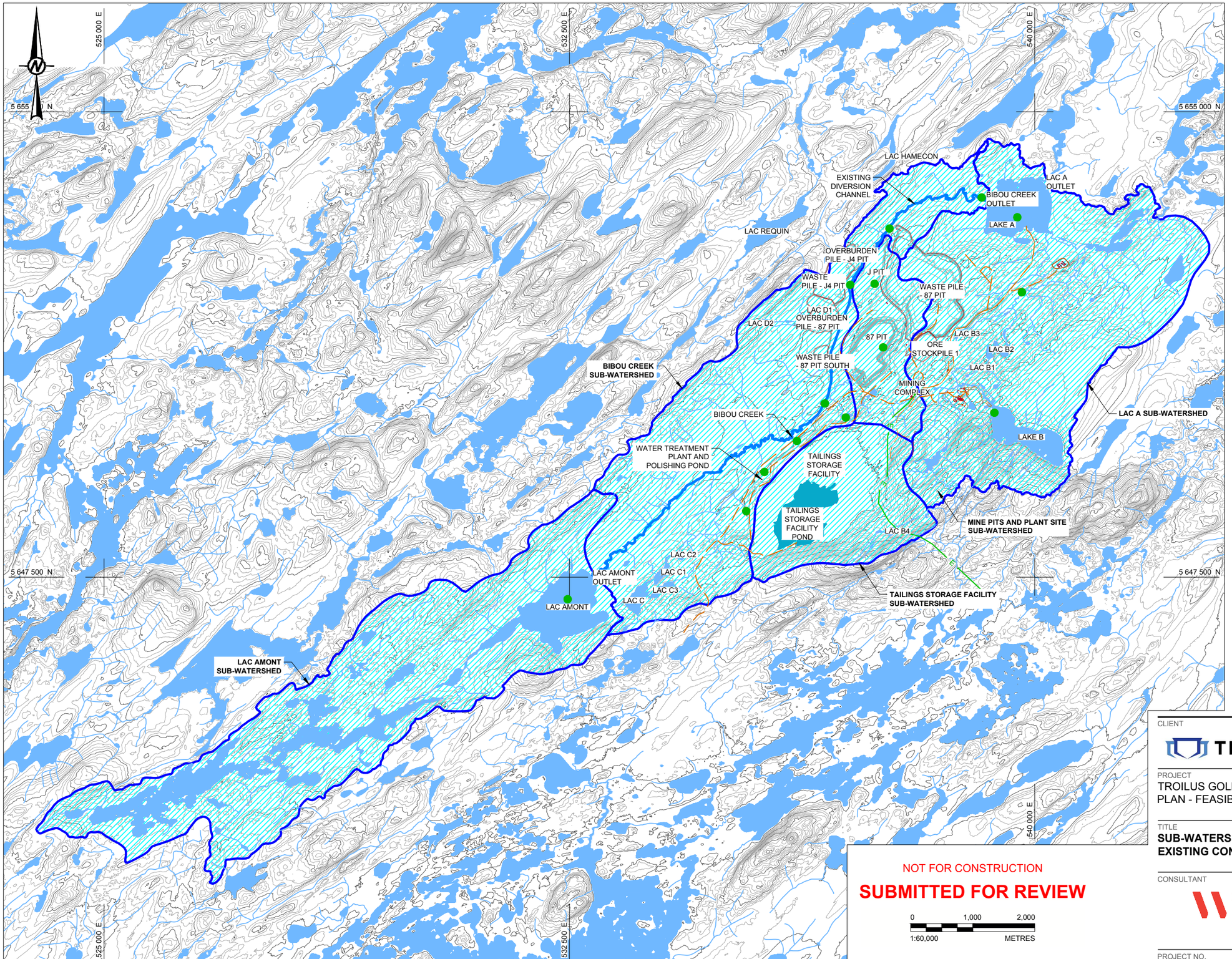
Figure 23: Average 7Q10 Low Flow Statistics Based on Selected CEHQ (2023) 1970 - 2023 Data

2.3 Local Hydrology Data

2.3.1 Hydrological System around the Troilus Site

The Troilus Site (see Figure 27) is located within the Bibou Creek valley between Lac Amont (upstream and to the south) and Lac A (downstream and to the north). Lac Amont has a drainage area of 16.5 km^2, the existing Bibou Creek has a drainage area of 31.2 km^2 at its confluence to Lac A, and Lac A has a total drainage area of 48.2 km^2. The Tailings storage Facility, which discharges water to the Bibou Creek watershed following processing at the water treatment plant, has a drainage area of 5.11 km^2. The existing J Pit, 87 Pit and Plant site, which are all part of Lac A's drainage area, have an approximate combined drainage area of 2.39 km^2. Runoff from this area, as well as groundwater seepage to the existing pits, is released to the Lac A watershed following treatment when required. Other significant water bodies in the vicinity of the site include Lac B, Lac C1, and Lac C2, all within Lac A's watershed.

Downstream of Lac A, water flows through Lac A1 and Lac A2 to Lac Boisfort, which has a drainage area of approximately 290 km^2. Further downstream, the area drains west to the Rupert River and to James Bay.



LEGEND

- TOPOGRAPHIC CONTOUR (5 m INTERVAL) (560)
- BIBOU CREEK AND EXISTING DIVERSION CHANNEL
- EXISTING OVERBURDEN, WASTE AND ORE PILES
- NATURAL STREAMS
- ELECTRICITY TRANSMISSION LINE (2023) (E)
- PROCESS PLANT
- FLOW DIRECTION
- EXISTING ROADS (2023)
- NATURAL LAKES
- TSF POND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- WATERSHED AREAS

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2022.
3. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. COORDINATES SYSTEM : UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 1,000 2,000

1:60,000 METRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SUB-WATERSHEDS EXISTING CONDITIONS

CONSULTANT

wsp

YYYY-MM-DD	2024-05-03
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO. 2257554004 | CONTROL | REV. A | FIGURE 24

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2.3.2 Overview of Available Data

A number of hydrology-relevant field surveys were conducted over time at the Troilus site.:

- Poly-Geo Inc. (2019) documents a study of the flow and sedimentation in Bibou Creek, starting immediately to the south of the existing 87 Pit and continuing downstream through Lac A, A1, and A2 to a location approximately six kilometres north of Lac A outlet. This included photo-interpretation of surface materials, geomorphological analysis of the watercourses and lakes, and assessment of pit dewatering on sedimentary dynamics. A survey of 57 cross-sections on the existing Bibou Creek and diversion is included.
- Wachiih Resources (2019) documents a 2019 hydrological campaign between July and October 2019. Cross-sections were surveyed at eight locations on local watercourses. Continuous water level monitoring was performed at 10 locations, including the eight watercourse locations as well as stations on Lac A and Lac B. A single flow measurement was collected at each of the watercourse locations in July. Flow versus water level relationships were established for the watercourse locations using Mannings roughness estimates, channel slopes, cross-sections, and wetted widths at the time of the survey.
- Wachiih Resources (2024) documents a 2023 hydrological campaign, including three field visits and continuous water level measurements between May and October 2023 in Lac A, Lac Amont, and three streams. Three discrete flow measurements were used to establish flow-water level relationships. Additional cross-sectional bathymetry data and water levels were surveyed.

2.3.3 Lac Amont

Lac Amont collects runoff from a series of narrow lakes to the southwest. There is a possibility of connectivity to an adjacent watershed on the north side of Lac Amont at the location noted in Figure 27. WSP used the available LiDAR (Ministère des Resources Naturelles et des Forêts [MRNF] 2019) to extract the lake's stage-storage relationship above the 380.6 m normal water level (see Figure 28). The lake area varies between 1 and 1.3 km^2; the lake stores approximately 1.1 M m^3 of water within 1 m water depth above 380.6 m.

Based on three 2023 open-water season flow measurements, Wachiih (2024) reports lake outlet flow values between 0.09 and 0.27 m^3/s. WSP used numerical modelling to estimate lake outlet flood flows between 0.83 m^3/s (2-Year flood) to 3.6 m^3/s (100-year flood). The flood flows are small relative to 16.5 m^3/s lake watershed, a consequence of the lake's flood attenuation effect.

Table 17: Lac Amont Effluent Flow Statistics

Variable		Unit	Lac Amont Outflow
Drainage Area		km^2	16.2
2023 Flow Measurements (Wachiih 2024)		m^3/s	0.09 to 0.27
Modelled Flood Flows [(a)]	2-Year High Flow	m^3/s	0.83
	10-Year High Flow	m^3/s	1.45
	100-Year High Flow	m^3/s	3.61

Notes:

(a) WSP used the climate analysis presented in this document to simulate flood flows. HEM-HMS 4.10 software was used to model runoff through the Lac Amont system to the outlet to Bibou Creek.

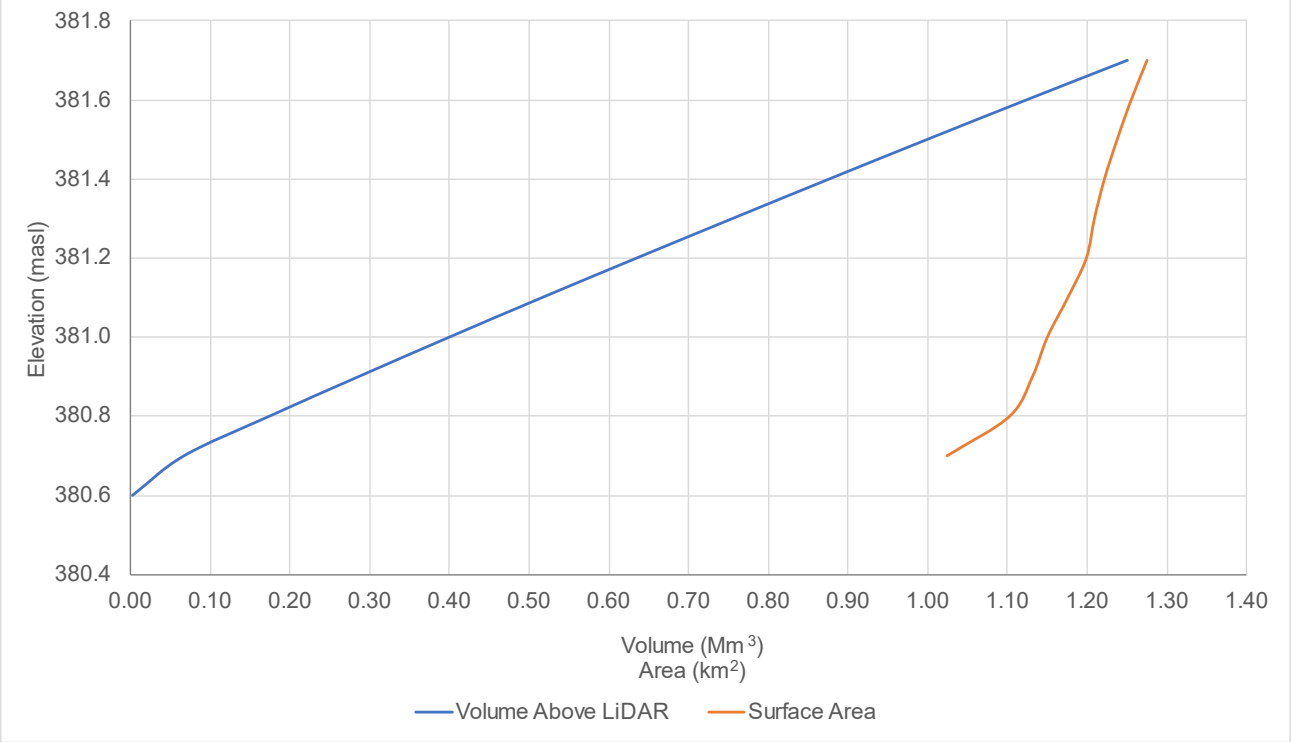

Figure 25: Lac Amont – State-Storage Curve

2.3.4 Bibou Creek

Bibou Creek, shown in Figure 30, flows through the Troilus project site, conveying flow from Lac Amont to Lac A. The creek is a twelve km long meandering channel. This length includes an approximately 3.5 km long diversion, which was constructed in the mid-1990s during the original project development to convey flow around the 87 Pit and the J Pit. The creek is one to four meters wide, with typical flow depths of around 0.3 m to 1.2 m and estimated bankfull depths up to 1.5 m. The profile of the existing Bibou Creek is shown in Figure 29. Longitudinal slopes of the creek are typically between 0.03% and 1.7%.

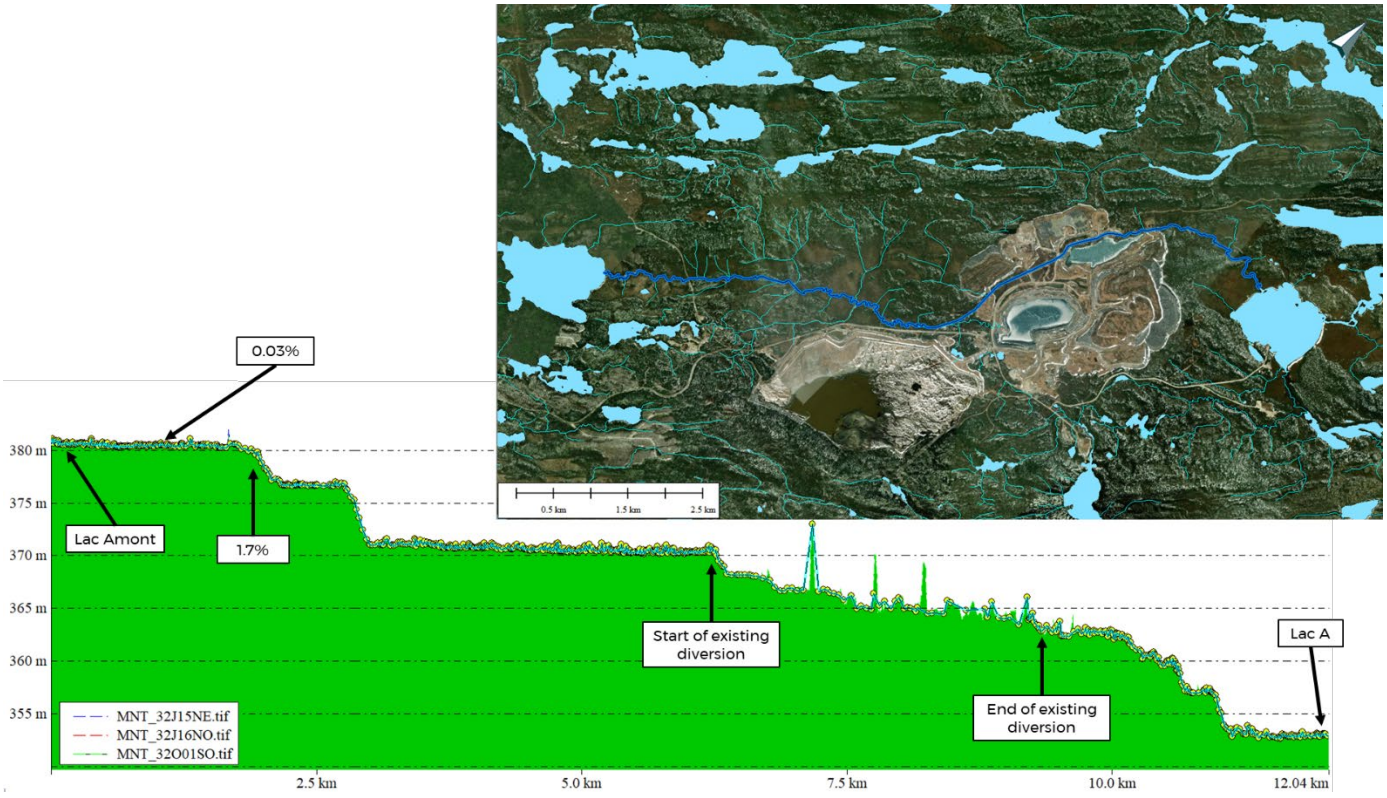

Figure 26: Existing Bibou Creek Profile (Based on Available LiDAR Elevation Information, MRNF 2019)

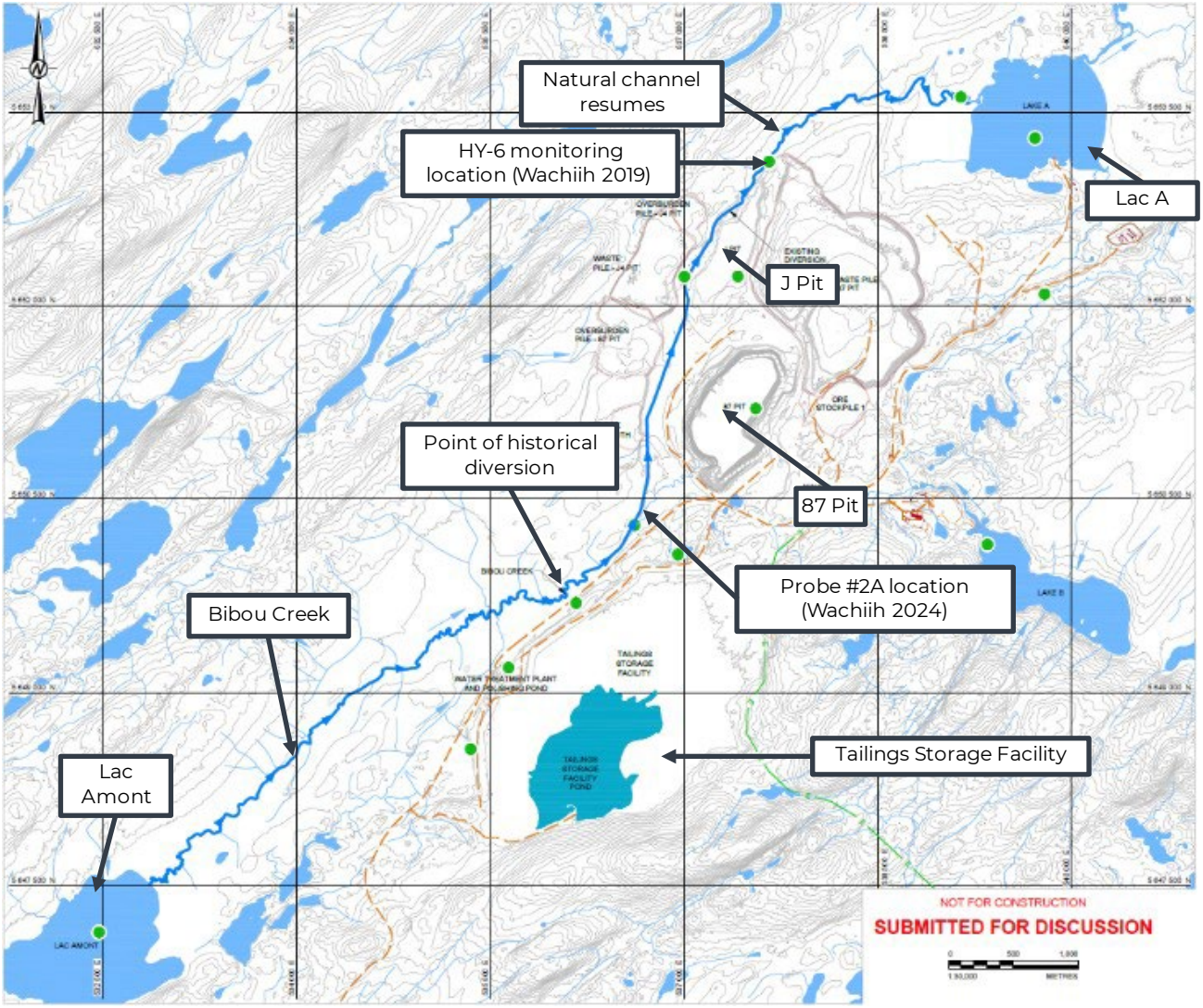

Figure 27: Bibou Creek - Existing Conditions

Flow statistics for Bibou Creek are shown in Table 24. They were estimated for a point about two kilometres upstream of the outfall to Lac A, north of the existing J Pit, using the CEHQ (2023) database (see discussion in Section 2.2) and Wachiih (2019) and Wachiich (2024) information. This location was designated HY-6 during the 2019 field program (Wachiih 2019), when a measured flow of 0.57 m^3/s in July 2019 was recorded. Wachiich (2024) reports three flow measurements between May and October 2023 and at a more upstream location (just south of 87 Pit), ranging from 0.08 m^3/s to 0.40 m^3/s.

Average annual flows were estimated at 0.66 m^3/s; they were estimated to 1.0 m^3/s during the open-water season and 0.32 m^3/s during the cold season. Further estimated statistics include a 0.07 m^3/s 7Q10 low flow and 3.3 m^3/s high flow.

Table 18: Estimated Bibou Creek Historical Flow Statistics

Variable	Unit	Existing Bibou Creek at Station HY-6, near the Confluence to Lac A
Drainage Area	km^2	31.2
Average Annual Flow	m^3/s	0.66
Average Open-Water Flow	m^3/s	1.0
Average Winter Flow	m^3/s	0.32
14Q2 High Flow	m^3/s	3.3
7Q10 Low Flow	m^3/s	0.07
Flow recorded in July 2019 (Wachiih 2019)	m^3/s	0.57
Flows recorded in May – October 2023 (Wachiih 2024)	m^3/s	0.08 – 0.40 (measured at a more upstream location)

Notes: Flow statistics extracted based on 1970 – 2023 daily timeseries in CEHQ (2023) database. Open-Water Period = May 1 to October 31. Winter Period = November 1 to April 30. 14Q2 = the 14-day average high flow with a 2-year return period. 7Q10=the 7-day average low flow with a 10-year return period.

2.3.5 Lac A

Troilus provided recorded water levels for Lac A between January 1997 and March 2011 as shown in Figure 31. The maximum recorded water level was 352.96 masl, in April 2005. The minimum recorded water level was 351.82 masl, in December 2001. The average water surface elevation during the time of record was 352.52 masl.

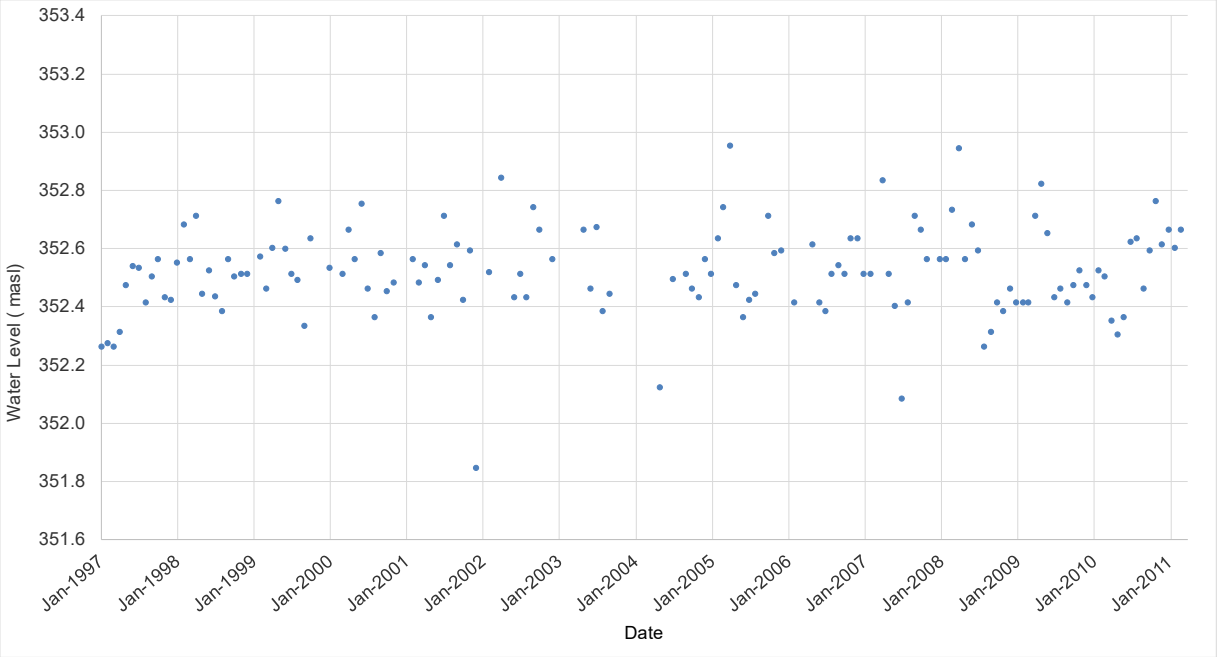

Figure 28: Lac A Historical Water Levels

2.3.6 Other Local Data

Troilus collected 2018, 2022, and 2023 bathymetry data for waterbodies in and around the project site, including Lac Amont, Lac A, Lac B and Lac C, as part of various hydrometric programs.

2.4 Hydrological Design Parameters

For the feasibility study design of water management structures, WSP applied the Soil Conservation Service Curve Number (SCS CN) number method (USDA 1986) to calculate the runoff losses during a short-term (i.e. few hours up to few days) extreme rainfall or rain-on-snow methods. The CN values were selected based on the applicable land cover and soil type and using available literature (HEC-HMS, 2022) and professional experience. Table 25 presents the selected values.

Table 19: Hydrological Design Parameters - Selected SCS CN Values

Land Type	Selected CN Value
Natural area, wooded	60
Natural Area, vegetated	71
Cleared area of the mine site	86
Overburden dumps and built areas (includes plant site)	91
Waste rock dump	72
Tailings Beach	94
Mine Pit Area	93
Pond area (including wetland)	100 (no losses during the short-term events)

Note: Selected CN values account for the material and soil type properties, available literature (e.g. United States Army Corps of Engineers [USACE] 2023), and WSP's professional experience.

For the site-wide water balance, a precipitation-runoff model was developed to calculate daily runoff amounts for each land type on the mine site. The conceptual model considers surface retention, shallow and deep infiltration, evapotranspiration losses, and the time-delayed response of a watershed to a rain or snowmelt input. The runoff model is described in more detail in the technical memorandum dedicated to the site-wide water balance analysis (Appendix L). Model parameters were selected considering the regional data, as described in Section 2.1 and WSP's understanding of the hydrological behaviour of different land types.

Table 26 below presents the resulting annual average runoff coefficients calculated by the model for the different land types. The runoff coefficients for individual rainfall or rain-on-snow events vary with the size of the events and with the antecedent moisture conditions.

Table 20: Estimated Annual Runoff Coefficients for the Land Types Used in the Water Balance Model

Land Type	Annual Runoff Coefficient (% of Total Precipitation) [(a)]
Overburden dumps, built areas	68
Cleared area of the mine site	68
Waste rock dumps	60
Natural area, wooded	58
Natural Area, vegetated	58
Tailings Beach	77
Mine Pit Area	86
Pond area (including wetland)	100 – not including evaporation or sublimation losses

Notes:

(a) The annual runoff coefficients are summary results of daily calculations that include evapotranspiration and infiltration losses and that account for antecedent moisture conditions near the surface. The daily effective runoff coefficients vary with the intensity of the rain and snowmelt event.

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APPENDIX D

Bibou Creek Stream Diversion

1.0 DESIGN BASIS, CRITERIA AND CONSIDERATIONS

1.1 Background of Design

In 2022, Golder Associates Ltd. prepared on behalf of Troilus Gold Ltd. (Troilus) an initial site-wide water management plan for their Troilus Project (Golder 2022). This water management plan included a design of the main diversion channel, shown in Figure 1. The channel was designed to contain the 100-year design flow with a minimum 0.3 m freeboard and included erosion protection that would be stable in events up to the 100-year design flow. The channel was approximately 10 km long with a 0.62 km long section that was to be constructed infill. The longitudinal slopes were between 0.1% and 6.7%. The PFS plan incorporated a dam at the Lac Amont outlet with an average height of four meters, which would increase the water level in Lac Amont by up to three meters and would allow the Main Diversion Channel to be moved out of the valley floor to reduce excavation and increase space for project infrastructure.

In 2023, WSP was retained by Troilus to advance the design of the surface water management plan to a feasibility level study (FS). Part of this work included updating and refining the design of the main diversion channel. In May 2023, an options analysis of the main diversion channel was completed to incorporate feedback from local communities and stakeholders to reduce the impact of the mine plan and diversion channel on the local waterbodies (WSP 2023a). WSP studied the following alternative options to the PFS concept:

1) Adjust the diversion channel alignment and design such that the diversion dam is not required (eliminate Lac Amont water level increase). Two sub-options were considered:
   - The J Waste Dump remains as a buttress to the Tailings Storage Facility (TSF) Dam such that the diversion channel is required during the operational period and at closure.
   - A corridor is left between the J Waste Dump and the TSF Dam, which is used at closure for a drainage channel. The diversion channel is dismantled as part of the reclamation period.
2) Remove the diversion channel around the open pits and the waste dumps from the Stormwater Management Plan. A corridor is left between the J Waste Dump and the TSF Dam. A channel (partially the original Bibou Creek, partially a constructed channel) conveys the Bibou Creek water to either the 87 Pit or the J Pit, from where it is pumped to Lac A. The mining sequence is adjusted so that one of the two pits can serve at any given time for water storage.

Following a discussion with Troilus, Option 1 was selected to be progressed to the FS-level design. During the design of the FS-level Surface Water Management Plan, the Main Diversion Channel was renamed the DC1 Bibou Creek Diversion (DC1).

The DC1 channel is approximately 9.7 km long. The channel follows a similar alignment to the PFS Main Diversion Channel but was adjusted to maintain the connection to Lac Amont without impacting the normal water surface elevation of the lake. Additional adjustments included:

- Incorporation of fish passage and fish habitat features into the channel design.
- Adjustment of the longitudinal slope of the channel to reduce the maximum required riprap size to 500 mm, to make use of available mine waste rock and reduce processing efforts.
- Incorporate the new X22 pit expansion on the west side of the project area adjacent to the 87 Pit footprint.

- Moved the diversion alignment away from the “Fishhook Lake” to the west of the project area to reduce potential impact to adjacent watersheds.
- Removal of the upstream Lac Amont dam and incorporation of a smaller flood protection berm to divert the 100-year flow from the Bibou Creek floodplain into the diversion.

1.2 Available Information and Data

The information outlined in Table 1 below describes the available external data used in the feasibility design of the stream diversion system.

Table 1: Available Data

Data	Source Date	Date Received	Prepared by	Source
AGP Mining Consultants Inc. (AGP) Mine Schedule V9 50ktpd	February 10, 2024	February 10, 2024	AGP	AGP Mining Consultants Inc.
Lac A Water Level Data		May 15, 2023		Troilus
État de référence du milieu récepteur. Étude sur le mouvement du poisson dans le ruisseau Sans Nom – Version préliminaire.		May 17, 2023	Wachiih	Troilus
220507-MFFP-LiDAR-1m	2019	June 27, 2023	Government of Quebec	Government of Quebec
Characterisation habitat des poisons	January 21, 2019	August 1, 2023	Wachiih	Troilus
Lake A and B Bathymetry Final Report	January 2019	August 2, 2023	Wachiih	Troilus
Hydrology – Reference Study – Troilus Mining Project	March 22, 2024	March 22, 2024	Wachiih	Troilus

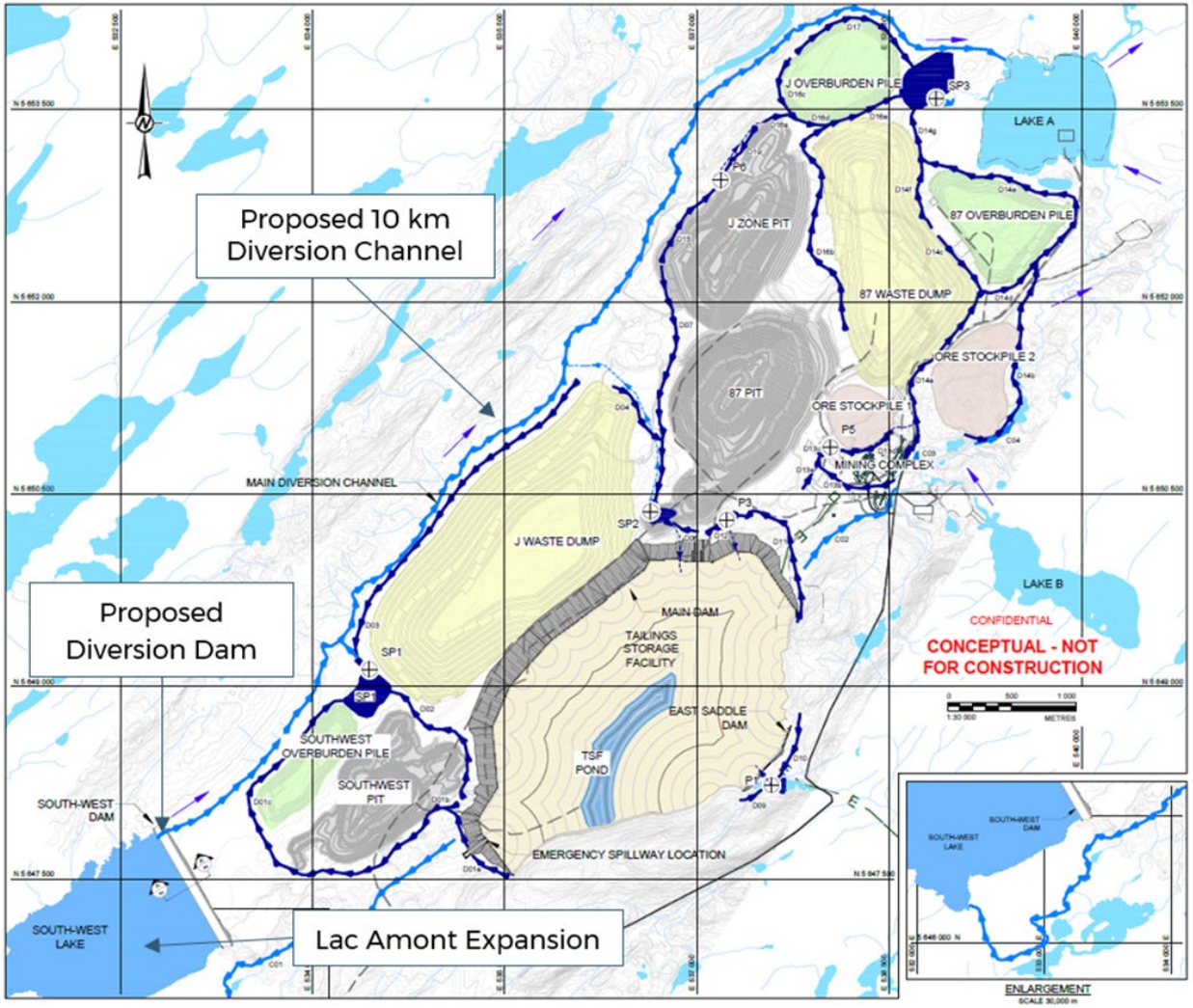


Figure 1: Early Concept (Before the Feasibility Study) Site Wide Water Management Plan - Ultimate Project Development

1.3 Design Criteria and Considerations

The feasibility design of the diversion channel refines the design outlined in the pre-feasibility study. For the feasibility study further hydrological, geotechnical, hydraulic, and environmental assessments/analyses were conducted. Special consideration was also given to maintaining fish habitat and passage through the channel. Table 2 below outlines the design criteria and considerations used in the design of the stream diversion system.

Table 2: Design Criteria

Item Description	Design Basis, Criteria and Considerations	Information Sources
Design Life	Operational portion of channel: ▪ During the life of Mine. Less than 30 years. Closure portion of channel: ▪ Long-term sustainability	Proposed Water Management Plan
Coordinate System	NAD_1983_UTM_Zone_18N	
Topographical Data	1.0 m LiDAR	Quebec (2019)
Hydrologic		
Determination of Design Flood Discharges	Calculated with HEC-HMS (Hydrologic Engineering Center and Hydrologic Modeling System) (US Army Corps of Engineers [USACE] 2021)	Industry Standard
Geotechnical		
Side Slopes	In Bedrock: 1H:1V In Till: 2.5H:1V	Assumed
Aquatic		
Fish Passage	Fish Passage must be provided between the 7Q10 low flow and 14Q2 high flow conditions	Recommended
Hydraulic		
Design Flow Event for Flow Conveyance	Contain the 100-year flood event based on historical climate selected	Directive 019 (MELCCFP, 2022)
Freeboard	Minimum 0.3 m above the 100-year water depth, to be provided with access road construction adjacent to the channel, where practical.	Recommended; industry practice.
Design Flood Event for Erosion Protection	Design for the non-erodible 100-year flood event	Directive 019 (MELCCFP, 2022)
Minimum Channel Bottom Width	Minimum channel bottom width of 2 m (not including low flow channels)	For constructability, with consideration of equipment expected to be used.
Channel Materials		
Erosion Protection Material Selection	Maximum riprap size of 500 mm	Sourcing from Run-of-Mine blast rock
Bedding Material Requirements	Filter layers – sandy gravel, cobble, as required by erosion protection material size	

Fish Passage Design Criteria

The channel is designed to provide fish passage for conditions between the 7Q10 low flow and 14Q2 high flow conditions:

- 7Q10 refers to the annual minimum 7-day average flow rate with a 10-year occurrence interval (May to October).
- 14Q2 refers to the annual maximum 14-day average flow rate with a 2-year occurrence interval.

As described in Section 5.1, the Walleye and the Burbot were selected as the design species. Walleye are the main species that will make use of the channel during spring freshet. The 14Q2 high flow event was selected as the representative spring freshet event. Flow velocities during this period were assessed against the Walleye's maximum swimming ability over a 25 m distance against a 1 m/s current. The lower swimming capacity of the burbot was considered by including frequent shelter places in the design; the maximum flow velocities limits for Burbot were not imposed as design constraints for the entire 7Q10 – 14Q2 flow interval.

Table 3 below outlines the maximum distances Burbot and Walleye can travel, given the flow velocity.

Table 3: Maximum Distance Over Which Burbot and Walleye can Travel without Shelter Given the Flow Velocity During High Flow Events (Katopodis, 2016)

Swim Distance	Maximum Flow Velocity for Burbot (m/s)	Maximum Flow Velocity for Walleye (m/s)
3	1	2.2
25	-	1.0
100 - 300	0.1	0.4

To maintain passage during the representative low flow 7Q10 event, the channel was designed to have a minimum water depth of 0.1 to 0.2 m.

Other Design Criteria

Other design considerations are listed below.

- Reduce use of erosion protection materials.
- Reduce excavation volumes.
- Minimize impact on existing infrastructure, where practical.

2.0 HYDROLOGICAL ASSESSMENT

HEC-HMS (Hydrologic Engineering Center and Hydrologic Modeling System) (USACE 2021) was used to simulate peak design flows for the DC1 diversion channel. The model's data inputs include meteorological and hydrological data, drainage areas, Curve Number (CN) values, and lag times to determine peak design flows.

2.1 Hydrologic Inputs

Climate design inputs (extreme, short-term rain statistics) are described in Appendix C. WSP used the 100-Year, 24-Hour extreme rainfall event as a design event for ditches and channels; the Soil Conservation Service (SCS) Type 2 distribution was used.

2.2 Drainage Areas and CN Values

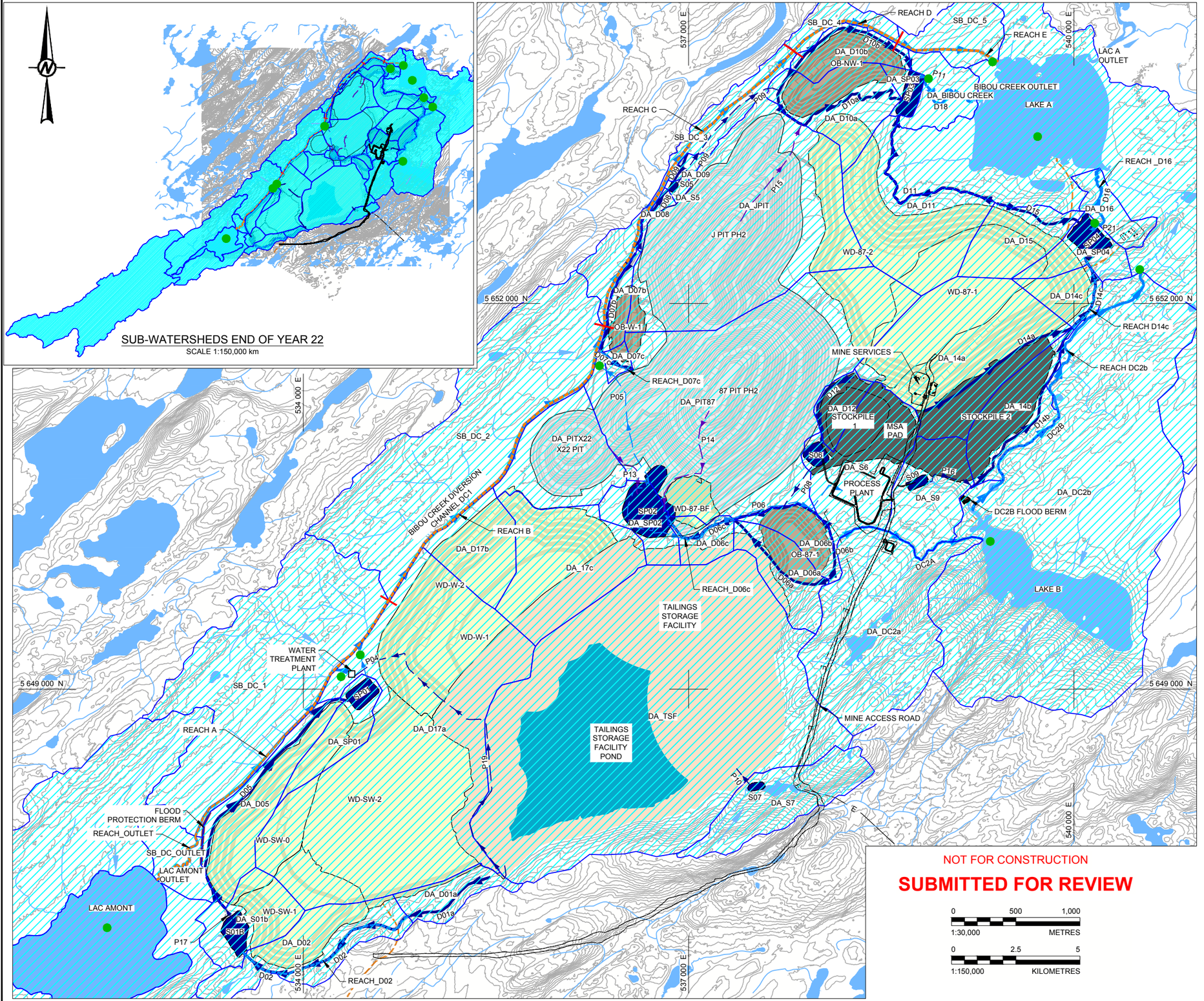
The drainage areas were delineated using a Digital Terrain Model (DEM) and topographic contours derived from provincial 2019 LiDAR with 1m resolution (Quebec 2019) and mine plan information, including pit and dump boundaries and surface contours from AGP. Existing surface drainage features were incorporated. Streamflow paths were delineated based on the drainage areas and existing and future mine plan topography. Drainage areas and streamflow paths are shown in Figure 2.

SCS CN and SCS Unit Hydrograph methods (US Department of Agriculture [USDA], 1986) were estimated for the HEC-HMS model. The SCS-CN method is an empirical technique used to estimate rainfall-runoff volume in small watersheds, with CN being an empirically derived parameter calculating direct runoff from a rainfall event. CN values range from 100 (for water bodies) to approximately 30 for permeable soils with high infiltration rates. The value depends on soil type, condition, and the land use and land cover (LULC) of an area.

In 2021, WSP completed terrain mapping of the project area (WSP 2021). This terrain mapping was cross-referenced with the mine plan to develop an estimate of the land type distribution for each drainage area contributing to the DC1 diversion channel. The proposed land type and Curve Number (CN) value were determined using the terrain map's land type and future mine plan for the area, as tabulated in Table 4.

Table 4: Hydrological Design Parameters – Selected SCS CN Values

Land Type for HEC-HMS Model	Terrain Map Analogue	CN Value
Overburden dumps, built areas		91
Cleared area of the mine site	Anthropocene	86
Waste dump (rock)		72
Natural area, wooded	Morainal (Till)	60
Natural Area, vegetated	Organic	71
Tailings Beach		94
Mine Pit Area		93
Pond area (including wetland)	Waterbody	100



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SUBMITTED FOR REVIEW

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1:30,000 METRES

0 2.5 5
1:150,000 KILOMETRES

WATER MANAGEMENT

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- P## — CLEAN WATER PIPELINE (PUMPING)
- P## — CONTACT WATER PIPELINE (PUMPING)
- P## — PIT DEWATERING
- FLOW DIRECTION
- NATURAL WATERCOURSES
- NATURAL LAKES
- TSF POND
- SP## — SEDIMENTATION POND (CONTACT WATER)
- S## — SUMPS / PUMP STATION (CONTACT WATER)
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- WASTE DUMP
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- PROCESS PLANT
- E — RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD
- WATERSHED AREAS
- DIVERSION REACHES FLOW PATH
- DITCH REACHES FLOW PATH

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END-OF-MINE-LIFE SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN
SUB-WATERSHEDS END OF YEAR 22

CONSULTANT

wsp

YYYY-MM-DD	2024-05-03
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO. 2257554004 | CONTROL | REV. A | FIGURE 02

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

0 25 mm

Path: \\pp04r.qds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-QLD-2257554004\02_PRODUCTION\FIGURES | File Name: 2257554004FIG015.dwg | Last Edited By: tfeterne Date: 2024-05-03 Time:2:12:30 PM | Printed By: TFeterne Date: 2024-05-03 Time:2:32:56 PM

2.3 Lag Times

SCS unit hydrograph method was applied to simulate the design flows in HEC-HMS. This method requires Lag time and curve number (CN) as input. The lag time was determined from the delineated streamflow flow paths and was calculated using the curve number of the watershed, slope, and area of the basin flow paths as input and time of concentration (T_c) for each sub-basin.

The lag time and the total time of concentration (T_c) are calculated using the time of Concentration and Travel time equations (USDA 1986). The total time of concentration (T_c) is the sum of Travel time (T_t) values for the various consecutive flow segments in a flow path (sheet flow, shallow concentrated flow, and channel flow).

The travel time (T_t) is calculated for each individual flow path and their flow segments based on the sheet flow, shallow concentrated flow, and open channel flow.

- Sheet flow over plane surfaces usually occurs near the ridgeline that defines the watershed boundary. Sheet flow typically occurs for no more than 100 feet (30 meters) before transitioning to shallow concentrated flow. The travel time (T_t) is computed based on the Manning's kinematic solution.
- Shallow concentrated flow collects in swales, small rills, and gullies. The shallow concentrated flow velocity (V) is calculated as a function of terrain slope and roughness.
- Open channel flow occurs when the shallow concentrated flow meets the proposed designed diversion channel or the contact ditches. Natural channels are identified from aerial imagery or site topography. Manning's equation is used to estimate average flow velocity.

2.4 Summary Table

Table 5 summarizes the HEC-HMS inputs for each hydraulic reach of the DC1 diversion channel, including drainage area, CN values, and calculated lag times.

Table 5: HEC-HMS Input Parameters

HEC-HMS ID	Description	Sub-Basin Drainage Area (km^2)	CN Value	% Impervious	Lag Time (min)
SB_01	Drainage area upstream of Lac Amont, including upstream lakes	10.4	71	20%	350
SB_02	Drainage area around Lac Amont	4.7	71		49
Lac Amont	Waterbody	1.2	100	100%	Not applicable
SB_DC_Outlet	Drainage area between Lac Amont and the start of the diversion	0.26	71	0	21
SB_DC_01	Diversion, Sta 0+000 to 2+406	1.9	71	0	40
SB_DC_02	Diversion, Sta 2+406 to 5+219	2.0	71	0	43
SB_DC_03	Diversion, Sta 5+219 to 7+912	0.43	71	0	37
SB_DC_04	Diversion, Sta 7+912 to 8+834	0.16	71	0	14
SB_DC_05	Diversion, Sta 8+834 to 9+657	0.31	71	0	38

Channel reaches, which serve as collectors for upstream segments, also had separate lag times calculated for the length of the channel to estimate the flow concentration time from upstream drainage areas. These lag times are shown in Table 6.

Table 6: Reach Lag Times

Structure ID	Lag Time (min)
Reach_Outlet	36.6
Reach A	42.6
Reach B	52.6
Reach C	49.0
Reach D	6.1
Reach E	5.6

2.5 HEC-HMS Results

HEC-HMS outputs for the 100-year summer event are shown in Table 7.

Table 7: HEC-HMS Outputs

Hydrologic Element	Description	Total Contributing Drainage Area (km2)	Peak 100-Year Discharge (m3/s)
SB_01	Lakes upstream of Lac Amont	10.4	18.3
SB_02	Lac Amont runoff area	4.68	30.4
Lac Amont	Lac Amont Waterbody	1.19	49,0
UpstreamLake	Total flow out of Lac Amont	16.3	3.6
Reach-Outlet	Flow conveyed from upstream areas toward diversion	16.3	3.6
SB_DC_Outlet	Flow from local drainage area around Lac Amont Outlet	0.26	2.9
DC_Outlet	Total runoff through Lake A Outlet toward diversion	16.5	3.7
Reach-A	Flow conveyed from upstream areas	16.5	3.7
SB_DC_1	Flow from local drainage area	1.94	14.5
DC_A	Total flow through DC1, Sta 0+000 to 2+403	18.5	17.4
Reach-B	Flow conveyed from upstream areas	18.5	17.4
SB_DC_2	Flow from local drainage area	2.00	14.2
DC_B	Total flow through DC1, Sta 2+403 to 5+218	20.5	25.1
Reach-C	Flow conveyed from upstream areas	20.5	24.9
SB_DC_03	Flow from local drainage area	0.42	3.3
DC_C	Total flow through DC1, Sta 5+218 to 7+913	20.9	25.6

Table 7: HEC-HMS Outputs

Hydrologic Element	Description	Total Contributing Drainage Area (km2)	Peak 100-Year Discharge (m3/s)
Reach-D	Flow conveyed from upstream areas	20.9	25.5
SB_DC_04	Flow from local drainage area	0.16	2.2
DC_D	Total flow through DC1, Sta 7+913 to 8+833	21.1	25.7
Reach-E	Flow conveyed from upstream areas	21.1	25.7
SB_DC_05	Flow from local drainage area	0.31	2.4
DC_E	Total flow through DC1, Sta 8+833 to 9+654	21.4	26.2

2.6 Significant Flow Statistics for Fish Passage Assessment

Based on the regional hydrology assessment conducted for this project (see Section 2.2 in Appendix C of the main report), the 7Q10 low flow, average annual flow, and 14Q2 high flow rates were calculated for the DC1 channel. These flows are summarized in Table 8.

Table 8: Flow Rates Utilized in DC1 Design

Flow Event	Upstream (Sta 0+000 to 2+403) Flow Rate (m^3/s)	Downstream (Sta 2+403 to 9+654) Flow Rate (m^3/s)
7Q10 Low Flow	0.03	0.04
Average Annual Flow	0.56	0.70
14Q2 High Flow	2.5	2.8

3.0 GEOTECHNICAL ASSESSMENT

3.1 Overview of Ground Conditions

Geotechnical conditions were assessed along the length of the DC1 diversion channel. Boreholes (BH) were selected based on proximity and representative topography to characterize the in-situ material. Conditions are summarized in Table 9. The station numbers in Table 9 are shown in Drawing C200 in Appendix J, and in below. Borehole data is from WSP (2022b) and WSP (2023b).

For locations where boreholes were scheduled at the time of design but had not been completed, values for bedrock depths and peat thicknesses were inferred based on surficial geology and other boreholes. These assumptions should be confirmed during detailed design.

Table 9: Geotechnical Condition by Reach

Segment	Station	Borehole	Distance from Diversion (m)	Bedrock Depth (m)	Summary of Sub-Surficial Material	Peat Thickness (m)
1	0+000 to 0+100	BH-23-14-TP	67	10 (inferred)		1.2 (inferred)
2	0+100 to 0+700	MW-21-10	95	5	Gravely silty sand, presence of cobbles and boulders	0.8
3	0+700 to 1+380	BH-23-27	2	10 (inferred)		1 (inferred)
4	1+380 to 1+820	BH-23-27	2	10 (inferred)		1 (inferred)
5	1+820 to 2+120	BH-23-29-TP	1	8 (inferred)		1 (inferred)
6	2+120 to 2+740	BH-23-32	10	7 (inferred)		1.2 (inferred)
7	2+740 to 3+370	GZ-21-005	167	7.13		1.2 (inferred)
8	3+370 to 3+700	GZ-21-003	13	7.37		1.2 (inferred)
8	3+700 to 4+500	BH-23-36	65	2.82	Fine to coarse sand - silty, traces of gravel	0.76
8	4+500 to 5+250	BH-23-40	40	6.45	Sand (fine to coarse), traces of gravel, cobbles and boulders near bottom	0.61
9	5+250 to 6+170	BH-23-41	24	3.19	Fine to coarse sand, to sandy gravel, to cobbles and boulders near bottom	0.61
10	6+170 to 6+670	BH-23-42	0	2	Shallow bedrock under organics	1
11	6+670 to 7+600	BH-23-71	5	3.3	Sand (fine to coarse), trace of gravel	0.6
12	7+600 to 7+990	BH-23-72	5	10.7	Sand (medium to coarse), to silty sand, to sand (fine to coarse) to medium-coarse sand, traces of gravel throughout	0.61

Table 9: Geotechnical Condition by Reach

Segment	Station	Borehole	Distance from Diversion (m)	Bedrock Depth (m)	Summary of Sub-Surficial Material	Peat Thickness (m)
13	7+990 to 8+510	BH-23-73	10	7.79	Sand (medium), trace of gravel, cobbles and boulder near bottom	0.61
14	8+510 to 8+870	BH-23-46	220	2.45	Silty sand to sand and gravel to coarse sand	0.76
15	8+870 to 9+300	BH-23-22	40	1.44	Fine sand with trace of gravel	0.46
16	9+300 to 9+654	BH-23-74-TP	20	10 (inferred to be deep based on proximity to Lac A)		1.5 (inferred based on proximity to Lac A)

Notes: “inferred” = For locations where boreholes were scheduled at the time of design, but had not been completed, values for bedrock depths and peat thicknesses were inferred based on surficial geology and other boreholes. These assumptions should be confirmed during detailed design.

3.2 Design Considerations and Geotechnical Uncertainty

Side-slopes in bedrock were set at 1H:1V. Side slopes in till were set at 2.5H:1V, except for some areas where they were adjusted to 2H:1V to improve conditions for fish passage.

While the assumptions for channel side slopes, including removal of peat excavation in till and bedrock and construction of embankments, were reviewed by a geotechnical engineer, a slope stability analysis along the length of the diversion channel was not conducted. It is recommended that for the next design phase, a side slope analysis of each channel segment be conducted to assess channel stability and optimize channel geometry where appropriate.

4.0 HYDRAULIC ASSESSMENT

4.1 Channel Alignment

The channel alignment of DC1 was refined from the pre-feasibility study using updated hydrological and geotechnical assessments. The updated alignment is 9.7 km long, and is separated into sixteen segments with longitudinal slopes ranging from 0.01% to 1.7%. The 1.70% slope represents an average slope through the segment, for hydraulic modelling of flood flows. This is described in detail below.

The upstream portion of the channel (the first 5.3 km) will remain after the mine closure, whereas the downstream portion of the diversion channel (4.4 km) will only be operational during the life of the mine. The entire channel is designed to provide fish passage. The upstream closure portion of the channel is designed to provide sustainable fish habitat as well as fish passage, and limit disturbance during the operational life of the diversion as well as through the transition to the closure phase.

4.2 Channel Hydraulic Design

Hydraulic design analysis of the channel was performed based on the design criteria and considerations outlined in Table 2. The hydraulic analysis was performed to assess the required channel depth, channel side slopes, and erosion protection to contain the design event without erosion. A one-dimensional hydraulic model was developed for the diversion using HEC-RAS (USACE 2021). The 2-year, 10-year, and 100-year flood events were simulated through the channel for design of flood flow conveyance and erosion protection requirements. The 7Q10 low flow, 14Q2 high flow, and average annual flows were simulated in the 1D HEC-RAS model to assess the channel against fish passage requirements.

The Manning's roughness values varied between segments and within cross-sections. Manning's roughness values between 0.03 and 0.20 were selected for calculating the design flow depths and the design flow velocities (USACE 2019). A roughness of 0.03 represents a moderately clean, straight channel, while a roughness of 0.20 represents a channel with variable slopes, pools and large embedded boulders.

The 1D HEC-RAS model boundary conditions were based on existing conditions on the upstream and downstream ends of the channel, and are included in Table 10.

Table 10: Model Boundary Conditions.

Boundary Condition	Type	Value	Consideration
Upstream	Normal Depth	0.3%	Slope of the upstream Bibou Creek Channel
Downstream	Normal Depth	0.01%	Gradient of the ground adjacent to Lac A

The simulated design flood water surface profiles are shown in Figure 3. The calculated depth-averaged design flood flow velocities along the entire channel alignment are shown in Figure 4.

Each of the sixteen channel segments uses one of ten typical cross-sections, and incorporates additional details to provide fish passage under high and low-flow conditions. The typical cross-sections are included in the design drawings (Appendix J) and also in Figure 5 through Figure 14. The fish passage design details are also included in the design drawings, and are described in detail in Section 5.0.

- Cross-section 1 is shown in Figure 5, and applies to channel segments 1 and 4. It is designed to convey flow down a moderately steep channel slope to follow existing topography. The low-flow portion of the cross-section is designed as a small meandering channel.
- Cross-section 2 is shown in Figure 6, and applies to channel segments 2, 3, and 5 through 7. It is designed to convey flow on a shallow sloped channel. The low-flow portion of the cross-section is designed as a small meandering channel.
- Cross section 3 is shown in Figure 7, and applies to channel segment 8. It is designed to convey flow on a very shallow sloped channel. The low-flow portion of the cross-section is designed as a small meandering channel.
- Cross-section 4 is shown in Figure 8, and applies to channel segments 9 and 11. It is designed to convey flow on a shallow sloped channel. The channel is excavated in bedrock with steep side slopes. The low-flow portion of the cross-section is designed with a series of low weirs to provide backwatered areas for fish passage and rest.

- Cross-section 5 is shown in Figure 9, and applies to channel segment 10. It is designed to convey flow on a very shallow sloped channel. The channel is constructed in fill to convey flow through a topographical low area. The low-flow portion of the cross-section is designed with a series of low weirs to provide backwatered areas for fish passage and rest.
- Cross-section 6 is shown in Figure 10, and applies to channel segment 12. It is designed to convey flow on a shallow sloped channel. The channel is excavated in bedrock with steep side slopes up to the top of bedrock, and shallower side slopes in till. The low-flow portion of the cross-section is designed with a series of low weirs to provide backwatered areas for fish passage and rest.
- Cross-section 7 is shown in Figure 11, and applies to channel segment 13. It is designed to convey flow down an average 1.70% slope to follow existing topography. The channel is constructed as a series of rock ramps and pools to provide fish passage during high- and low-flow events.
- Cross-section 8 is shown in Figure 12, and applies to channel segment 14. It is designed to convey flow on a shallow sloped channel. The low-flow portion of the cross-section is designed with a series of low weirs to provide backwatered areas for fish passage and rest.
- Cross-section 9 is shown in Figure 13, and applies to channel segment 15. It is designed to convey flow down an average 1.70% slope to follow existing topography. The channel is constructed as a series of rock ramps and pools to provide fish passage during high- and low-flow events.
- Cross-section 10 is shown in Figure 14, and applies to channel segment 16. It conveys flow into the downstream Lac A.

Table 11 outlines the channel characteristics and parameters which were modelled in HEC-RAS and references the typical cross-sections and fish passage design details described above. Table 11 also includes embankment heights for local sections of the channel where the design freeboard is either provided for through construction of access roads adjacent to the diversion or where the channel ins constructed entirely in fill to reduce excavation.

Table 12 summarizes the modelling results for the 2-year, 10-year and 100-year flood events and the erosion protection and filter layer requirements. Selected cross-sections from the HEC-RAS model showing the 2-year, 10-year, and 100-year water levels are shown in Attachment A.

The 7Q10, average annual flow, and 14Q2 flow events were modelled for fish passage. The results of the hydraulic modeling of these events are described in Section 5.0. The design details incorporated to meet fish passage requirements are also described in detail in Section 5.0. and are described in low flow design type for each segment is included in Table 11.

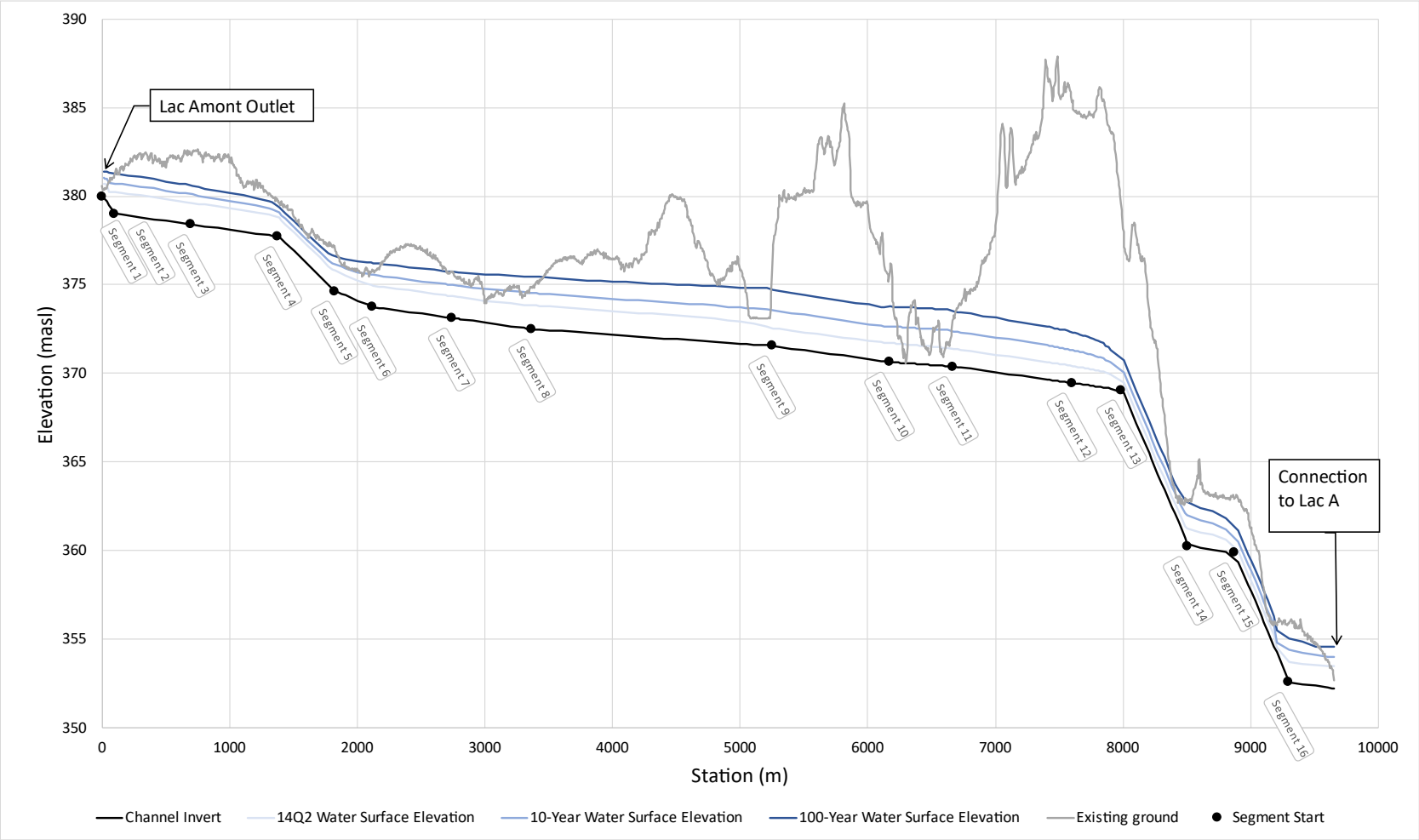

Figure 3: DC1 Diversion Channel Water Surface Profiles

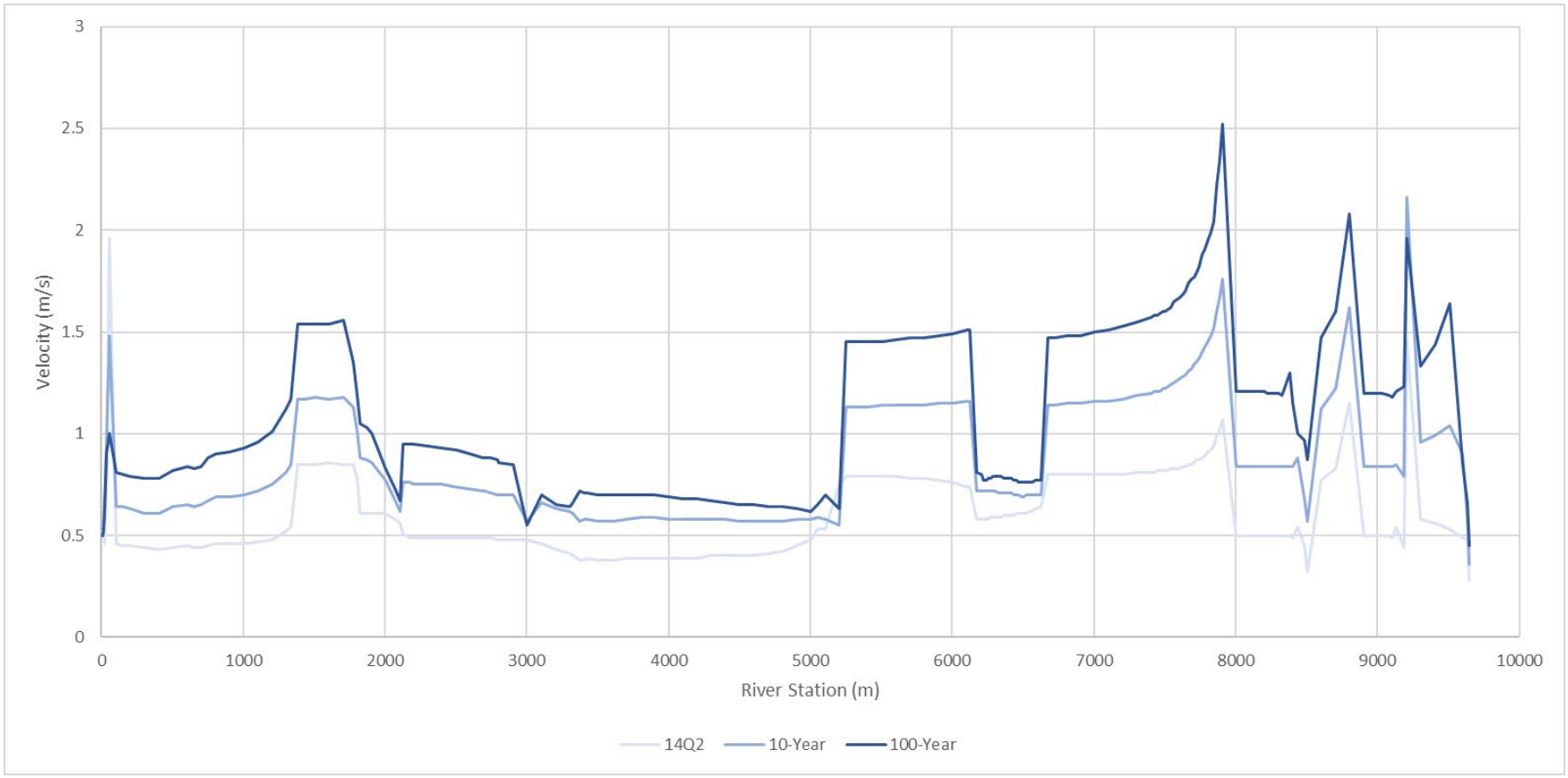

Figure 4: DC-1 Diversion Channel Velocity Profiles

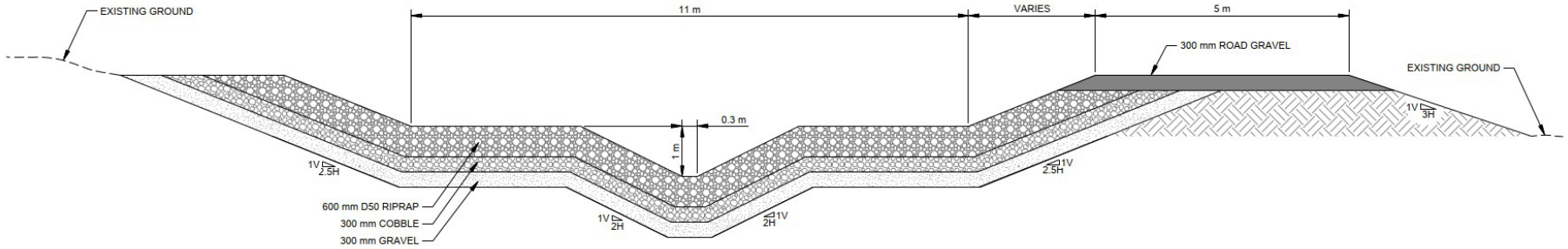

Figure 5: Typical Section 1

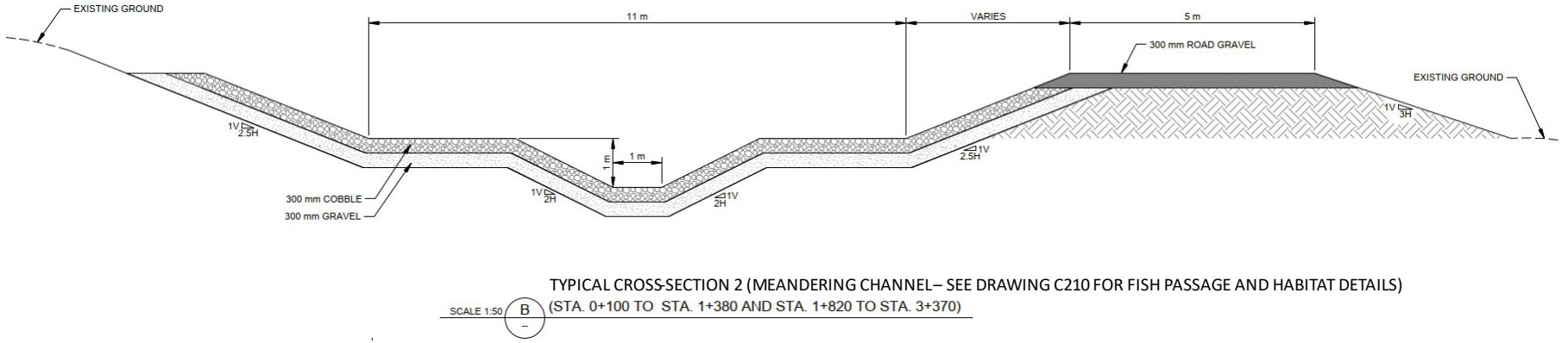

Figure 6: Typical Section 2

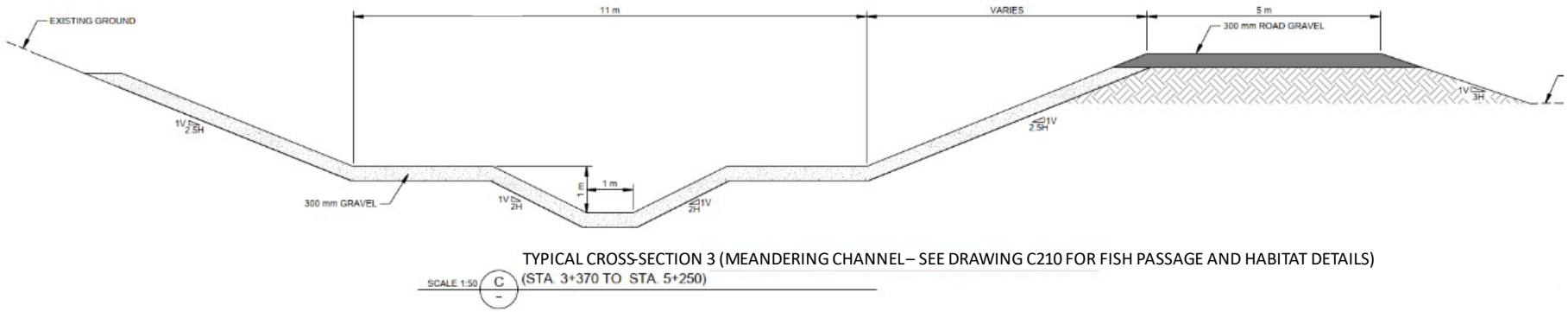

Figure 7: Typical Section 3

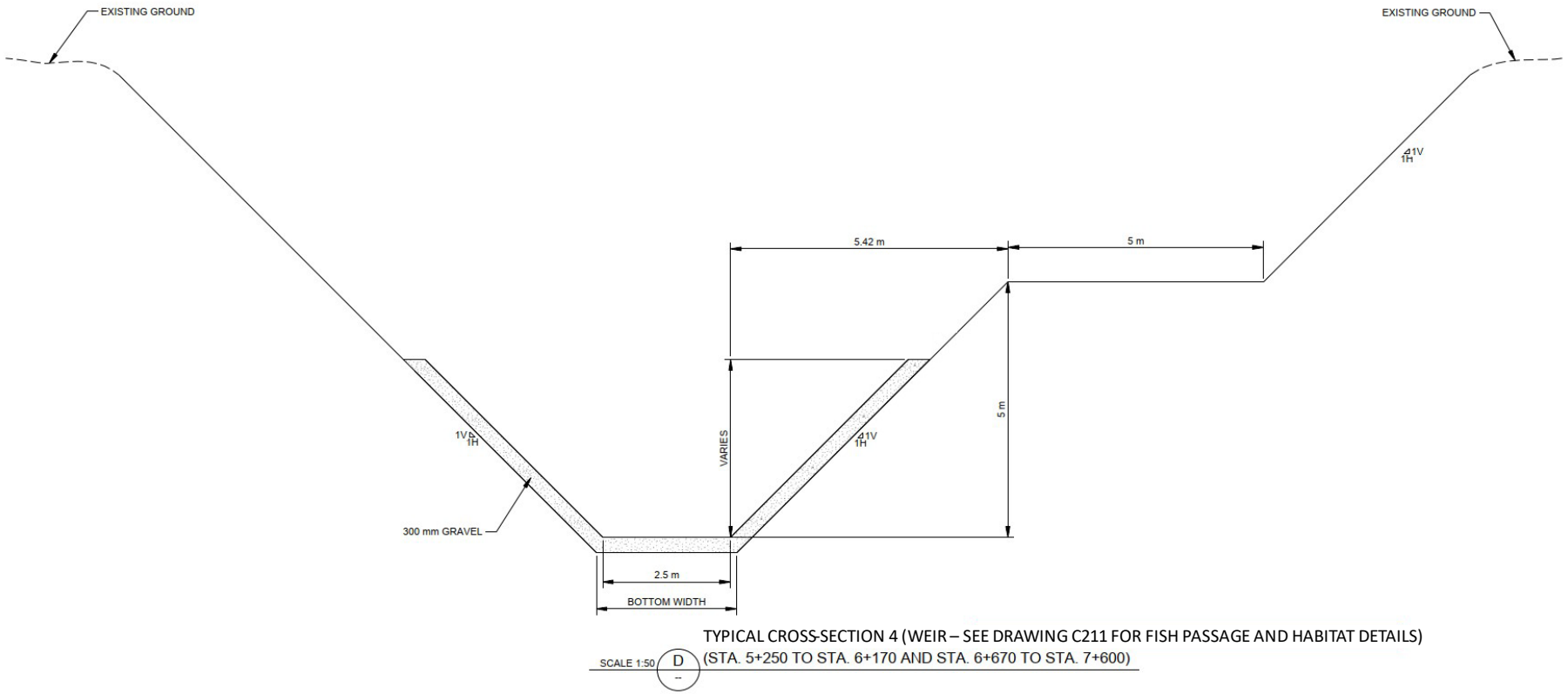

Figure 8: Typical Section 4

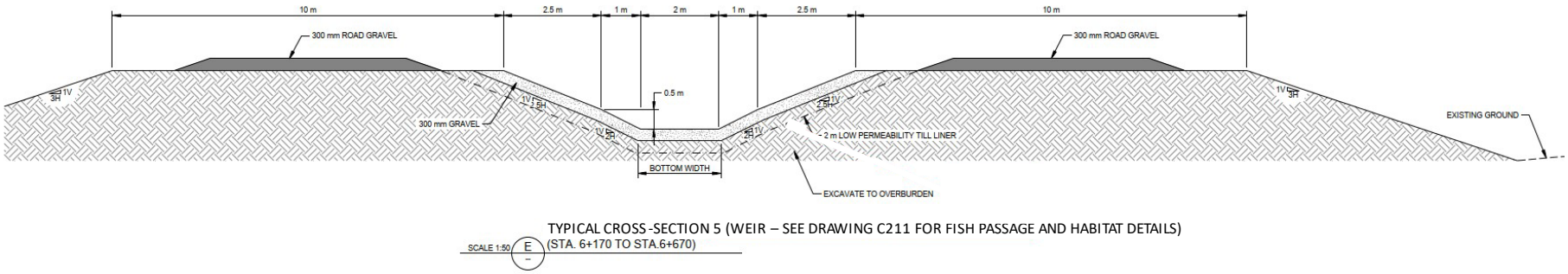

Figure 9: Typical Section 5

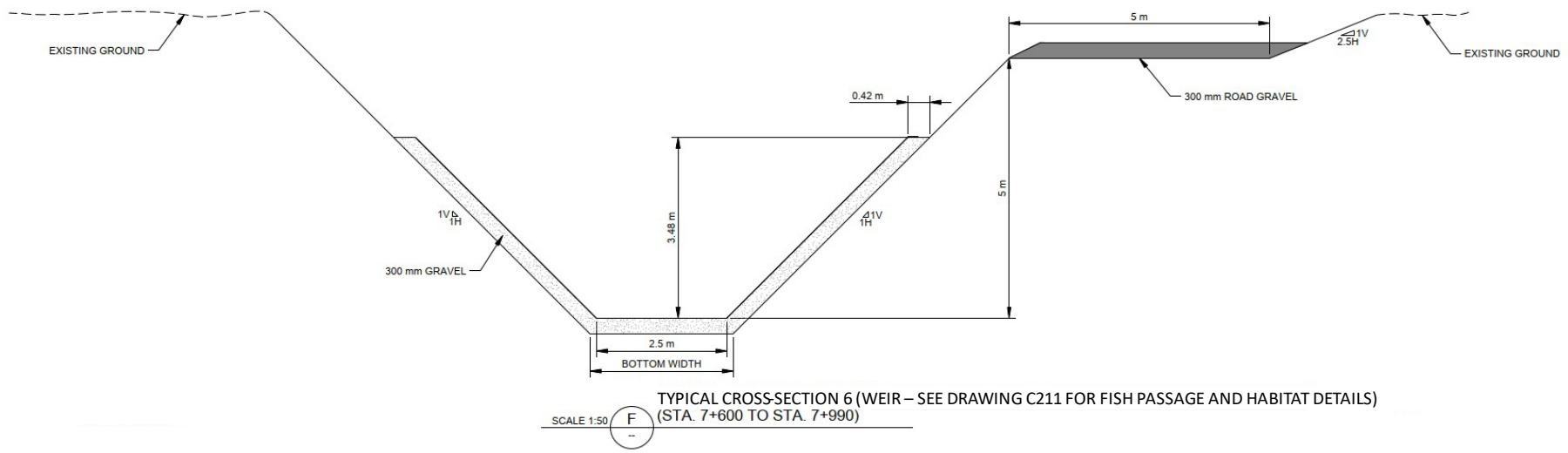

Figure 10: Typical Section 6

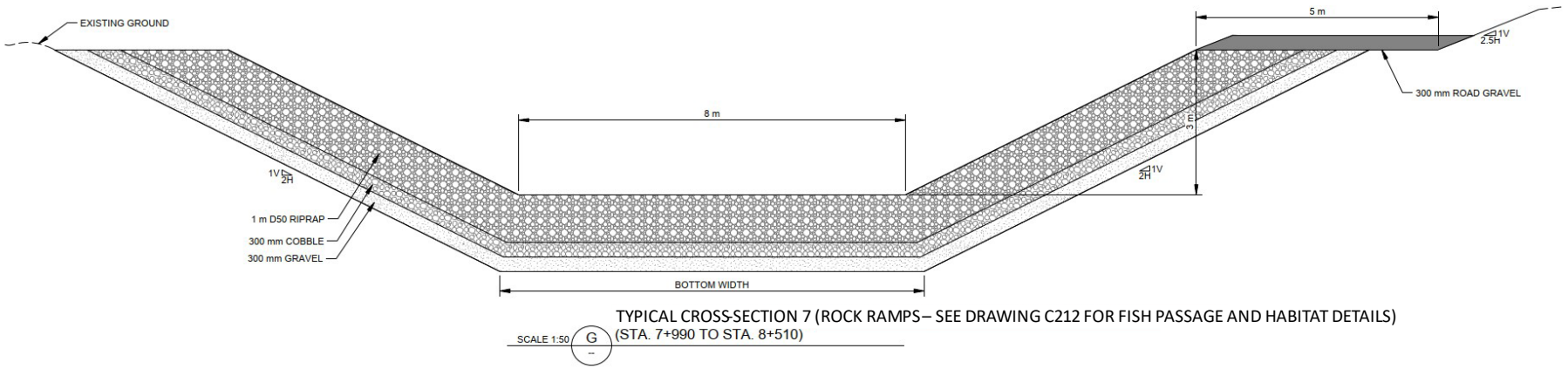

Figure 11: Typical Section 7

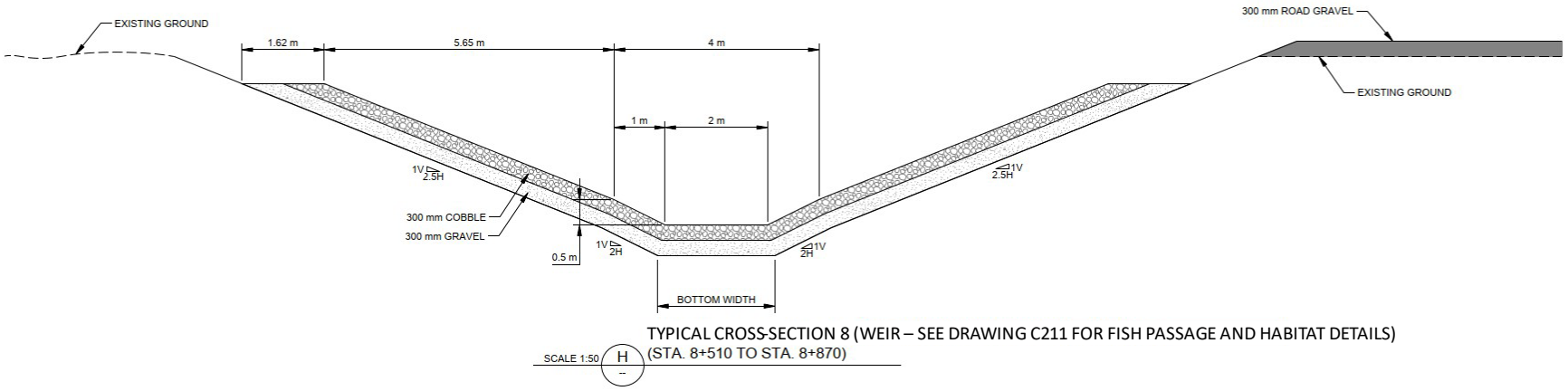

Figure 12: Typical Section 8

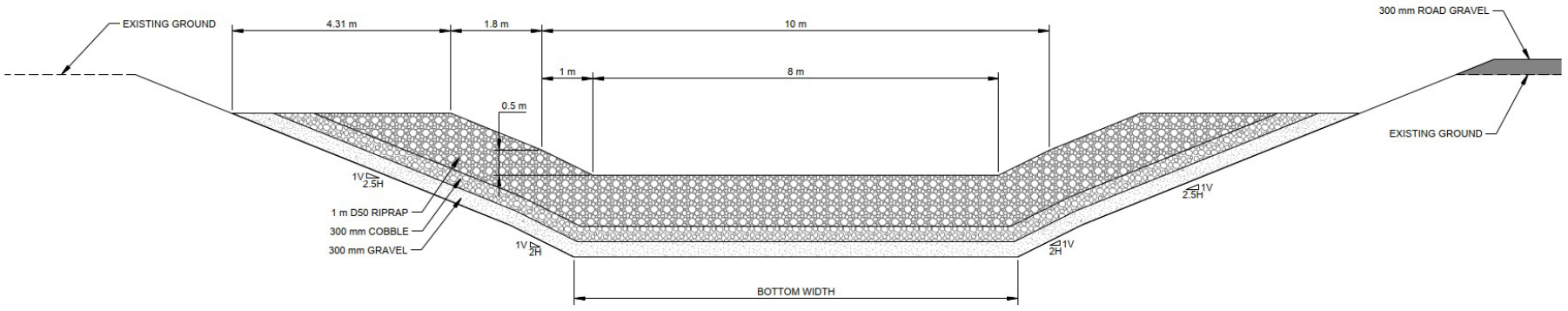

Figure 13: Typical Section 9

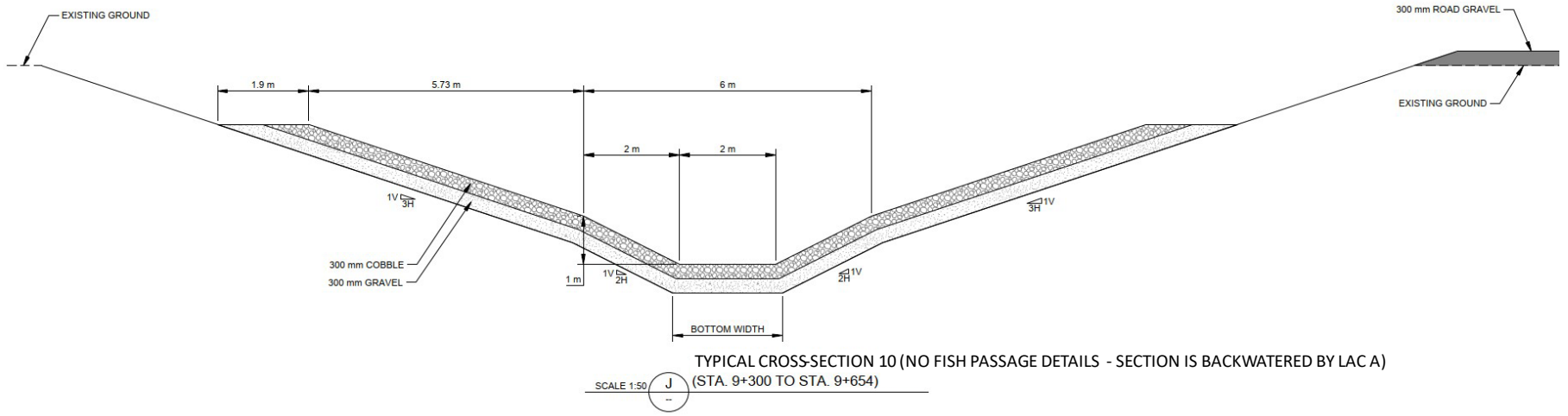

Figure 14: Typical Section 10

Table 11: DC1 Geometry

Segment							Low Flow Channel			Main Channel			Embankment [c]		
Segment Number	Station		Typical Cross-Section # [a]	Fish Passage Detail [b]	Length	Slope	Width	Depth	Side Slope	Width (including Bench)	Side Slope	Bench Width	Height above Channel Invert	Top Width	Side Slope
	From	*To*			*m*	*%*	*m*	*m*	*H:1V*	*m*	*H:1V*	*m*	*m*	*m*	*H:1V*
1	0+000	0+100	1	Meandering channel	100	1.00%	0.3	1	2	11	2.5	-	Right Side: 2.12 m -	5	3
2	0+100	0+700	2	Meandering channel	600	0.10%	1	1	2	11	2.5	-	Right Side: 2.57 m -	5	3
3	0+700	1+380	2	Meandering channel	680	0.10%	1	1	2	11	2.5	-	Right Side: 2.22 m -	5	3
4	1+380	1+820	1	Meandering channel	440	0.70%	0.4	1	2	11	2.5	-	- -	5	3
5	1+820	2+120	2	Meandering channel	300	0.30%	0.5	1	2	11	2.5	-	Right Side: 2.79 m -	5	3
6	2+120	2+740	2	Meandering channel	620	0.10%	1	1	2	11	2.5	-	Right Side: 2.90 m -	5	3
7	2+740	3+370	2	Meandering channel	630	0.10%	1	1	2	11	2.5	-	Right Side: 3.23 m -	5	3
8	3+370	5+250	3	Meandering channel	1880	0.05%	1	1	2	11	2.5	-	Right Side: 3.45 m -	5	3
9	5+250	6+170	4	Weir	920	0.10%	2.5	5	1	17.5	1	5	- -	-	-
10	6+170	6+670	5	Weir	500	0.05%	2	0.5	2	4	2.5	-	Right Side: 3.49 m Left Side: 3.49 m	10	3
11	6+670	7+600	4	Weir	930	0.10%	2.5	5	1	17.5	1	5	- -	-	-
12	7+600	7+990	6	Weir	390	0.10%	2.5	5	1	17.5	2.5	5	- -	-	-
13	7+990	8+510	7	Rock Ramp	520	1.70% [d]	8	3	2	25	2.5	5	Right Side: 2.46 m Left Side: 2.67 m	5	3
14	8+510	8+870	8	Weir	360	0.10%	2	0.5	2	4	2.5	-	- -	-	-
15	8+870	9+300	9	Rock Ramp	430	1.70% [d]	8	0.5	2	10	2.5	-	Right Side: 2.08 m -	5	3
16	9+300	9+654	10	Backwatered from Lac A	354	0.10%	2	1	2	6	3	-	- -	-	-

Notes:

(a) Typical cross-sections describe the channel geometry designed for flood flow conveyance, including widths, depths, and side slopes,

(b) Fish passage details describe the additional features not shown in the typical cross-sections which are provided for fish passage and conveyance. These details are fully described in Section 5.0.

(c) Embankments are for freeboard above existing ground (typically through construction of access roads parallel to the channel, and for flow containment in sections where the channel is constructed in fill.

(d) The 1.70% slope represents an average slope through the segment, for hydraulic modelling of flood flows. The compound slope in these segments, which incorporates additional details for fish passage, is represented by the detailed schematic of the rock ramps shown in Drawing C212 and in Section 5.2.3. Actual hydraulic parameters on the rock ramps will be different than those shown here.

Table 10: DC1 HES-RAS Results and Erosion Protection

Segment					Erosion Protection				Channel Hydraulics			
Segment Number	Station		Length	Slope	Total Thickness	Erosion Protection Size (D50) (b)	Filter Layers	Erosion Protection Height above Invert	Return Period	Design Discharge	Maximum Water Depth above Invert	Average Velocity
	From	*To*	*m*	*%*	*m*	*mm*	*Filter 1 / Filter 2*	*m*	*Years*	*m3/s*	*m*	*m/s*
1	0+000	0+100	100	1.00%	1.20	300	Cobble Gravel	2.12	2	2.73	0.96	0.87
									10	7.93	1.28	0.82
									100	17.44	1.82	0.71
2	0+100	0+700	600	0.10%	0.60	100	Gravel -	2.61	2	2.73	1.27	0.46
									10	7.93	1.75	0.63
									100	17.44	2.31	0.81
3	0+700	1+380	680	0.10%	0.60	100	Gravel -	2.51	2	2.73	1.25	0.49
									10	7.93	1.70	0.73
									100	17.44	2.21	0.97
4	1+380	1+820	440	0.70%	1.20	300	Cobble Gravel	2.20	2	2.73	1.10	0.85
									10	7.93	1.44	1.15
									100	17.44	1.90	1.48
5	1+820	2+120	300	0.30%	0.60	100	Gravel -	2.77	2	2.73	1.22	0.60
									10	7.93	1.78	0.78
									100	17.44	2.47	0.89
6	2+120	2+740	620	0.10%	0.60	100	Gravel -	2.91	2	3.14	1.27	0.51
									10	10.51	1.86	0.74
									100	25.07	2.61	0.92
7	2+740	3+370	630	0.10%	0.60	100	Gravel -	3.24	2	3.14	1.35	0.48
									10	10.51	2.02	0.65
									100	25.07	2.94	0.73
8	3+370	5+250	1880	0.05%	0.30	50	- -	3.53	2	2.98	1.38	0.44
									10	10.19	2.06	0.58
									100	25.64	3.23	0.68
9	5+250	6+170	920	0.10%	0.30	50	- -	3.43	2	2.98	1.08	0.80
									10	10.19	2.00	1.15
									100	25.64	3.13	1.49

Table 10: DC1 HES-RAS Results and Erosion Protection

Segment					Erosion Protection				Channel Hydraulics			
Segment Number	Station		Length	Slope	Total Thickness	Erosion Protection Size (D50) (b)	Filter Layers	Erosion Protection Height above Invert	Return Period	Design Discharge	Maximum Water Depth above Invert	Average Velocity
10	6+170	6+670	500	0.05%	0.30	50	- -	4.27	2	2.98	1.95	0.62
									10	10.19	2.85	0.72
									100	25.64	3.97	0.80
11	6+670	7+600	930	0.10%	0.30	50	- -	3.40	2	2.98	1.04	0.82
									10	10.19	1.99	1.17
									100	25.64	3.10	1.54
12	7+600	7+990	390	0.10%	0.30	50	- -	3.10	2	3.01	1.00	0.95
									10	10.24	1.83	1.47
									100	25.68	2.80	2.02
13	7+990	8+510	520	1.70% (a)	1.60	50	Cobble Gravel	2.66	2	3.01	0.93	0.50
									10	10.24	1.62	0.81
									100	25.68	2.36	1.14
14	8+510	8+870	360	0.10%	0.60	100	Gravel -	2.56	2	3.06	0.95	0.94
									10	10.42	1.58	1.32
									100	26.21	2.26	1.72
15	8+870	9+300	430	1.70% (a)	1.60	50	Cobble Gravel	2.08	2	3.06	0.70	0.62
									10	10.42	1.21	0.98
									100	26.21	1.78	1.29
16	9+300	9+654	354	0.10%	0.60	100	Gravel -	2.80	2	3.06	1.31	0.51
									10	10.42	1.81	0.81
									100	26.21	2.50	1.06

Notes

(a) The 1.70% slope represents an average slope through the segment, for hydraulic modelling of flood flows. The compound slope in these segments, which incorporates additional details for fish passage, is represented by the detailed schematic of the rock ramps shown in Drawing C212 and in Section 5.2.3. Actual hydraulic parameters on the rock ramps will be different than those shown here.

(b) After the installation of the riprap layer, the channel surface can be smoothed out with a small quantity of gravel that is more favorable for fish passage and aquatic life. Additional specific measures to accommodate fish passage and aquatic life are included in Section 5.0

4.3 Erosion Protection Design

As described in the design criteria, the channel was designed to be non-erodible up to the 100-year flood event. Using the flow velocities and water depths determined from the hydraulic model, riprap nominal diameter (D_{50}) was calculated using the following two methods:

1. U.S. Army Corps of Engineers Riprap Design (USACE 1994)
2. Simon's Method (Simon 1977)

The maximum calculated riprap D_{50} for each channel segment was rounded up to 50 mm, 100 mm, 300 mm or 500 mm. In segments where riprap was not required, the channel was lined with a layer of cobble followed by a layer of gravel. In segments where riprap was required, filter layers of cobble and gravel are also included. Table 12 below outlines the riprap and filter layer requirements for each segment of the channel.

Table 12: Riprap and Filter Layer Design

Segment	USACE (D_{50}) (mm)	Simons (D_{50}) (mm)	Layer 1 (Riprap) [b]		Layer 2 (Cobble)		Layer 3 (Gravel)	
			Size (D_{50}) (mm)	Thickness (mm)	Size (D_{50}) (mm)	Thickness (mm)	Size (D_{50}) (mm)	Thickness (mm)
1	128	227	300	600	100	300	50	300
2	24	28			100	300	50	300
3	24	28			100	300	50	300
4	92	168	300	600	100	300	50	300
5	77	79			100	300	50	300
6	39	32			100	300	50	300
7	35	32			100	300	50	300
8	24	19			50	300	50	300
9	25	26			50	300	50	300
10	40	24			50	300	50	300
11	25	26			50	300	50	300
12	25	27			50	300	50	300
13 [a]	251	366	500	1000	100	300	50	300
14	69	42			100	300	50	300
15 [a]	300	359	500	1000	100	300	50	300
16	45	44			100	300	50	300

Notes:

(b) Erosion protection on these segments are based on a 1.70% slope, which represents an average slope through the segment, for hydraulic modelling of flood flows. The compound slope in these segments, which incorporates additional details for fish passage, is represented by the detailed schematic of the rock ramps shown in Drawing C212 and in Section 5.2.3. Actual hydraulic parameters and erosion protection requirements on the rock ramps may vary from those shown here.

(b) After the installation of the riprap layer, the channel surface can be smoothed out with a small quantity of gravel that is more favorable for fish passage and aquatic life. Additional specific measures to accommodate fish passage and aquatic life are included in Section 5.0.

5.0 FISH PASSAGE AND FISH HABITAT

As described in the design criteria in Section 1.3, the proposed DC1 diversion channel will replace Bibou Creek diverting flow from the Bibou Creek watershed around the Troilus Project area. The diversion channel is required to provide fish passage between Lac Amont and Lac A. Following the initial hydraulic design to size the channel for flood flow conveyance and erosion protection, additional details were incorporated into the channel to provide fish passage through the channel.

This section describes the approach followed to accommodate fish passage requirements. It summarises the fish passage design considerations as well as the modelling results for the 7Q10 high flow, the 14Q2 low flow, and the average annual flow design events, which were selected as the design events to assess fish passage.

5.1 Description of Bibou Creek

The existing Bibou Creek connects Lac Amont with Lac A. A portion of the existing creek is a historical diversion channel, which routes flow around the TSF, 87 Pit and J Pit. Bibou Creek is 1 to 4 m wide and has a water depth ranging between 0.3 m and 1.2 m. A fish survey of Bibou Creek conducted in 2021 (Wachiih 2021) Creek found the following fish species in the creek and adjacent lakes:

- Mottled Sculpin
- Cisco
- Walleye
- Northern Pike
- Burbot
- Minnow
- Longnose Dace
- Brook Trout
- Lake Whitefish
- Toru Perch

Of the fish found in the existing Bibou Creek, the Burbot was identified as the fish with the lowest swimming capabilities, and Walleye was identified as the fish most likely to use the channel during spring freshet. As such, the diversion channel was designed to allow for fish passage of Walleye; consideration was given for the Burbot's lower swimming abilities.

5.2 Fish Passage Design Concepts

Additional design details are incorporated into each of the ten typical cross-sections to incorporate fish passage requirements. There are three fish passage design types which are applied to the typical cross-sections, as summarized in Table 11. These types are described in detail below.

- Type 1 – Meandering Channel – Applicable for typical cross-sections 1, 2 and 3 (Figure 5, Figure 6, Figure 7).
- Type 2 – Flat Segments with Small Weirs – Applicable for typical cross-sections 4, 5, 6 and 8 (Figure 8,Figure 9, Figure 10, Figure 12).
- Type 3 – Rock Ramps – Applicable for typical cross-sections 7 and 9 (Figure 11, Figure 13).

5.2.1 Design Type 1 - Meandering Channel

Design Type 1 (Meandering Channel) is incorporated into segments 1 through 8 of the diversion channel. This design concept consists of a sinuous main channel lined with wooden logs and boulders located within a wider flood flow channel. The sinuosity of the channel is maintained at 1.05 throughout all eight segments. The main channel varies in width and roughness. Boulders are placed in strategic locations to create areas of shelter for fish, as well as slow down the overall velocity within the channel. Wooden logs are placed approximately every 20 m; this increases overall water depth during periods of low flow.

The HEC-RAS model described in Section 4.0 incorporated the low flow channel sinuosity by increasing the roughness of the low flow channel in the model to 0.06. Separate calculations were conducted for the 7Q10 flow event to include sinuosity, and the results are outlined in Table 13 below. The HEC-RAS model outputs, as described in Section 4.2, were used for the annual average, 14Q2 and 100-year flow events. Figure 15 through Figure 18 show the typical plan, profile and section of this design type.

Table 13: Design Type 1 - Channel Parameters and Modelling Results

	Diversion Segment							
	1	2	3	4	5	6	7	8
Length (m)	600	680	600	680	300	620	630	1880
Slope %	1.0	0.1	0.1	0.7	0.3	0.1	0.1	0.05
Main Channel								
Main Channel Sinuosity	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Main Channel Width (m)	0.4	1.0	1.0	0.4	0.5	1.0	1.0	1.0
Main Channel Depth (m)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Main Channel Side Slopes (H:1V)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Channel Roughness, n	0.06	0.045	0.045	0.06	0.06	0.045	0.045	0.045
Flood Flow Channel								
Flood Flow Channel Width (m)	11	11	11	11	11	11	11	11
Flood Flow Channel Depth (m)	2.12	2.61	2.51	2.20	2.77	2.91	3.24	3.53
Flood Flow Channel Side Slopes (H:1V)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Channel Roughness, n	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Modelling Results								
7Q10 depth (m)	0.15	0.14	0.14	0.15	0.17	0.16	0.16	0.19
7Q10 velocity (m/s)	0.33	0.16	0.16	0.29	0.21	0.19	0.19	0.15
Annual Average Depth (m)	0.49	0.65	0.65	0.58	0.67	0.69	0.72	0.77
Annual Average Velocity (m/s)	0.77	0.37	0.37	0.62	0.46	0.43	0.40	0.37
14Q2 depth (m)	0.8	1.23	1.20	1.05	1.15	1.23	1.26	1.30
14Q2 Velocity (m/s)	0.86	0.45	0.48	0.84	0.60	0.49	0.46	0.43
100 Year Depth (m)	1.60	2.26	2.07	1.72	2.19	2.54	2.76	3.06
100 Year Velocity (m/s)	0.71	0.81	0.97	1.48	0.89	0.92	0.74	0.68

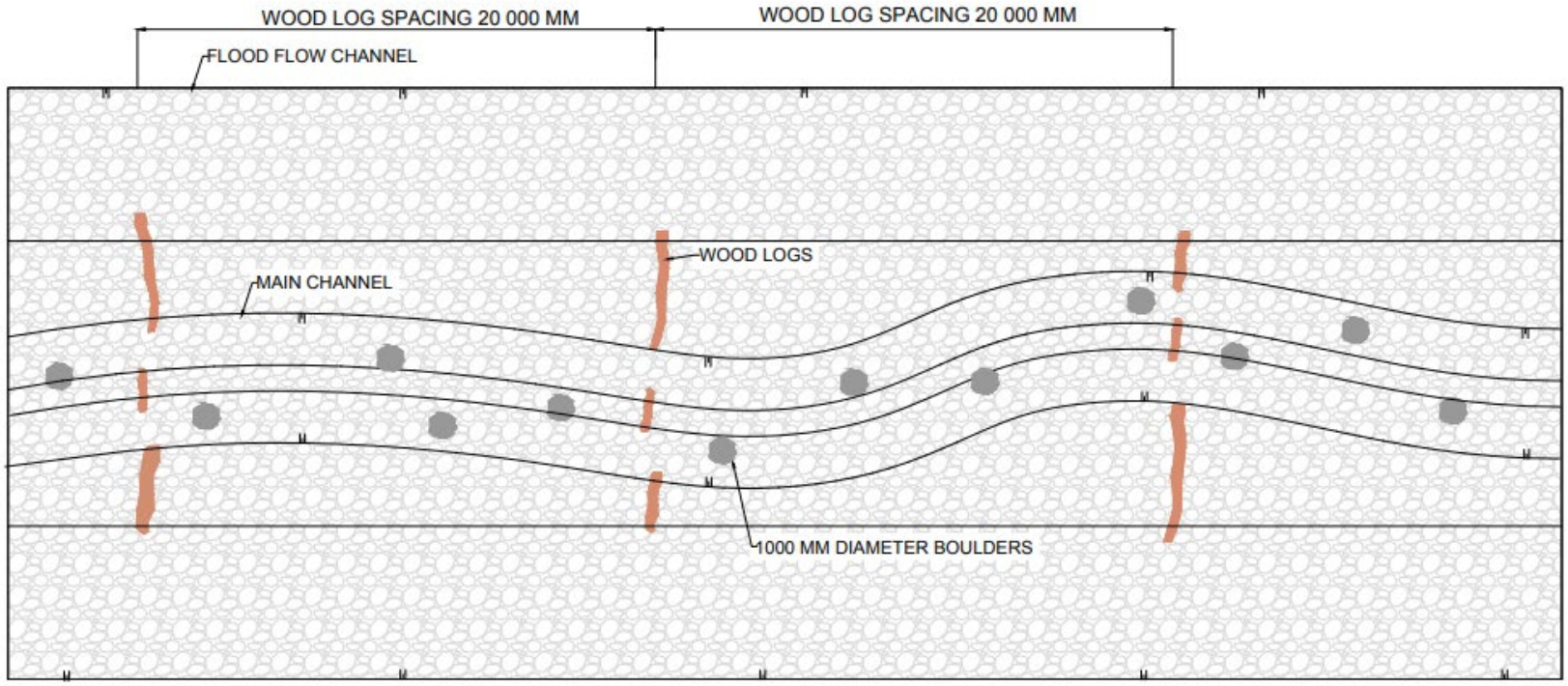

Figure 15: Design Type 1 – Plan View

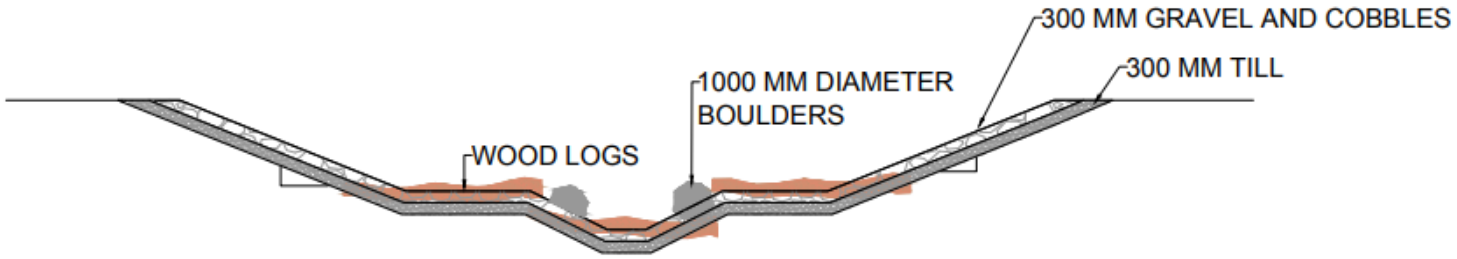

Figure 16: Design Type 1 - Cross Section

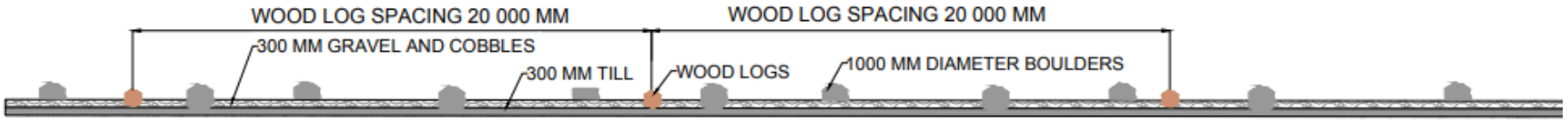

Figure 17: Design Type 1 - Main Channel Profile

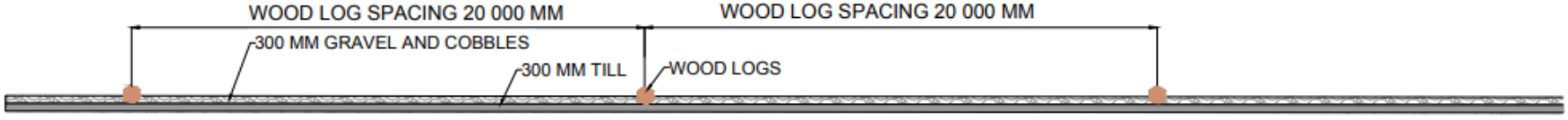

Figure 18: Design Type 1 - Flood Flow Channel Profile

5.2.2 Design Type 2 – Flat Segments with Small Weirs

Design Type 2 is incorporated into segments 9 through 12 and segments 14 and 16 of the diversion channel. The general concept of design type 2 is that it is implemented in the operational portion of the channel, where the slope of the channel is shallow. The channel is lined with gravel and cobble, and a check weir is placed every 100 m to create a backwater effect and increase the water depth during periods of low flow.

The check weir is composed of a 10% slope upstream of the crest, a 5 m long crest and a 1% slope downstream of the crest. The weir crests are made of riprap, where the voids are filled with smaller material, such as bedding gravel, to prevent flow through the weir. As mentioned previously, a HEC-RAS model was developed to determine the flow velocity and water depth for the various segments and design types. The modelling results of Design Type 2 and the channel characteristics are summarized in Table 14. Figure 19 through Figure 22 show the arrangement of this design type in plan view, profile view, and section view.

Table 14: Design Type 2 - Channel Characteristics and Modelling Results

	Segment					
	9	10	11	12	14	16
Length (m)	920	500	930	390	360	354
Slope %	0.1	0.05	0.1	0.1	0.1	0.1
Manning n	0.03	0.03	0.03	0.03	0.03	0.03
Main Channel						
Main Channel Width (m)	2.5	2	2.5	2.5	2	2
Main Channel Depth (m)	3.43	4.27	3.40	3.10	2.56	2.80
Main Channel Side Slopes (H:1V)	1	1	1	1	3	2.5
Modelling Results						
7Q10 depth (m)	0.19	0.20	0.19	0.19	0.19	0.14
7Q10 Velocity (m/s)	0.09	0.11	0.09	0.09	0.09	0.14
Average Annual Depth (m)	0.50	0.56	0.50	0.50	0.42	0.79
Average Annual Velocity (m/s)	0.48	0.44	0.48	0.48	0.61	0.26
14Q2 Depth (m)	0.91	1.09	0.91	0.91	0.82	1.21
14Q2 Velocity (m/s)	0.90	0.60	0.90	0.90	0.92	0.49
100 Year Depth (m)	2.63	3.22	2.63	2.63	2.1	2.35
100 Year Velocity (m/s)	1.92	0.78	1.92	1.92	1.72	1.06

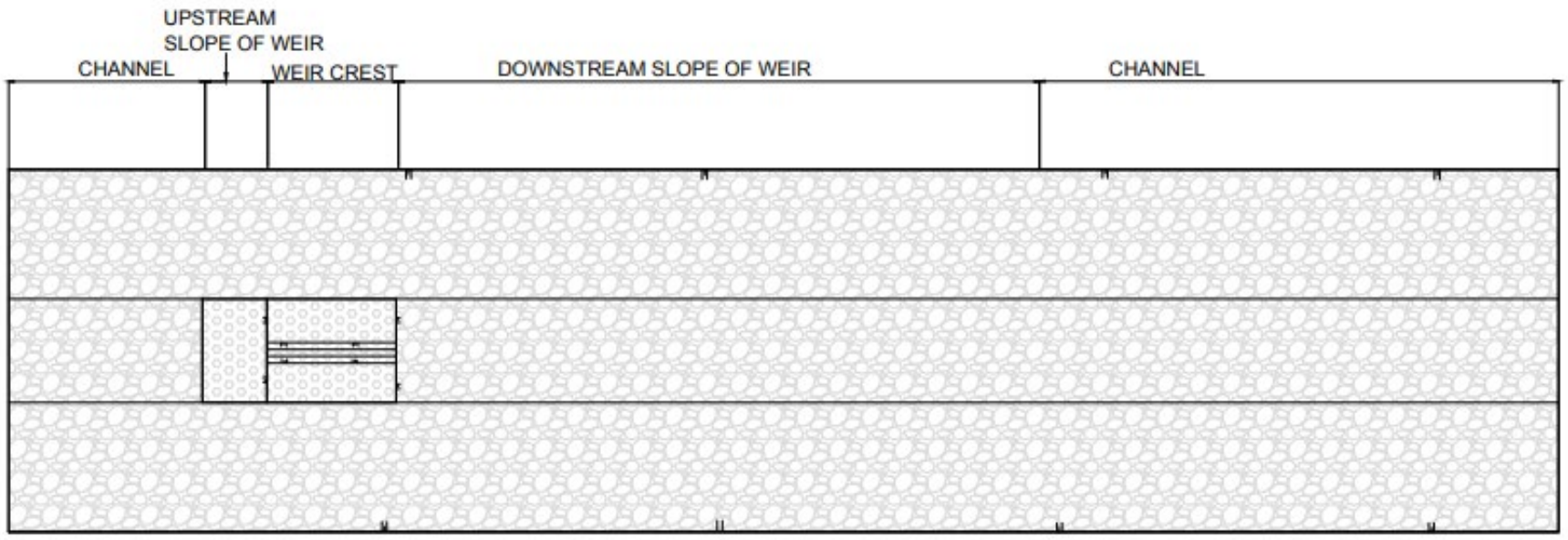

Figure 19: Design Type 2 - Plan View

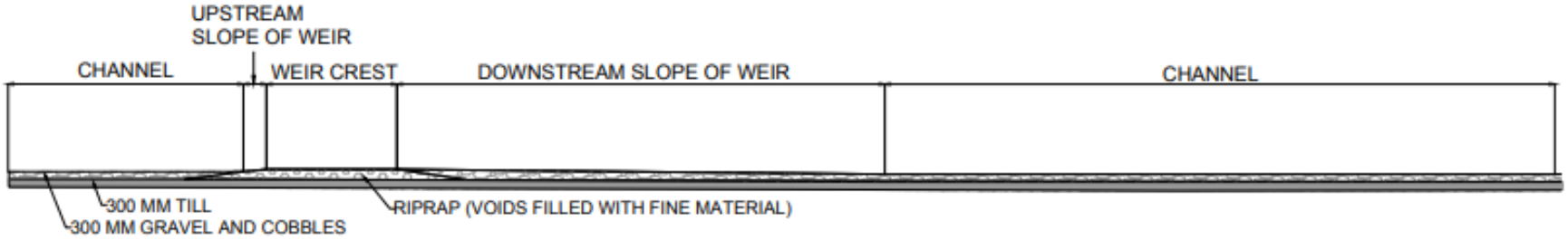

Figure 20: Design Type 2 - Profile

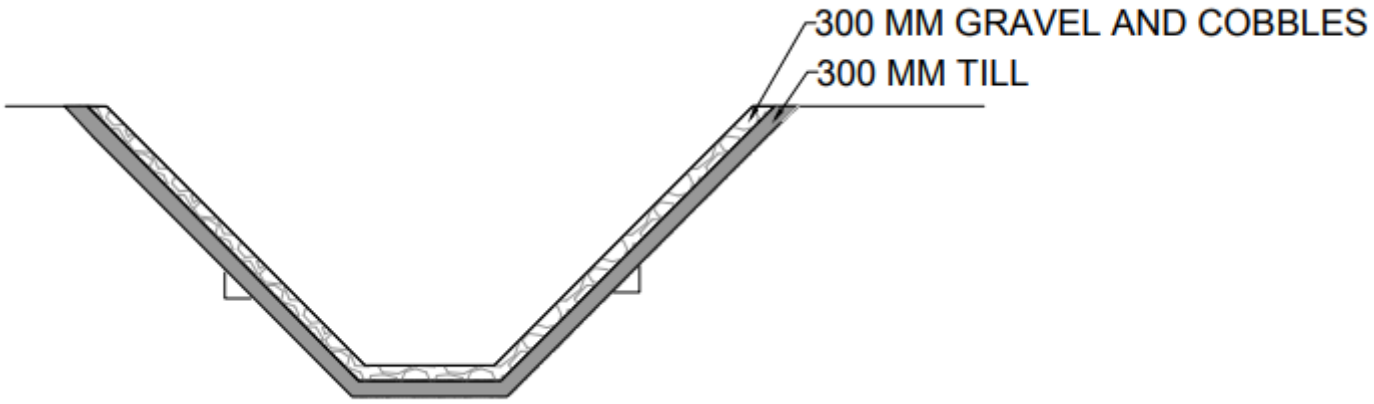

Figure 21: Design Type 2 - Channel Cross Section

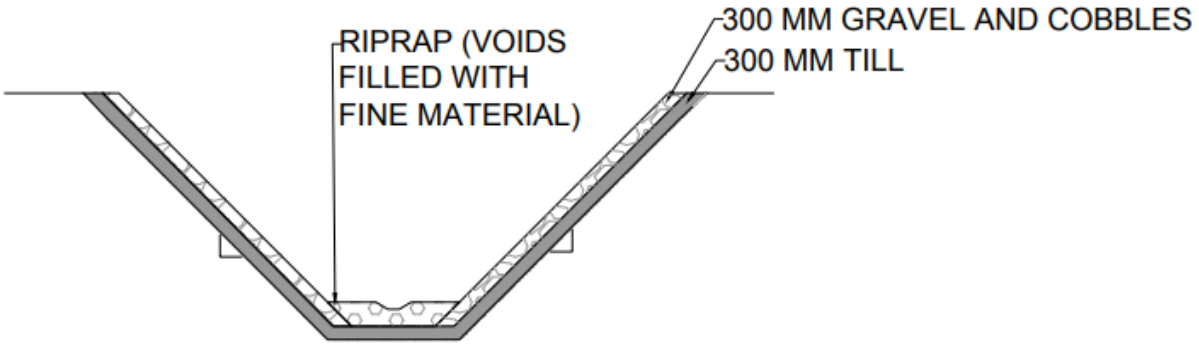

Figure 22: Design Type 2 - Check Weir Crest Cross Section

5.2.3 Design Type 3 – Steep Channel with Rock Ramps

Design Type 3 is incorporated into the steep operational channel segments 13 and 15. It is composed of a series of rock ramps with a 3.5 % slope and flat pools which result in an average slope of 1.7%. The length of the rock ramp section is 24 m, and the pool length is 11 m. Rock ramps are analogues of natural fishways which provide fish passage and aquatic habitat through the simulation of a natural stream environment. Rocks and boulders are placed in strategic locations to decrease velocity and increase flow depth. The placement of the rocks and boulders mimics a natural steep stream and allows fish to move from one pool to another.

A low flow channel is located within the main channel in the rock ramp sections. The low flow channel is narrow and shallow and is designed to contain the 7Q10 low flow. Flow higher than the 7Q10 would spill into the main channel. The low flow channel is lined with a geomembrane to reduce seepage losses into underling rock and sand, so that flow depth is maintained in the channel during low flow conditions. The low flow channel has a sinuosity of 1.05 to further decrease velocity and increase flow depth during low flow conditions.

The main channel is lined with gravel and cobbles, and boulders are placed in strategic locations to ensure enough areas of fish shelter are available in the rock ramp sections. The spacing of boulders was calculated using the methodology outlined in the Journal of Hydraulic Engineering (Baki, 2016). Using this methodology, the following spacing is required for the rock ramp sections:

- Longitudinal spacing of 3.0 m
- Transverse spacing of 2.5 m

This design type was modelled separately from the 1-D HEC-RAS model described in Section 4.2. The original HEC-RAS model did not include the riffle and pool sequencing an instead assumed a long steep segment. A separate 1-D HEC-RAS model was developed to model the riffle and pool sequencing. The 1-D HEC-RAS model was used to inform on the 14Q2, average annual, and 100-year flood event. Further calculations were required for the 7Q10 flow event as the low flow channel was not included in the 1D HEC-RAS model. The low flow channel and 7Q10 event was modelled separately using Manning's equation. The results of these 1-D model and 7Q10 low flow calculations along with channel parameters can be found below in Table 15. Figure 24 through Figure 28 below show the arrangement of this design type.

Table 15: Design Type 3 - Channel Characteristics and Modelling Outputs

	Segment	
	13	15
Length (m)	520	430
Compound Slope %	1.7	1.7
Rock Ramp Slope %	3.5	3.5
Manning n	0.05	0.05
Low Flow Channel		
Low Flow Channel Sinuosity	1.05	1.05
Low Flow Channel Width (m)	0.3	0.3
Low Flow Channel Depth (m)	0.2	0.2

Table 15: Design Type 3 - Channel Characteristics and Modelling Outputs

	Segment	
	13	15
Low Flow Channel Side Slopes (H:1V)	0.5	0.5
Main Channel		
Main Channel Width (m)	6	6
Main Channel Depth (m)	2.66	2.08
Main Channel Side Slopes (H:1V)	3	3
Modelling Results on Rock Ramp Sections		
7Q10 Depth (m)	0.15	0.15
7Q10 Velocity (m/s)	0.64	0.64
Annual Average Depth (m)	0.29	0.29
Annual Average Velocity (m/s)	0.30	0.30
14Q2 Depth (m)	0.64	0.64
14Q2 Velocity (m/s)	0.77	0.77
100 Year Depth (m)	1.70	1.70
100 Year Velocity (m/s)	2.39	2.39

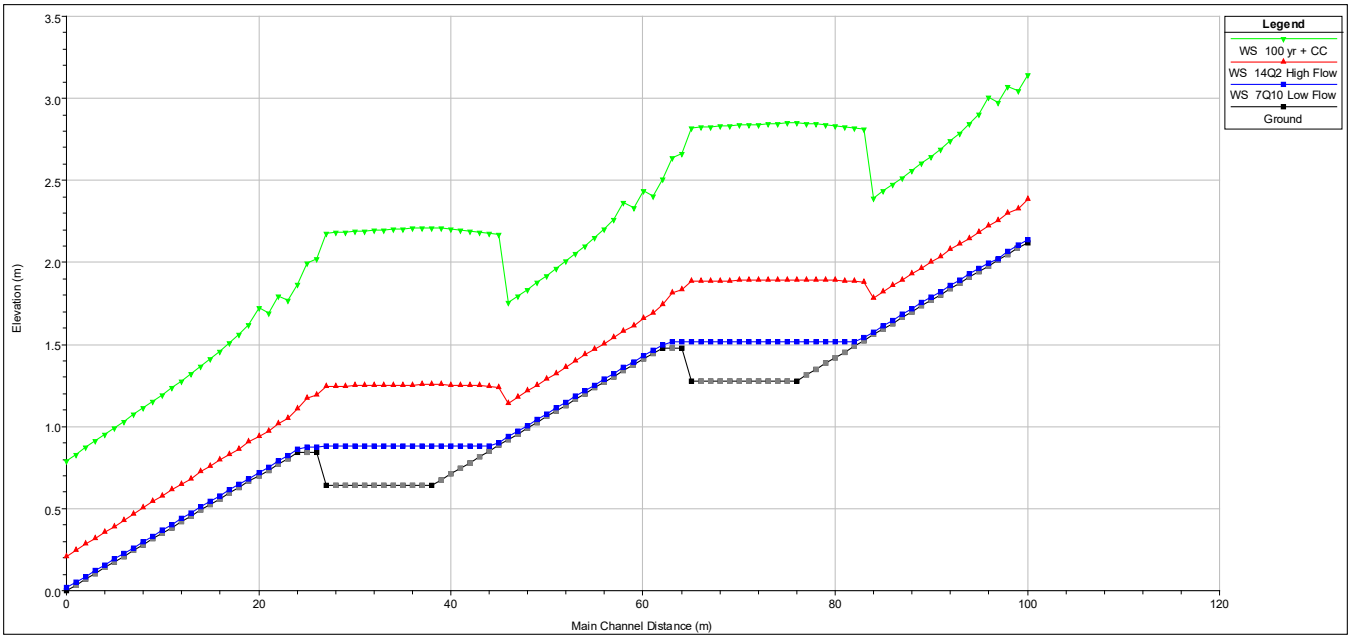

Figure 23: Riffle and Pool 1D HEC-RAS Model Water Surface Profiles

Riprap Sizing

In Section 4.3, the required riprap sizing was calculated for the whole stream diversion. Design Type 3 – Steep Channel and Rock Ramps was not fully incorporated into the hydraulic model. The required riprap calculated for segments 13 and 15 in Section 4.3 and shown in Table 12 was based on an average slope of 1.7%, as an approximation of conditions during high flow events. instead of the rock ramp and pool sequence. Based on that calculation, a D50 of 500 mm is required for high flows.

Upon further design of these segments, additional calculations were conducted to determine the required riprap in the Design Type 3 segments. Based on the expected energy at the bottom of the rock ramp sections, erosion protection is required along the steep segments of this design type to increase the roughness of the channel as well as provide the necessary energy dissipation. Using the USACE method for calculating riprap, a D50 of 350 mm is required along these rock ramp sections and should extend 5 m upstream and downstream into the pools. The individual boulders that provide the macro-roughness to the rock ramps would have a typical diameter of approximately 1,000 mm.

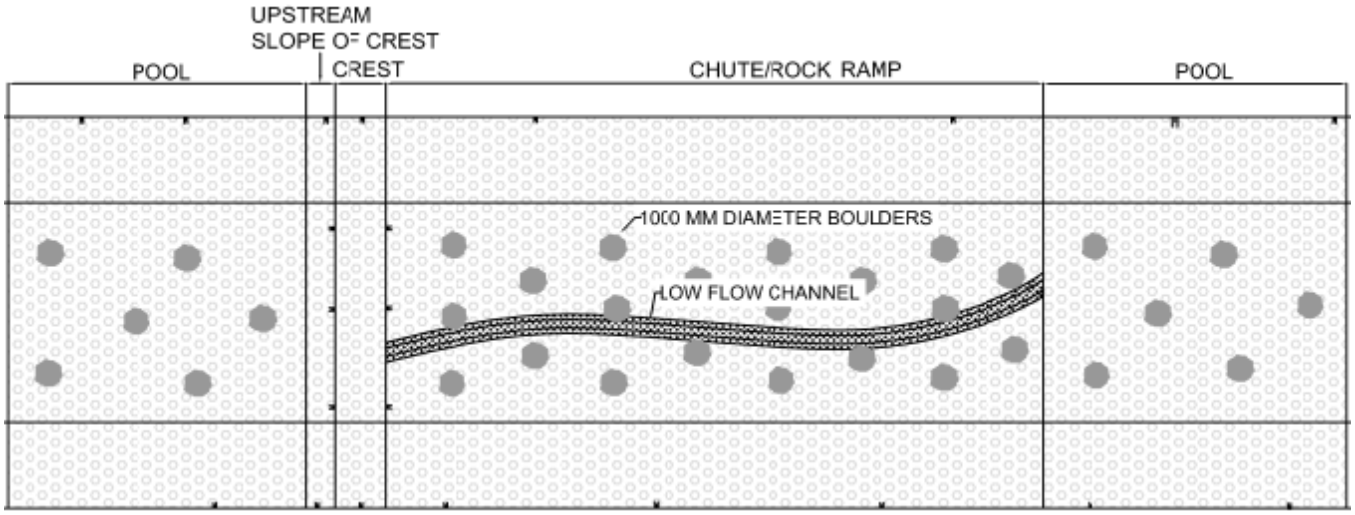

Figure 24: Deign Type 3 - Plan View

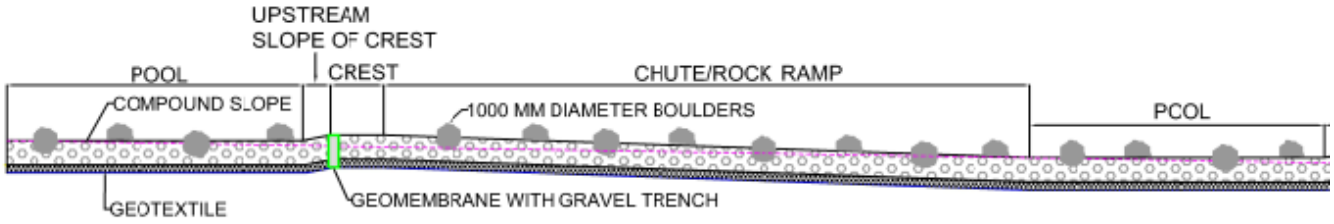

Figure 25: Design Type 3 - Profile of Main Channel

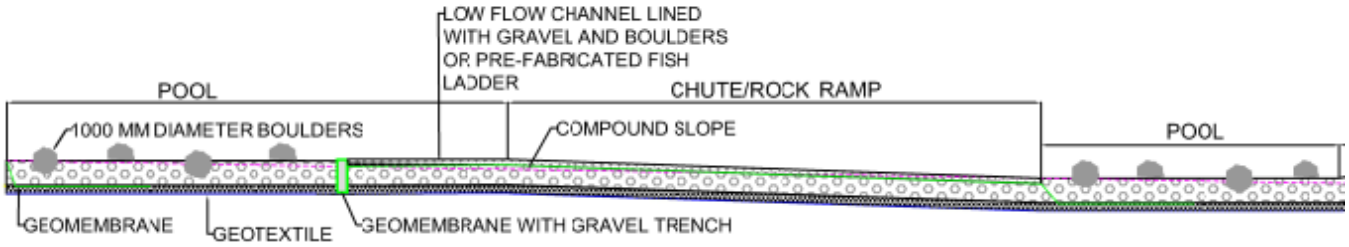

Figure 26: Design Type 3 - Profile of Low Flow Channel

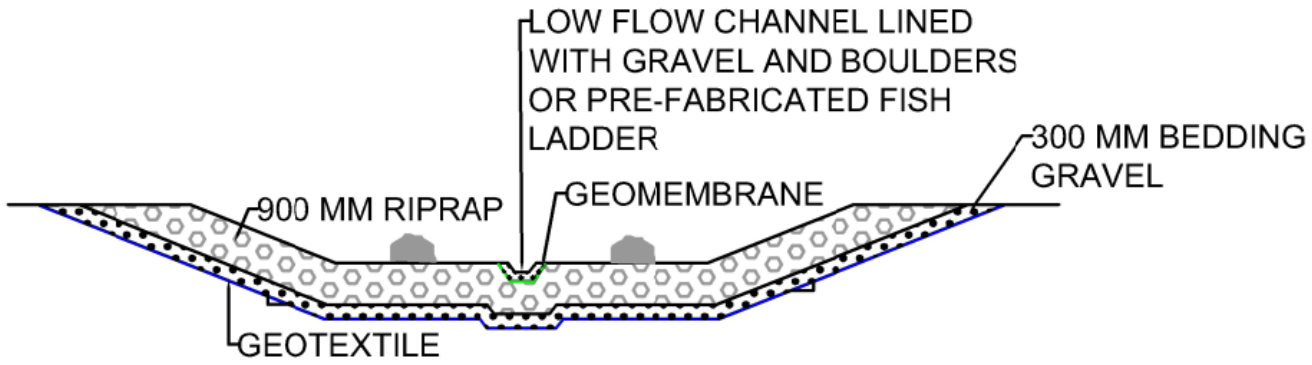

Figure 27: Design Type 3 - Cross Section of Rock Ramp

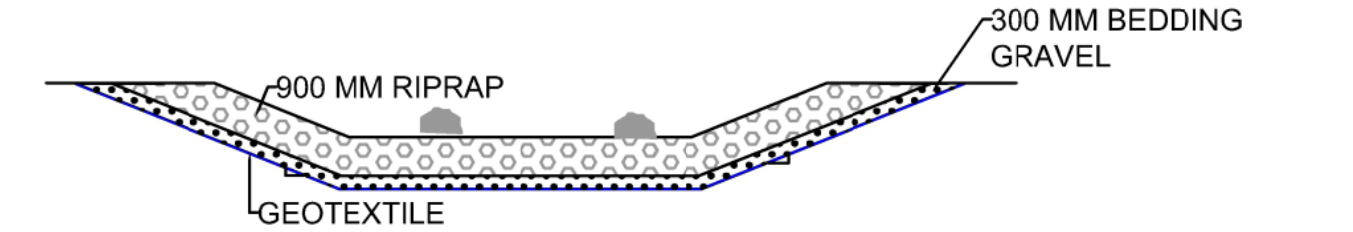

Figure 28: Design Type 3 - Cross Section of Pool

6.0 FLOOD PROTECTION BERM

The southwest Flood Protection Berm, which diverts runoff from the Bibou Creek floodplain into the DC1 Diversion Channel, is approximately 400 m long and has a maximum height above ground elevation of 2.4 m at the existing Bibou Creek thalweg. The proposed berm cross-sections are shown in the FS design drawings in Appendix J.

The conceptual design for the Flood Protection Berm is based on surficial terrain mapping and limited test pit data (Table 16). Additional data within and adjacent to the proposed footprint should be collected, and the design should be updated as required.

Table 16: Geotechnical Data for the Flood Protection Berm

Borehole	Location on Berm Alignment	Peat Thickness	Underlying Material
TM-23-14	Near Bibou Creek Thalweg near Sta 0+300 on the berm	1.4	Sand, fine to medium, wet. Augered to 2.6 m
MW-23-24	150m south of the south end of the berm	0.61	Sande, fine to coarse, to 6.73 m depth at bedrock.

The berm crest has an elevation of 382.3 masl. The lowest point along the berm's toe is at 379.9 masl, within the existing Bibou Creek channel. The freeboard accommodates the 100-year flood, which would lead to a 2.06 m maximum water depth relative to the invert of the DC1 diversion channel. The berm design includes over-excavation through approximately 1.4 m of peat to a fine to medium-grained sand layer and a 1.2 m deep cutoff key of compacted till, excavated into the underlying sand layer to intercept. The berm is built with a compacted till core with a top width of seven meters. Erosion protection is provided with a minimum of 0.6 m of waste rock over a filter layer of 0.3 m of sandy gravel.

The berm is covered with waste rock, including on the downstream 10H:1V face, to safely pass the overflow up to the Probable Maximum Flood (PMF). Overflow will be directed to the area within the southwest pit footprint and adjacent waste rock dumps.

The berm has a 10 m top width, 3H:1V side slope on the upstream side near the diversion, and 10H:1V side slopes on the downstream side. Flow in excess of the 100-year flood would overtop the berm. WSP verified that the overtopping depth would reach a maximum flow depth of approximately 0.25 m during the probable maximum flood (71.3 m^3/s). Velocities and depths were estimated using the DC1 HEC-RAS model with a levee to represent the berm. The required erosion protection riprap on the berm crest, upstream, and downstream faces is shown in Table 17. Riprap calculations were based on Simons (1977) for flow against the upstream face and USACE (1994) for flow over the crest and on the downstream face.

Table 17: Erosion Protection on the Flood Berm

Location	Slope	Minimum Rock Size (mm)	Minimum Rock Thickness (m)	Filter Layers
Upstream Face	3H:1V	108	1.0	0.3 m sandy gravel
Crest	0.3%	10	0.6	None
Downstream Face	1H:1V	175	1.0	0.3 m sandy gravel

7.0 WATERCOURSE INTERCEPTIONS AND TIE-INS (SMALL TRIBUTARIES)

The next engineering phase will need to include design details at locations where the diversion channel intercepts an existing watercourse. Table 18 below lists all the locations of small tributaries for which further consideration is required.

Table 18: Watercourse Interception Locations

Tie-In	DC1 Station
1	1+640
2	1+780
3	2+100
4	3+000
5	3+390
6	4+070
7	6+300
8	6+600

8.0 CIVIL DESIGN

Two surfaces were developed in Civil 3D, representing both the finished grade (top of erosion protection) and the excavation surface. Transitions between channel geometries were designed using approximated widths of the design water surface elevation for the 100-year return period upstream and downstream of the transition to change the width of water over a distance of five times the difference of the top widths (Smith 1995). A minimum transition distance of 20 m was deemed appropriate.

9.0 MAINTENANCE AND OPERATIONS

The upstream 5.3 km of the channel, which would remain in place at closure, was designed to require less maintenance and monitoring. However, regular inspections should be conducted to ensure lining materials have not been displaced after large flood events. The closure concept of the diversion channel is described in the main report.

The downstream 4.4 km of the channel, which would be decommissioned at closure, will require monitoring and maintenance after periods of high flow to replace boulders and rocks which may have been displaced. Weirs may require reshaping, and meandering portions of the low flow channels on the rock ramp sections should be regularly inspected to ensure ongoing fish passage connectivity through these sections of the channel.

The section of the channel built in fill between Sta 6+170 to 6+6670 should be monitored regularly for seepage from the channel, especially with respect to the integrity of the berm and low-permeability lining.

10.0 OPPORTUNITIES

- The suggested riffle and pool design type is expected to be labour-intensive to construct, as boulders must be placed at specified intervals. A potential opportunity to reduce this risk would be to implement pre-fabricated fish ladders in place of the low flow channel. Further engineering should be conducted to determine if this is a feasible option.
- At locations where the channel was excavated in bedrock, side slopes of 1H:1V were assumed. During detailed design, a side slope stability review should be conducted to assess if the bedrock side slopes can be reduced to 0.5H:1V or steeper. This could reduce the excavation volume and disturbance footprint, especially in Segment 9, Segment 11 and Segment 12, where the channel excavation is up to 17 m deep.
- In the first five kilometres of the channel, fish passage is provided for through a gently meandering low flow channel, logs, and boulders. Pools spaced along the channel will provide additional shelter and habitat and aid in channel naturalization.

11.0 RISKS

- Seepage out of the channel was not accounted for in sections where the channel is excavated in till. During detailed design, further hydrogeological assessment will be required to assess the seepage rate out of the channel and provide low-permeability layers where appropriate to ensure that the flow depth for fish passage is maintained during low-flow periods.
- Geotechnical assumptions in some locations were based on limited or unavailable data. Borehole data should be reviewed during detailed design, and additional data should be collected and integrated, where possible, to confirm or update assumptions. This may result in increased construction costs.
- The construction of the DC1 Main Diversion Channel is likely to be labour intensive and slower than expected, based on the bulk construction quantities alone. This is due to the detail nature of adding fish habitat features through-out the channel's length. Also, the requirement that more than half of the channel's length would remain in place at the site's restauration adds stringency and a high level of required rigour to the construction. These elements could lead to a high cost of construction for the diversion channel.

12.0 REFERENCES

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ATTACHMENT A

HEC-RAS Modelling Results

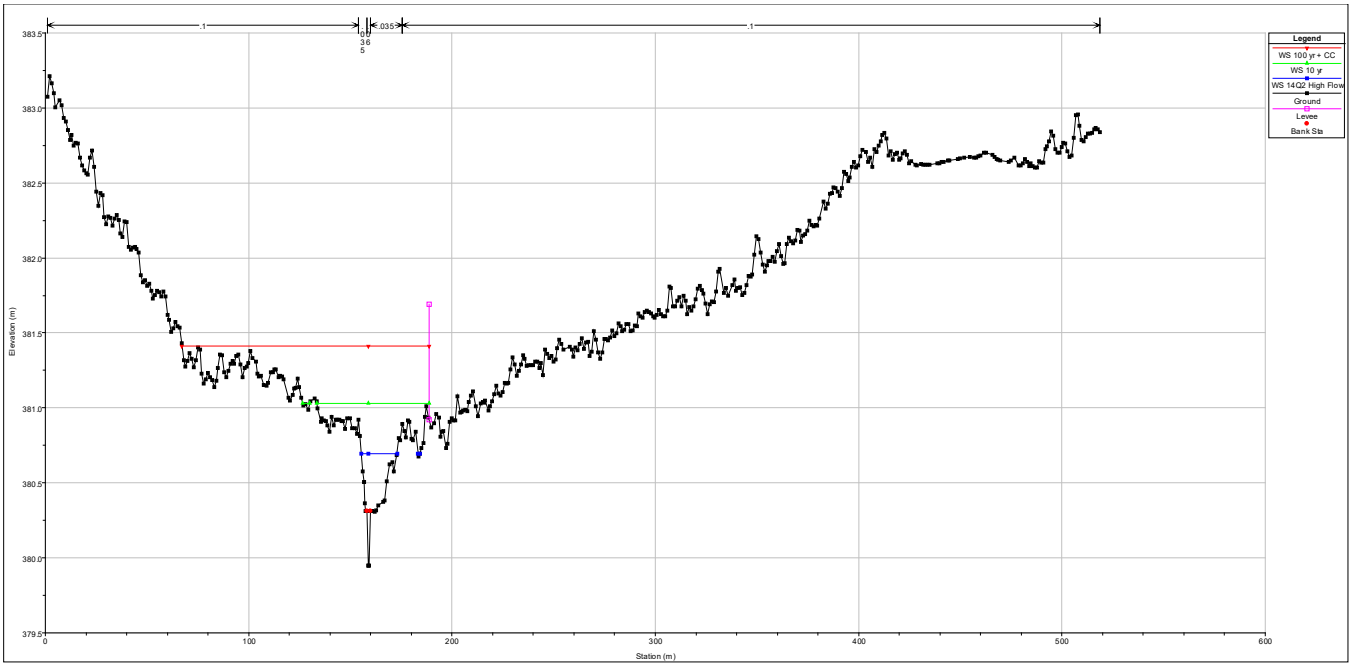


Figure 29: Cross-Section at Station 9+644

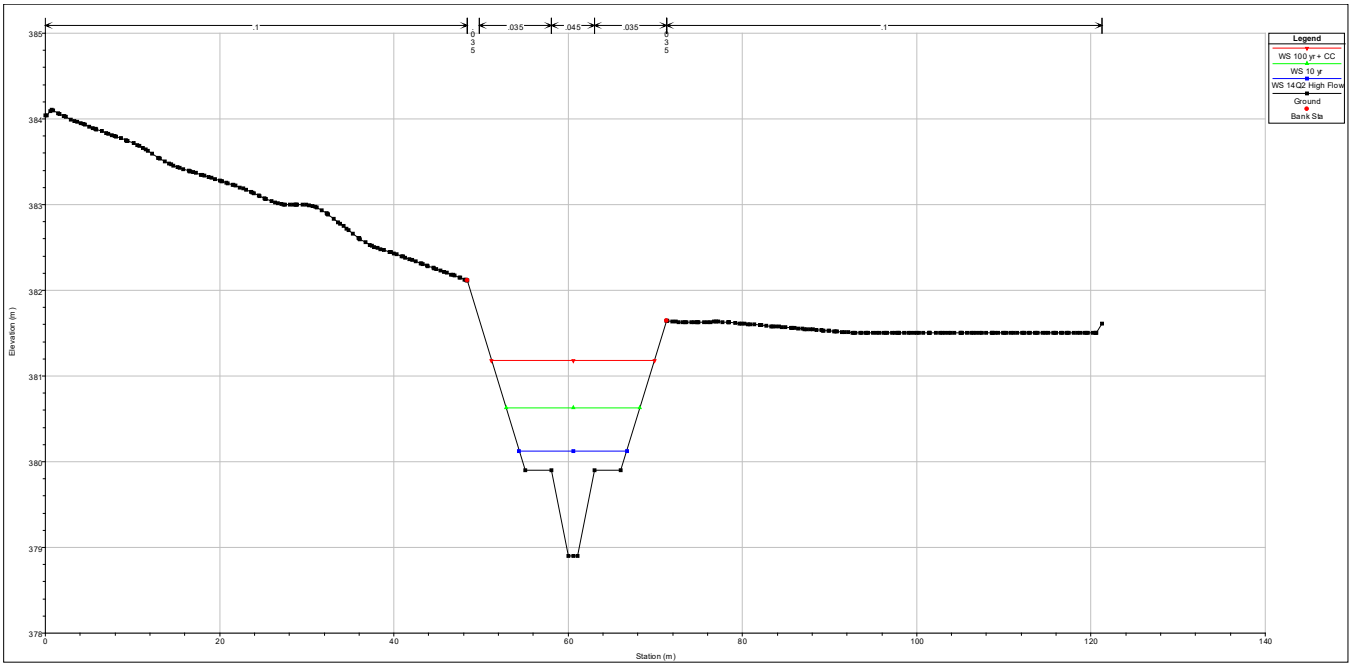


Figure 30: Cross-Section at Station 9+450

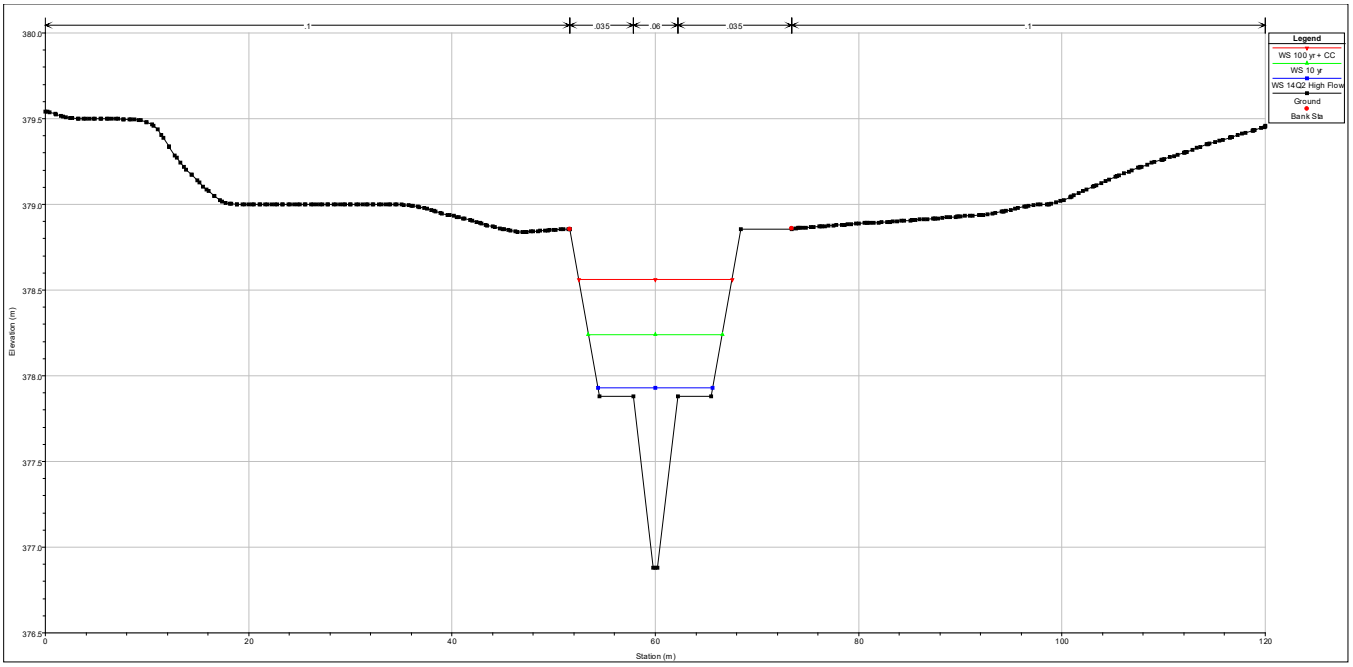


Figure 31: Cross Section at Station 8+149

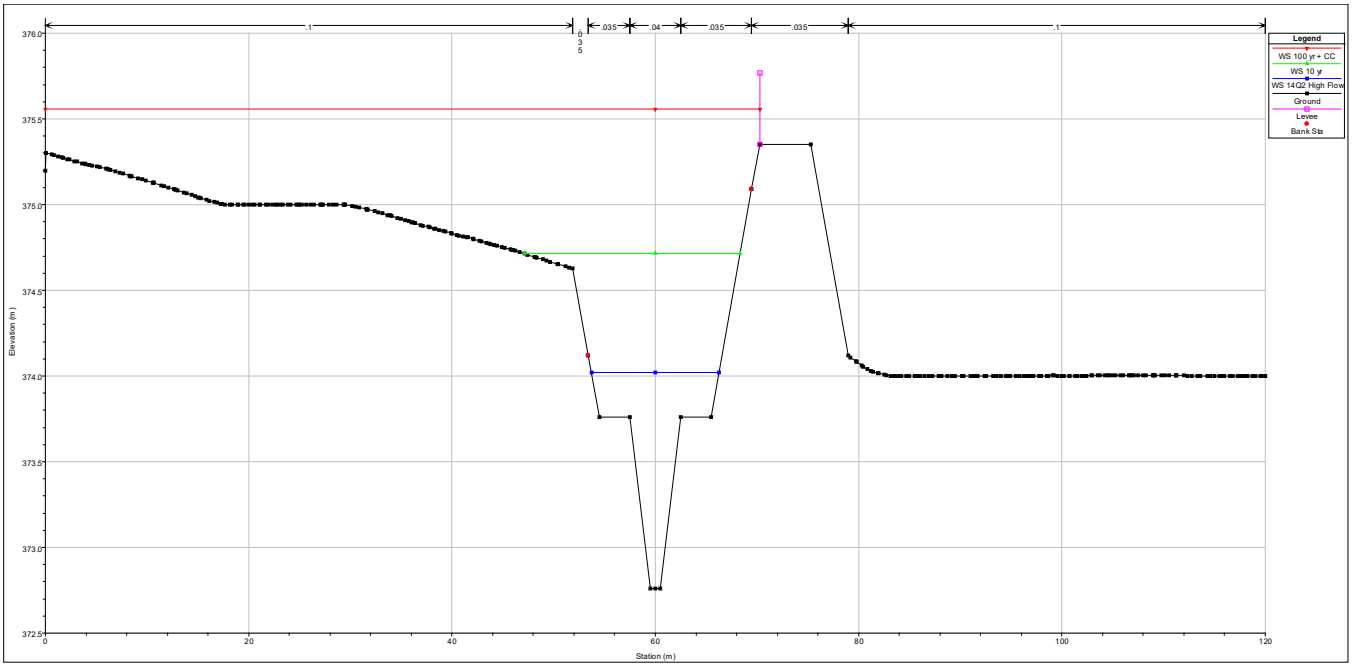


Figure 32: Cross-Section at Station 6+549

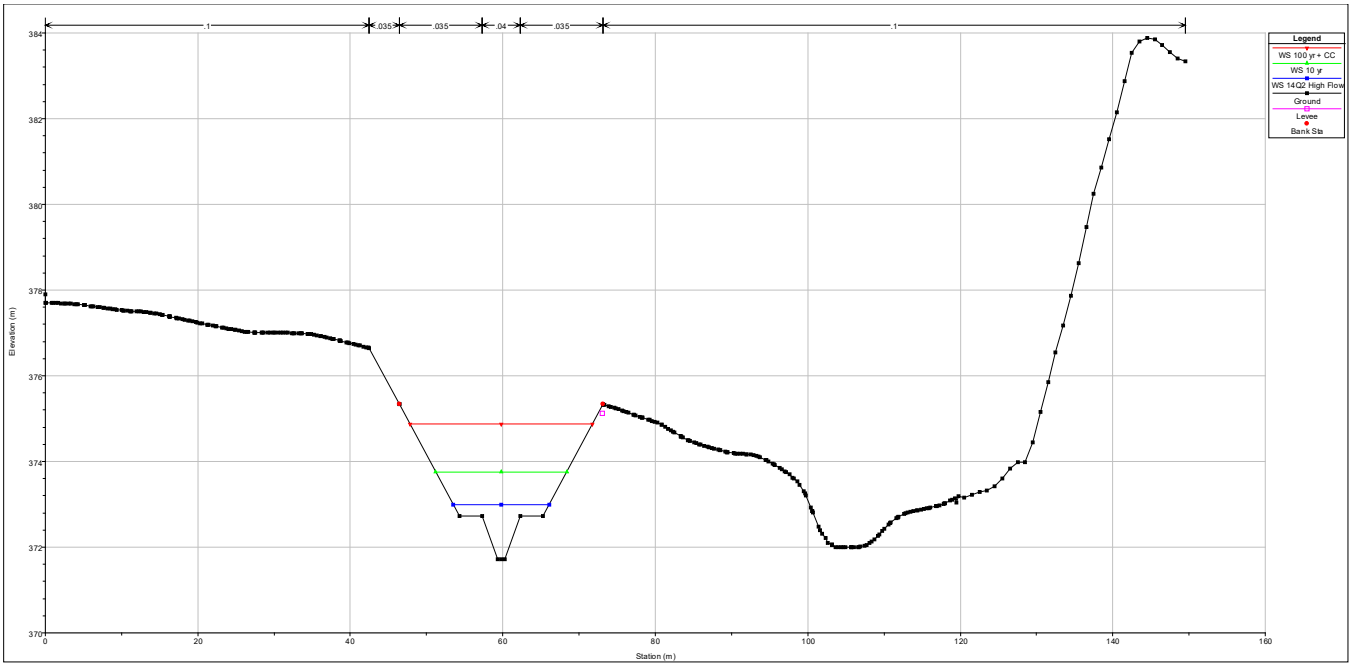


Figure 33: Cross-Section at Station 4+750

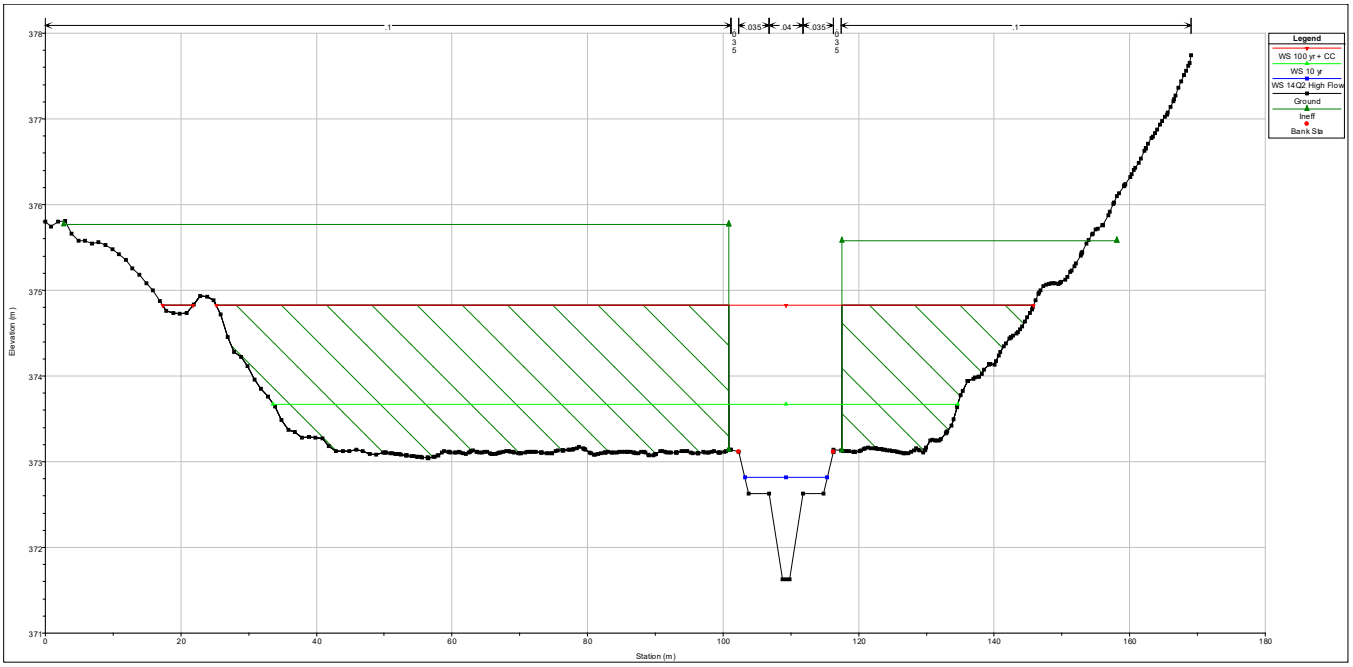


Figure 34: Cross-Section at Station 4+549

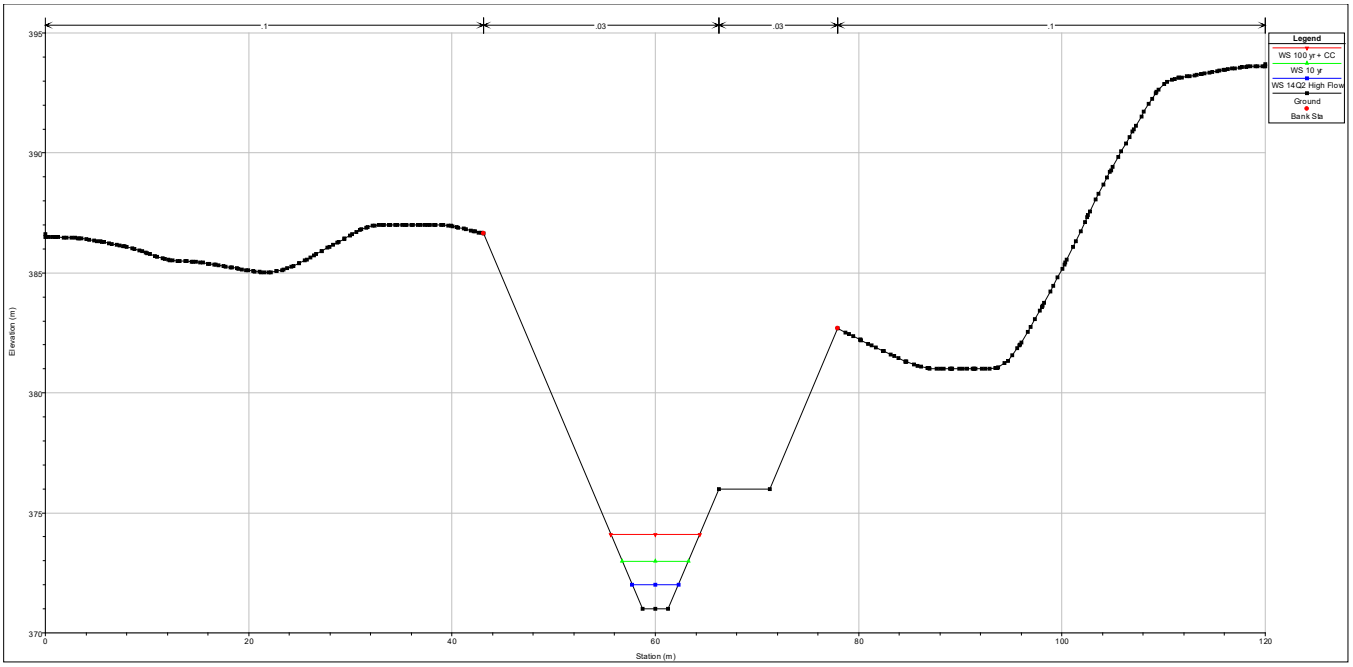


Figure 35: Cross-Section at Station 3+849

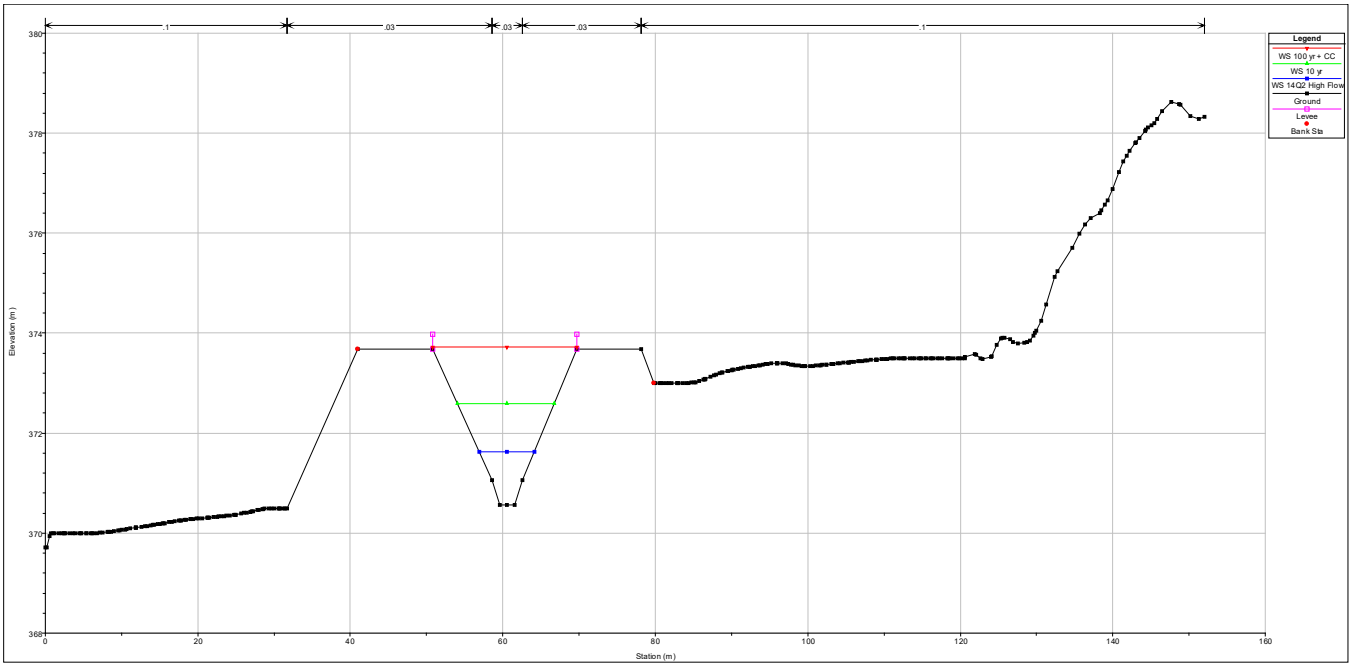


Figure 36: Cross-Section at Station 3+349

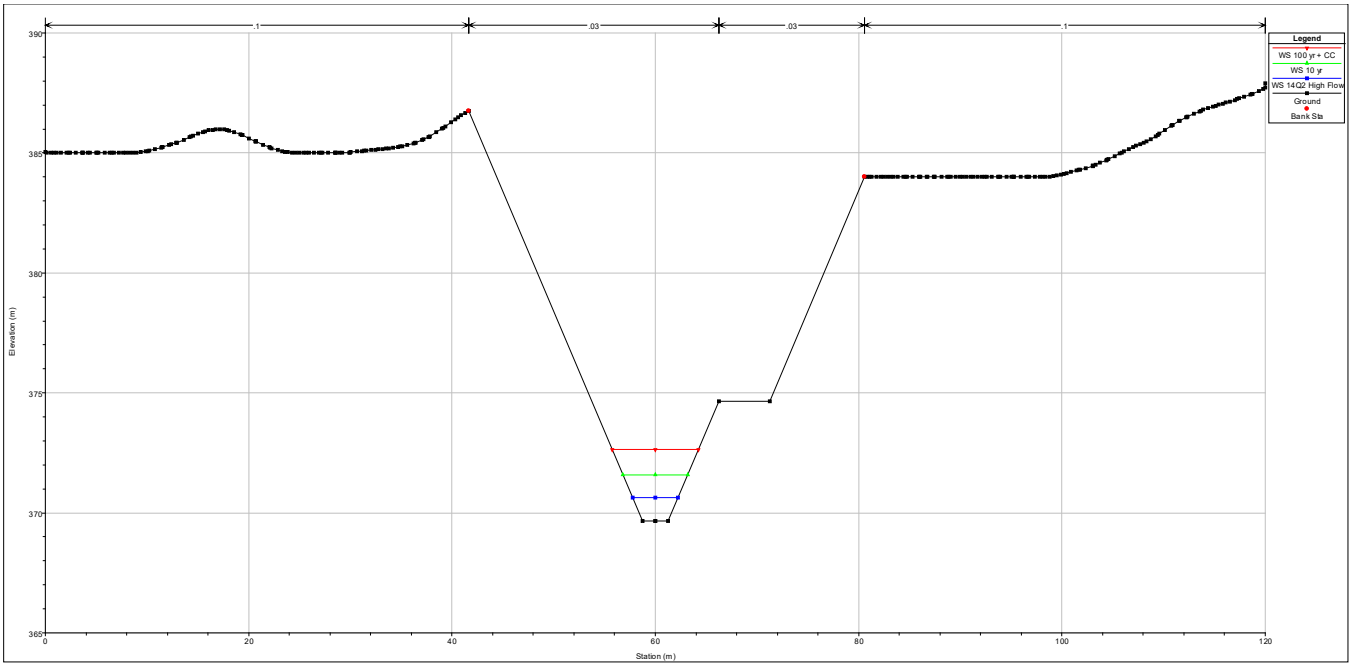


Figure 37: Cross-Section at Station 2+250

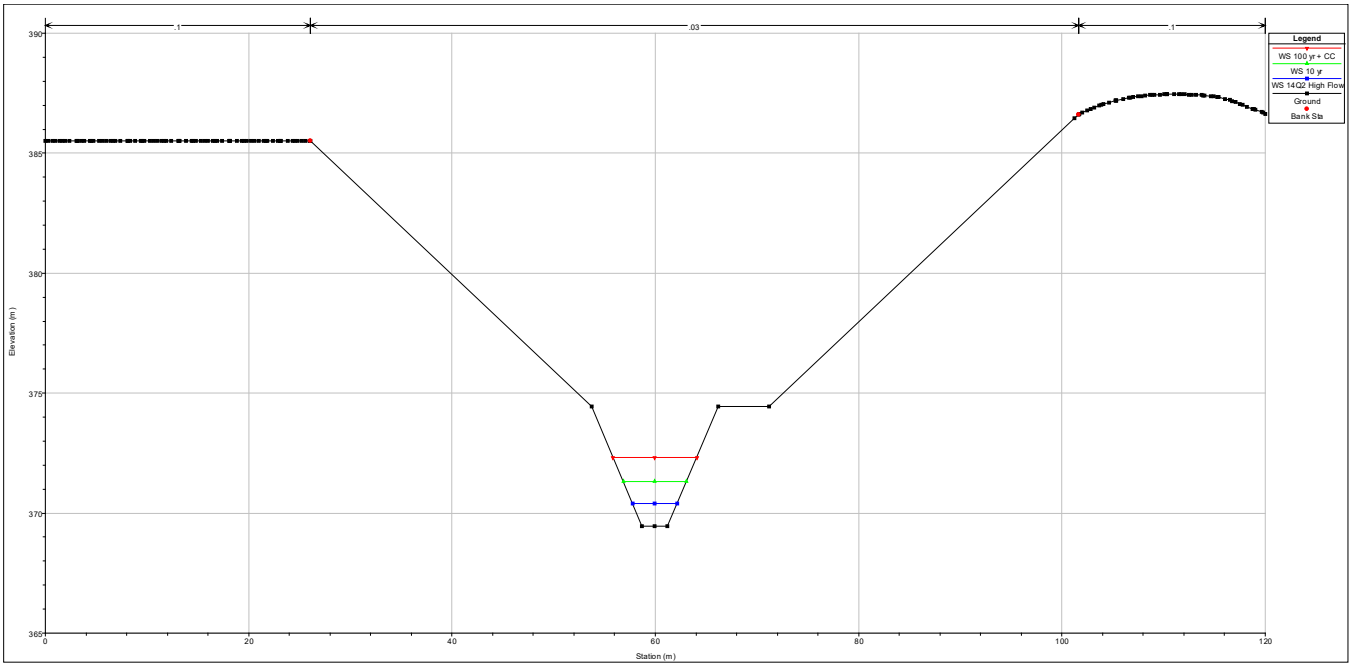


Figure 38: Cross-Section at Station 2+050

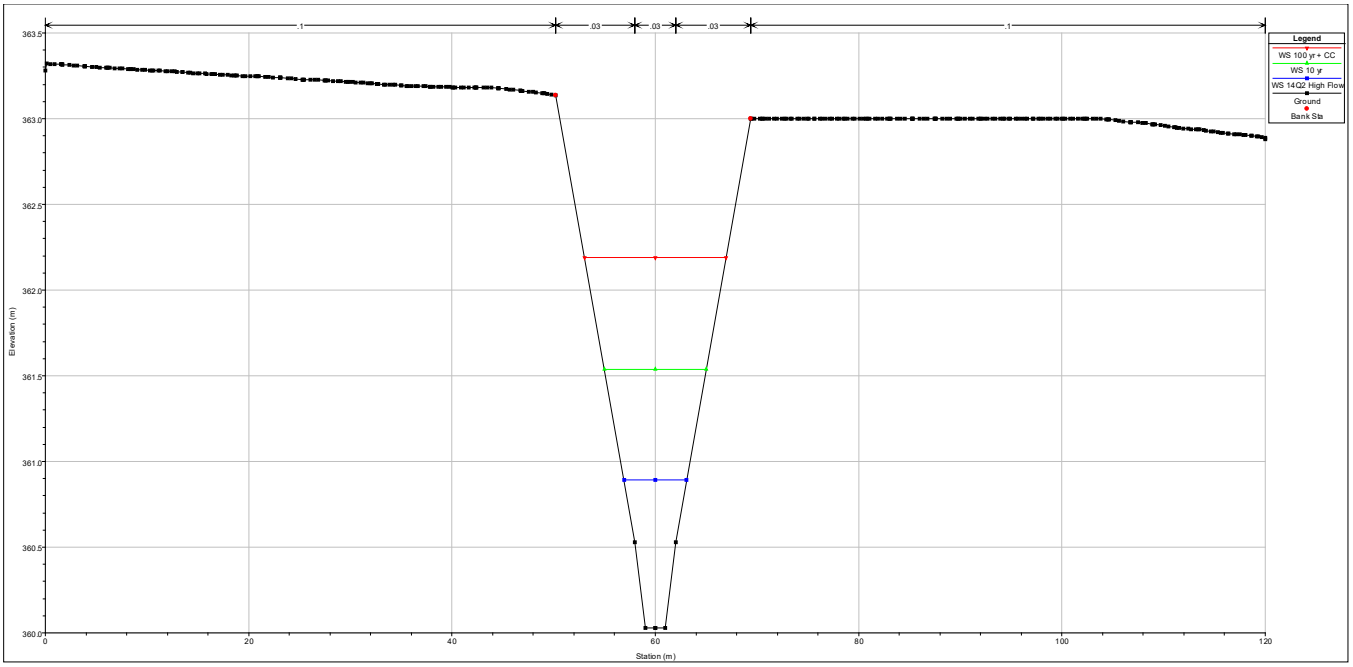


Figure 39: Cross-Section at Station 0+950

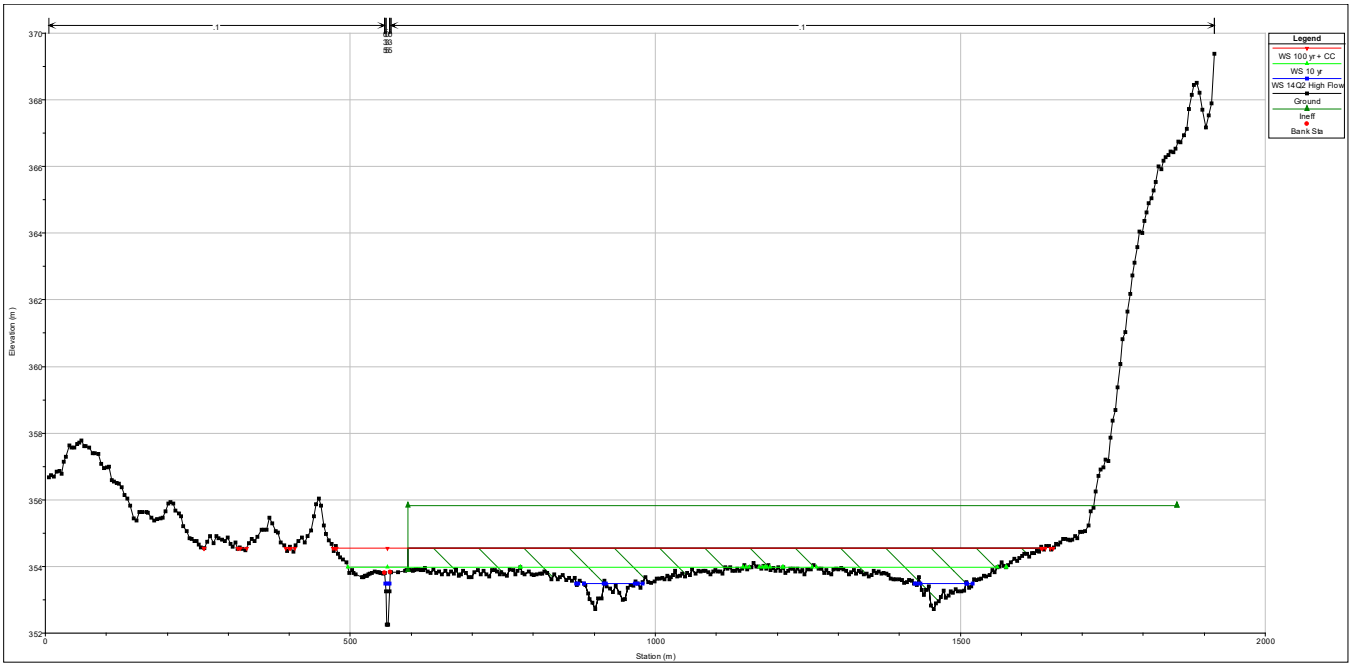


Figure 40: Cross-Section at Station 0+052

APPENDIX E

Contact Water Ponds, Sumps, and Ditches

This Appendix presents design details for the secondary diversions (including the DC2 east diversion and DCB temporary bypass channels), contact water collection ditches, sedimentation ponds, and pumping sumps. Construction of the surface water management infrastructure is distributed across the operational period and is aligned with the mine plan development as shown in Appendix B. The East Diversion and sedimentation ponds are assumed to be constructed in the year preceding their operational requirement. Sumps and collection ditches are assumed to be constructed in the first quarter of the mine plan development prior to the spring freshet.

Design flows and pond volumes were calculated using the HEC-HMS software (USACE 2021), the Soil Conservation Service (SCS) Curve Number (CN) and SCS Unit Hydrograph methods (USDA 1986). Ditch and channel hydraulics were analyzed using Manning's equation for open channel flow. Riprap rock sizes were calculated using USACE (1994).

The design of the pumping systems for the sedimentation ponds and sumps is described in Appendix G.

1.0 CALCULATION OF DESIGN FLOWS

HEC-HMS (Hydrologic Engineering Center and Hydrologic Modeling System) (USACE 2021) was used to simulate peak design flows for the Troilus mine area. Within HEC-HMS, the SCS CN and SCS Unit Hydrograph methods (USDA 1986) were applied. The SCS-CN method is an empirical technique used to estimate rainfall-runoff volume in small watersheds, with CN being an empirically derived parameter calculating direct runoff from a rainfall event. CN values range from 100 (for water bodies) to approximately 30 for permeable soils with high infiltration rates, and the value depends on soil type, condition, land use and land cover (LULC) of an area.

Peak design flows, and pond volumes were determined based on short-term flood events and small drainage areas covering diversion ditches, contact ditches, and sumps and sedimentation ponds. The model's data inputs include meteorological and hydrological data, drainage areas, CN values, and lag times to determine peak design flows.

1.1 Climate Inputs

Climate design inputs (extreme, short-term rain and rain-on-snow statistics) are described in Appendix C. WSP used the 100-Year, 24-Hour extreme rainfall event as a design event for ditches and channels the SCS Type 2 distribution. WSP used 100-year, 7-Day summer rainfall and spring rain-on-snow events for the design of sumps and ponds; the 7-Day distribution was such that the maximum intensity for each shorter duration is equal to the values presented in Appendix C; for the peak 24-Hour, the SCS Type distribution was used.

1.2 Drainage Areas and CN Values

The drainage areas were delineated using a Digital Terrain Model (DEM) and topographic contours derived from provincial 2019 LiDAR with 1m resolution and mine plan information, including pit and dump boundaries and surface contours from AGP Mining Consultants Inc. (AGP). Existing surface drainage features were incorporated. Drainage areas were delineated for diversions, contact ditches, sumps, and sedimentation ponds. Streamflow paths were delineated based on the drainage areas and existing and future mine plan topography.

In 2021, WSP completed a terrain analysis of the project area (WSP 2021), including surficial material, drainage types, slope stability, and underlying materials. This analysis provided information on the dominant surficial material based on the LULC of the area. The proposed land type and Curve Number (CN) value were determined using the terrain map's land type and future mine plan for the area, as tabulated in Table 1.

Table 1: CN Values

Land Type for HEC-HMS Model	Terrain Map Analogue (WSP, 2021)	SCS CN Value
Overburden dumps, built areas	Not Applicable	91
Cleared area of the mine site	Anthropocene	86
Waste dump (rock)	Not Applicable	72
Natural area, wooded	Morainal (Till)	60
Natural Area, vegetated	Organic	71
Tailings Beach	Not Applicable	94
Mine Pit Area	Not Applicable	93
Pond area (including wetland)	Water body	100

1.3 Lag Times

SCS unit hydrograph method was applied to simulate the design flows in HEC-HMS. This method requires the Lag Time parameter as an input. The lag time was determined from the delineated drainage flow paths and was calculated using the Curve Number of the watershed, slope and area of the basin flow paths as input and time of concentration (T_c) for each sub-basin.

The lag time and the total time of concentration (T_c) are calculated using the Time of Concentration and Travel Time equations (USDA 1986). The total Time of Concentration (T_c) is the sum of Travel Time (T_t) values for the various consecutive flow segments in a flow paths (sheet flow, shallow concentrated flow and channel flow)

The Travel Time (T_t) is calculated for each individual flow paths and their flow segments based on the sheet flow, shallow concentrated flow and open channel flow.

- Sheet flow over plane surfaces usually occurs near the ridgeline that defines the watershed boundary. Sheet flow typically occurs for no more than 100 feet (30 meters) before transitioning to shallow concentrated flow. The travel time (T_t) is computed based on the Manning's kinematic solution.
- Shallow concentrated flow collects in swales, small rills, and gullies. The shallow concentrated flow velocity (V) is calculated as a function of terrain slope and roughness.
- Open channel flow occurs when the shallow concentrated flow meets the proposed designed diversion channel or the contact ditches. Natural channels are identified from aerial imagery or site topography. Manning's equation is used to estimate average flow velocity.

1.4 Summary Table

Table 2 below summarizes the HEC-HMS inputs for each ditch, sump, and pond, including drainage area, CN values and calculated lag times.

The temporary bypass DCB was not included in the HEC-HMS model but was assumed to have similar flow rates to the main diversion DC1 (see Appendix D).

Figure 1 and Figure 2 show an approximation of the surface water drainage areas for each structure for the Year 1 and Year 22 SWMP configurations.

Table 2: HEC-HMS Input Parameters

HEC-HMS ID	Design Year	Sub-Basin Drainage Area (km2)	CN Value	% Impervious	Lag Time (min)
DA_DC2a	22	1.271	61.2	0	35.7
DA_DC2b	22	4.265	60.0	0	119.4
DA_D01a	1	0.451	73.0	0	10.5
DA_D01b	1	0.198	85.3	0	10.7
DA_D01c	1	0.052	70.7	0	5.6
DA_D02	22	0.565	68.9	0	11.3
DA_D03	1	0.083	81.9	0	7.3
DA_D04	1	0.124	79.7	0	7.5
DA_D05	22	0.842	68.9	0	27.9
DA_D06a	22	0.326	77.3	0	13.8
DA_D06b	22	0.329	80.1	0	5.5
DA_D06c	22	0.139	81.9	0	4.1
DA_D07b	22	0.128	87.0	0	9.3
DA_D07c	22	0.049	88.1	0	4.2
DA_D08	22	0.080	73.9	0	3.0
DA_D09	22	0.036	60.0	0	6.3
DA_D10a	22	0.487	75.7	0	8.9
DA_D10b	22	0.228	83.8	0	6.6
DA_D11	22	0.788	72.0	0	18.0
DA_D12	22	0.145	91.0	0	3.3
DA_D14a	22	1.190	69.3	0	26.8
DA_D14b	22	0.410	91.0	0	5.7
DA_D14c	22	0.180	72.0	0	10.5
DA_D15	22	0.351	72.0	0	12.1
DA_D16	22	0.115	67.5	0	11.7
DA_D17	22	2.096	70.8	0	11.3
DA_Pit87	22	2.265	87.8	100	(a)
DA_PitJ	22	1.959	86.3	100	(a)
DA_PitSW	22	1.129	87.3	100	(a)
DA_PitX22	22	1.163	82.0	100	(a)
DA_S1	1	0.121	74.1	40	4.2
DA_S2	1	0.023	81.0	20	1.3
DA_S3	1	0.328	69.8	5	7.7
DA_S5	22	0.030	63.8	20	6.7
DA_S6	22	0.605	86.0	5	19.0
DA_S7	22	0.512	61.0	1	10.1
DA_S9	22	0.451	86.0	5	9.4
DA_SP01	22	0.136	73.4	40	24.3

Table 2: HEC-HMS Input Parameters

HEC-HMS ID	Design Year	Sub-Basin Drainage Area (km2)	CN Value	% Impervious	Lag Time (min)
DA_SP02	22	0.130	88.7	90	1.6
DA_SP03	22	0.047	72.9	50	1.5
DA_SP04	22	0.175	87.4	80	0.0
DA_TSF	22	4.715	88.1	30	a)
DA_D02	22	0.474	71.5	0	7.3
DA_D01a	22	0.211	73	0	9.3
DA_S1b	22	0.3112	81	40	4.6

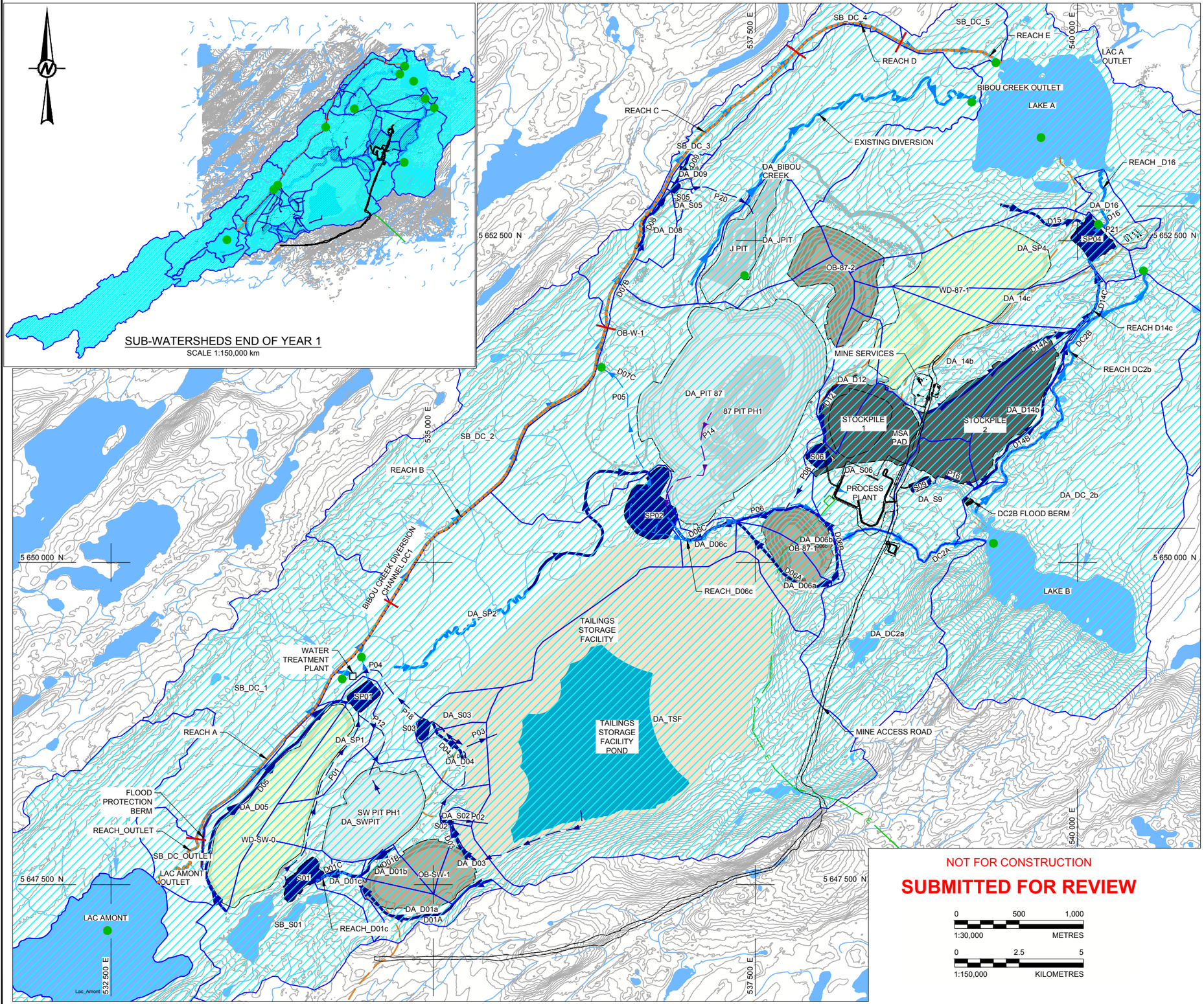
Notes:

(a) Tailings Storage Facility (TSF) and Pits are modelled as sinks in the HEC-HMS model; no lag time was accounted for.

Channel reaches, which serve as collectors for upstream ditches, had lag times calculated for the length of the channel. These lag times are shown in Table 3.

Table 3: Reach Lag Times

Structure ID	Design Year	Lag Time (min)
Reach_D01c	1	2.1
Reach_D02_Y22	22	1.8
Reach_D06c	22	3.2
Reach_D07c_Y22	22	2.0
Reach_D14c	22	2.0
Reach_D16	22	6.9
Reach_DC2b	22	35.4



LEGEND

- TOPOGRAPHIC CONTOUR (5 m INTERVAL) (560)
- NATURAL STREAMS
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- P## — CLEAN WATER PIPELINE (PUMPING)
- P## — CONTACT WATER PIPELINE (PUMPING)
- P## — PIT DEWATERING
- FLOW DIRECTION
- NATURAL LAKES
- SP## — SEDIMENTATION POND (CONTACT WATER)
- S## — SUMPS / PUMP STATION (CONTACT WATER)
- TSF POND
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- WASTE DUMP
- PROCESS PLANT
- E — RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD
- WATERSHED AREAS
- DIVERSION REACHES FLOW PATH
- DITCH REACHES FLOW PATH

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, FEBRUARY10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END OF YEAR (2) SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

0 2.5 5
1:150,000 KILOMETRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN
SUB-WATERSHEDS END OF YEAR 1

CONSULTANT

wsp

YYYY-MM-DD	2024-05-03
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

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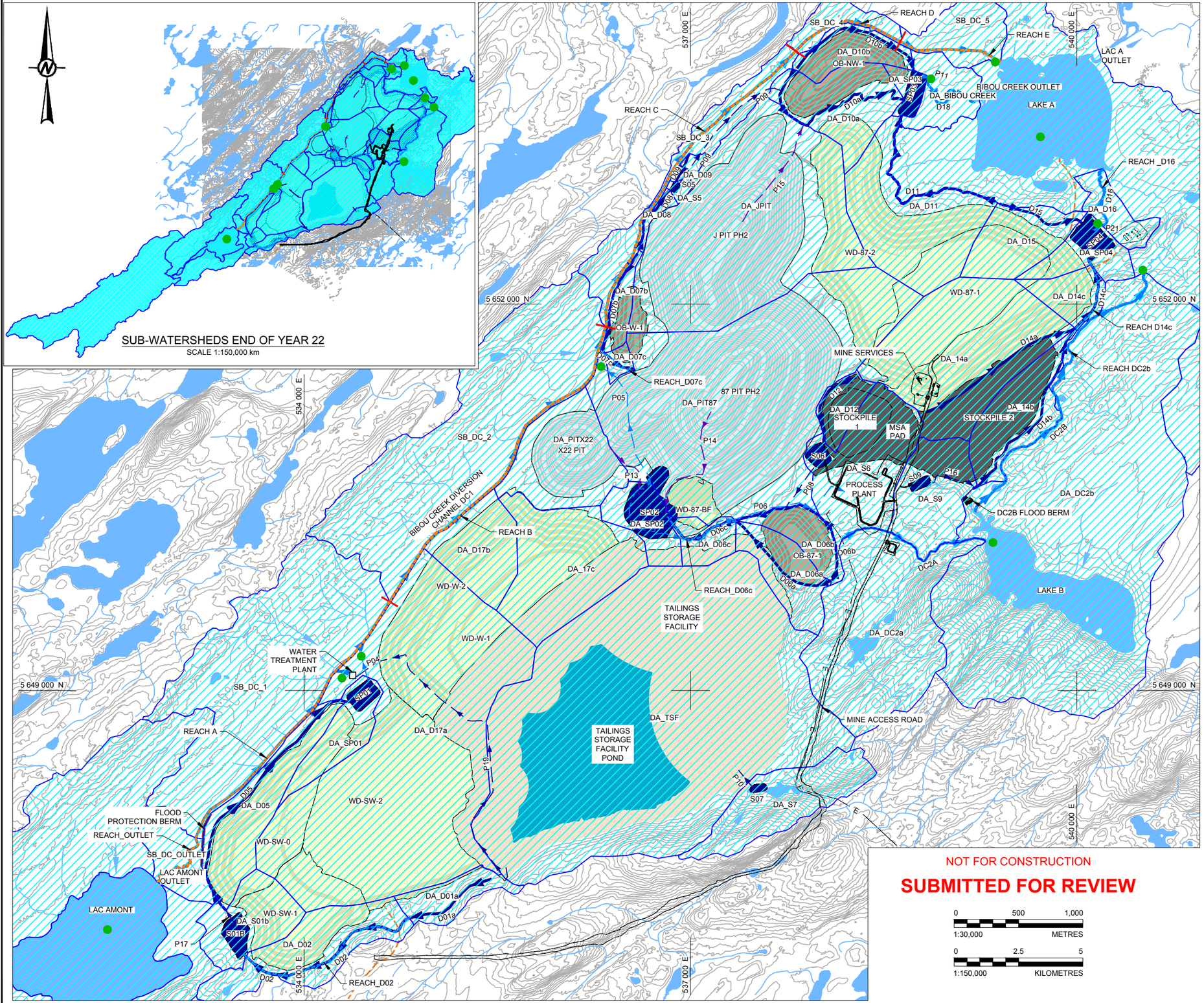

WATER MANAGEMENT

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- P## — CLEAN WATER PIPELINE (PUMPING)
- P## — CONTACT WATER PIPELINE (PUMPING)
- P## — PIT DEWATERING
- FLOW DIRECTION
- NATURAL WATERCOURSES
- NATURAL LAKES
- TSF POND
- SP## — SEDIMENTATION POND (CONTACT WATER)
- S## — SUMPS / PUMP STATION (CONTACT WATER)
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- OVERBURDEN PILE
- WASTE DUMP
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- PROCESS PLANT
- E — RELOCATED ELECTRICITY TRANSMISSION LINE
- EXISTING ROADS (2023)
- FUTURE ROAD
- WATERSHED AREAS
- DIVERSION REACHES FLOW PATH
- DITCH REACHES FLOW PATH

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END-OF-MINE-LIFE SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE; ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

SUBMITTED FOR REVIEW

0 500 1,000
1:30,000 METRES

0 2.5 5
1:150,000 KILOMETRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SURFACE WATER MANAGEMENT PLAN
SUB-WATERSHEDS END OF YEAR 22

CONSULTANT

wsp

YYYY-MM-DD	2024-05-03
DESIGNED	JF
PREPARED	TF
REVIEWED	VR
APPROVED	VR

PROJECT NO.	CONTROL	REV.	FIGURE
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1.5 HEC-HMS Results

1.5.1 Channels and Ditches

HEC-HMS outputs for the 100-year summer event are shown for the secondary diversion channels, and contact water ditches are included in Table 4.

The peak discharge for the 100-year event for the east diversion and contact water ditches is shown plotted against the drainage area in Figure 3. DC2b appears to be an outlier in terms of the flow rate relative to the total drainage area. This is because DC2b collects flow from both the upstream DC2a channel and from Lac C. Flow through Lac C was significantly attenuated upstream of DC2b, resulting in a lower flow rate compared to other channels.

Table 4: HEC-HMS Outputs – Secondary Diversion Channels and Contact Water Ditches

Hydrologic Element	Total Contributing Drainage Area (km^2)	Peak 100-Year Discharge (m^3/s)
D01a	0.5	7.6
D01b	0.2	4.5
D01c	0.7	12.6
D02	0.7	11.2
D03	0.1	2.0
D04	0.1	2.9
D05	0.8	7.4
D06a	0.3	5.6
D06b	1.1	8.4
D06c	1.5	15.2
D07b	0.1	3.2
D07c	0.2	4.3
D08	0.1	1.9
D09	0.0	0.4
D10a	0.6	9.6
D10b	0.2	6.0
D11	0.8	10.1
D12	0.1	4.9
D14a	1.2	10.9
D14b	0.9	12.7
D14c	2.2	20.5
D15	0.4	5.5
D16	0.1	1.6
D17	2.1	32.4
DC2a	1.3	6.8
DC2b	5.5	13.0

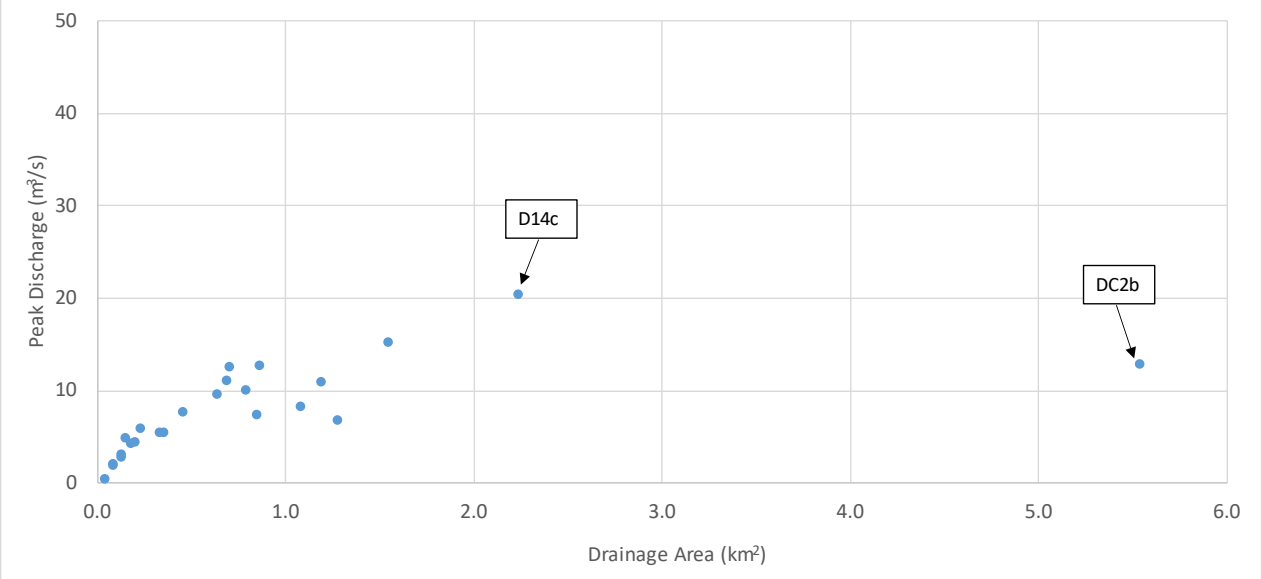


Figure 3: Secondary Diversions and Contact Water Ditches – Distribution of Drainage Area vs Peak Discharge

1.5.2 Sumps and Ponds

Maximum storage volumes and inflow rates are summarized for the sedimentation ponds and sumps in Table 5.

Figure 4 through Figure 25 show for each sedimentation pond and sump the simulation of 100-year live storage volume and of 100-year inflows and outflows. For all cases, the summer rainfall event led to a higher volume than the spring rain-on-snow event; the figures present the system's behaviour during the summer event alone.

Additional groundwater inflows to the ponds were judged to be small relative to the surface water flood inflows and were neglected for the purpose of the current design.

Table 5: Sedimentation Ponds and Sumps – HEC-HMS Summary for the 100-Year Design Event

Pond / Sump	Maximum Containment Volume	Peak Inflow	Design Pumping Capacity
	m^3	m^3/s	m^3/s
S01[(a)]	75,000	22	0.25
S02	4,000	2.6	0.30
S03	15,000	8.0	0.30
S05	4,000	2.6	0.20
S06 [(b)]	34,300 (10-Year) 53,000 (100-Year)	8.7 (10-Year) 12 (100-Year)	0.20
S07	12,000	5.5	0.20
S09	23,000	9.9	0.30
SP01	62,000	9.2	0.40
SP02	144,000	45	1.00
SP03	80,000	23	1.00
SP04	127,000	27	1.00

Notes:

(a) the same criteria were applied to Sump S01b

(b) Sump S06 design based on existing topography to contain the 10-year event prior to development of the STK1 footprint

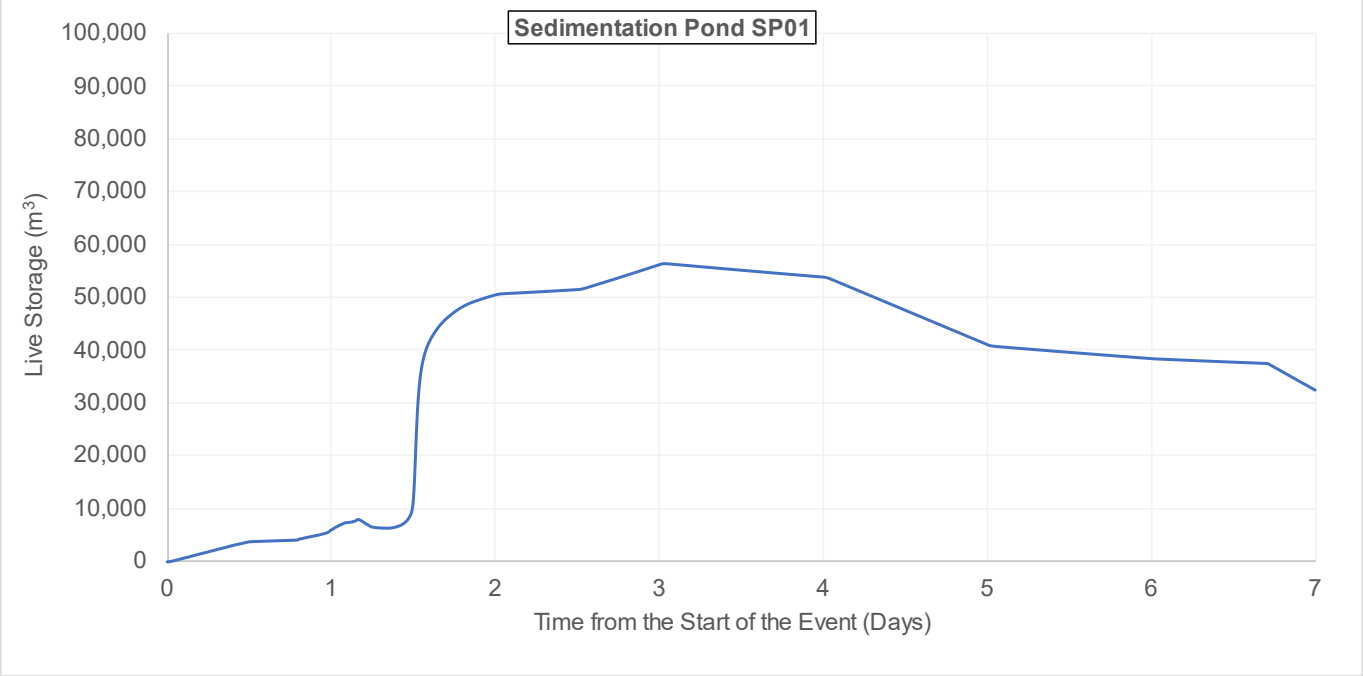


Figure 4: Sedimentation Pond SP01 – Simulation of 100-Year Live Storage Volume

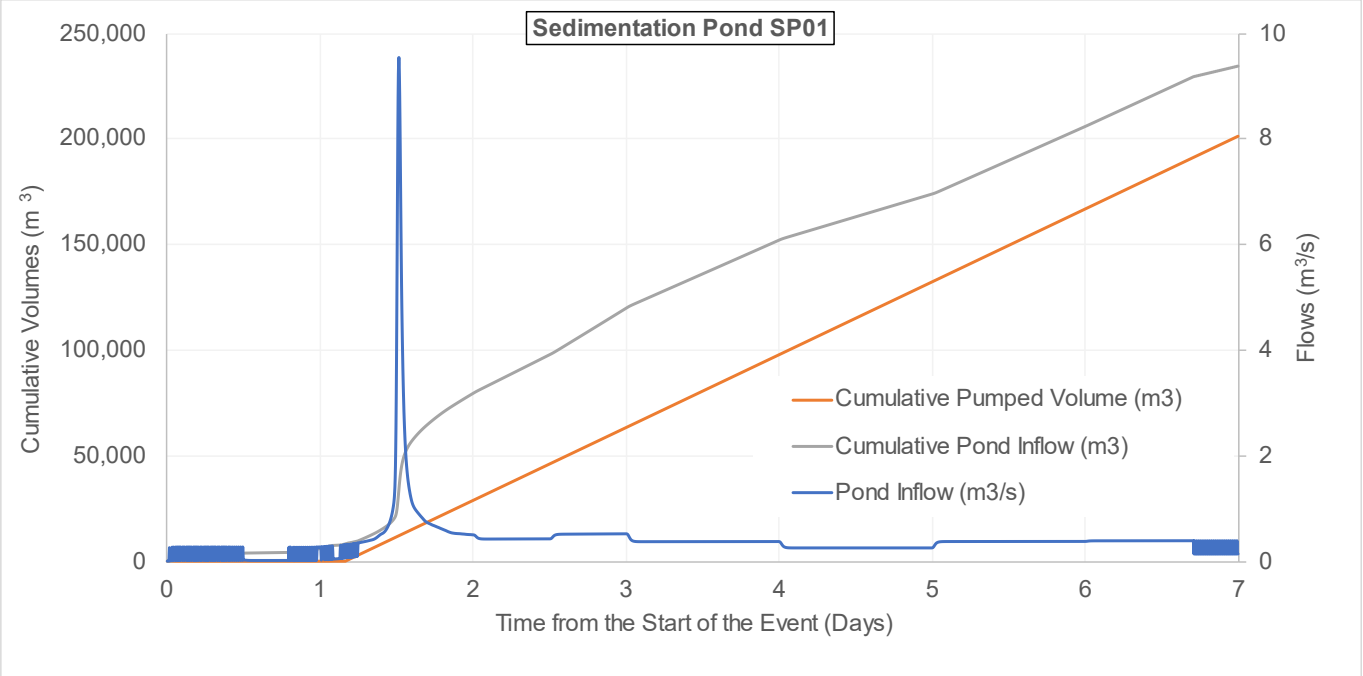


Figure 5: Sedimentation Pond SP01 – Simulation of 100-Year Inflows and Outflows

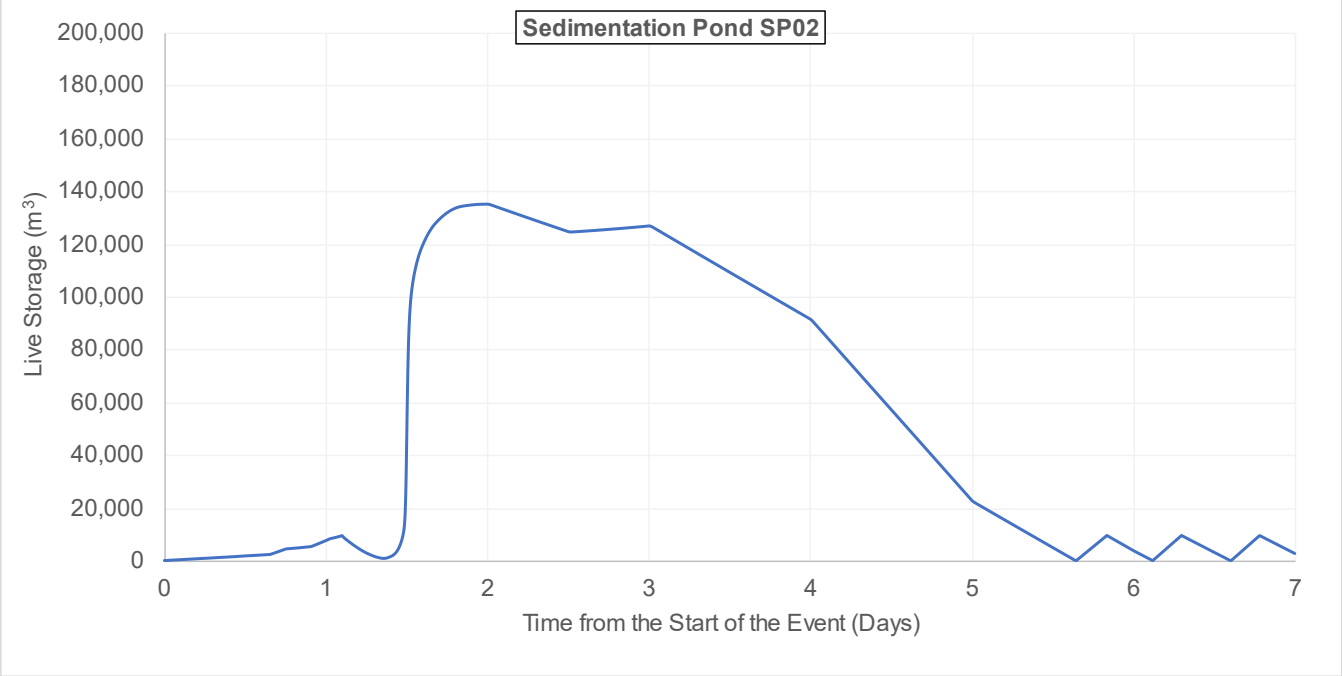


Figure 6: Sedimentation Pond SP02 – Simulation of 100-Year Live Storage Volume

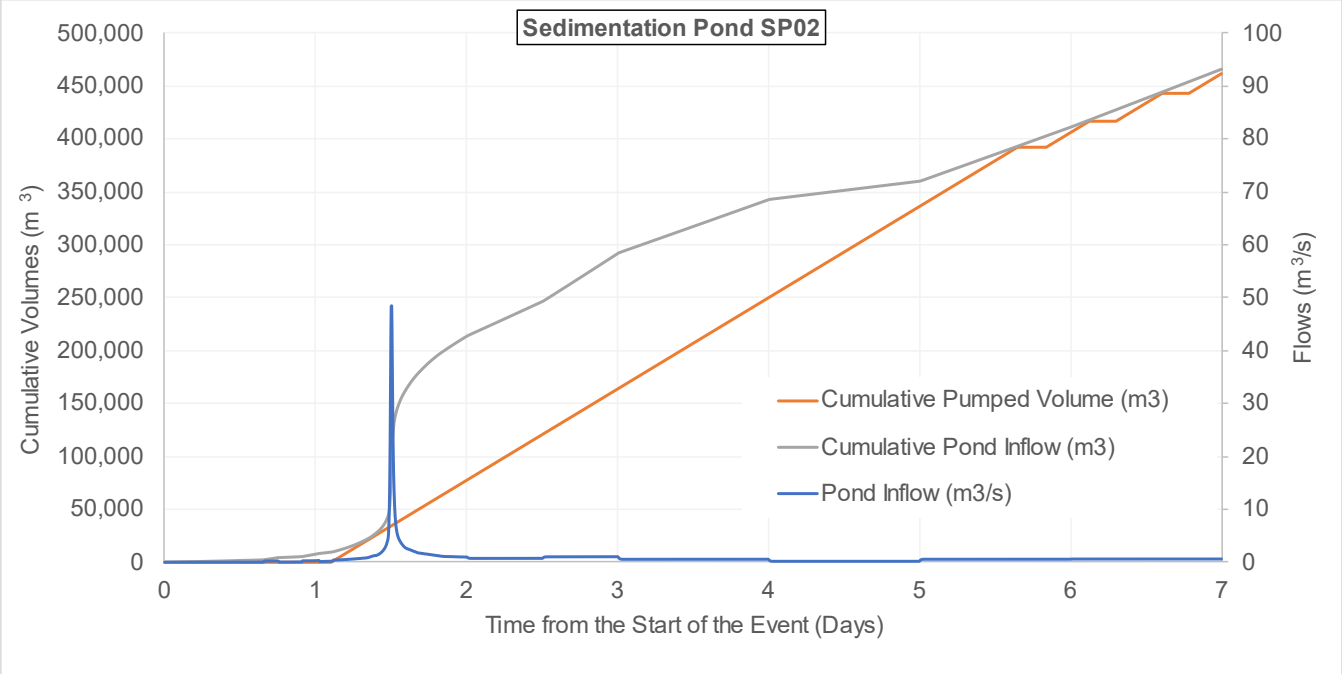


Figure 7: Sedimentation Pond SP02 – Simulation of 100-Year Inflows and Outflows

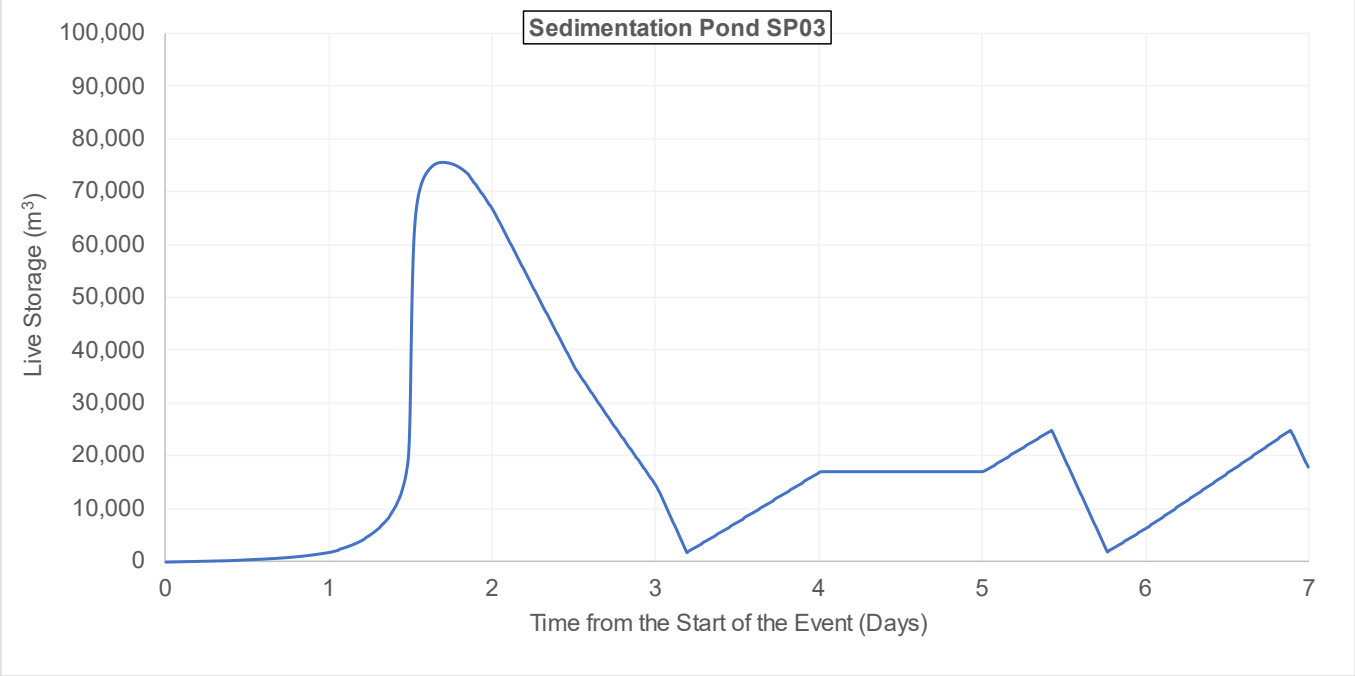


Figure 8: Sedimentation Pond SP03 – Simulation of 100-Year Live Storage Volume

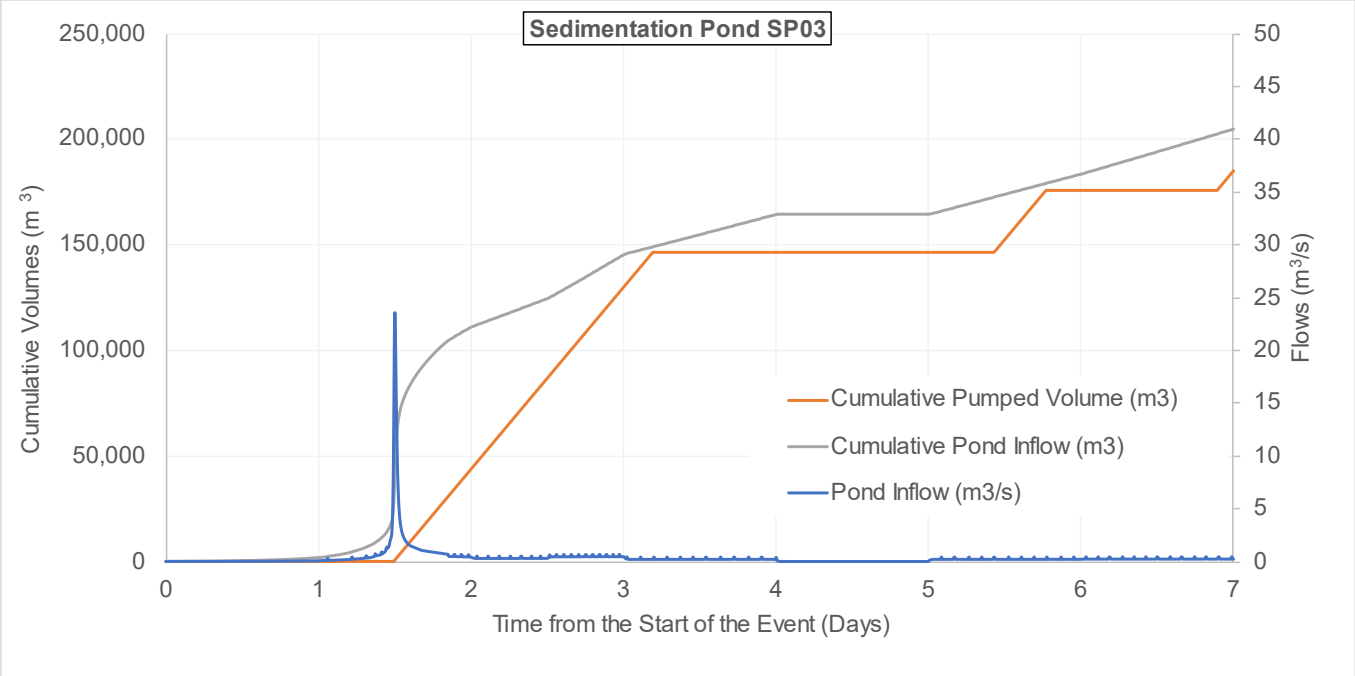


Figure 9: Sedimentation Pond SP03 – Simulation of 100-Year Inflows and Outflows

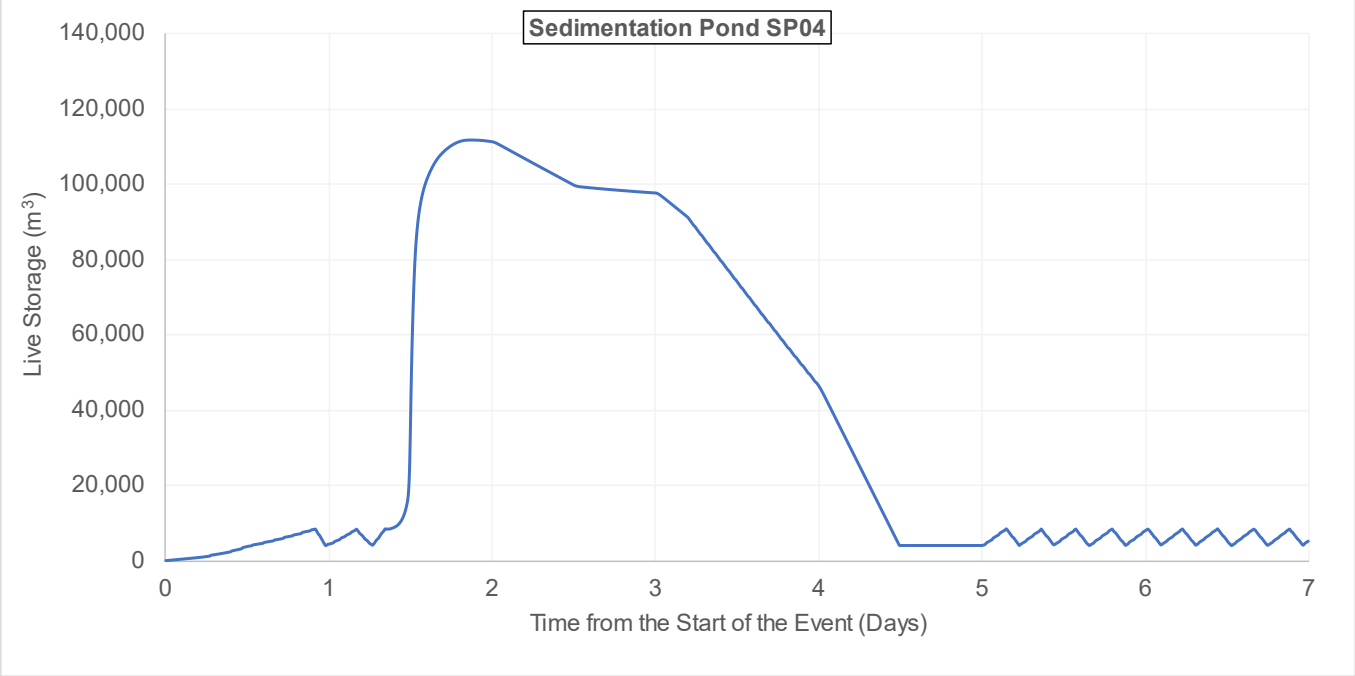


Figure 10: Sedimentation Pond SP04 – Simulation of 100-Year Live Storage Volume

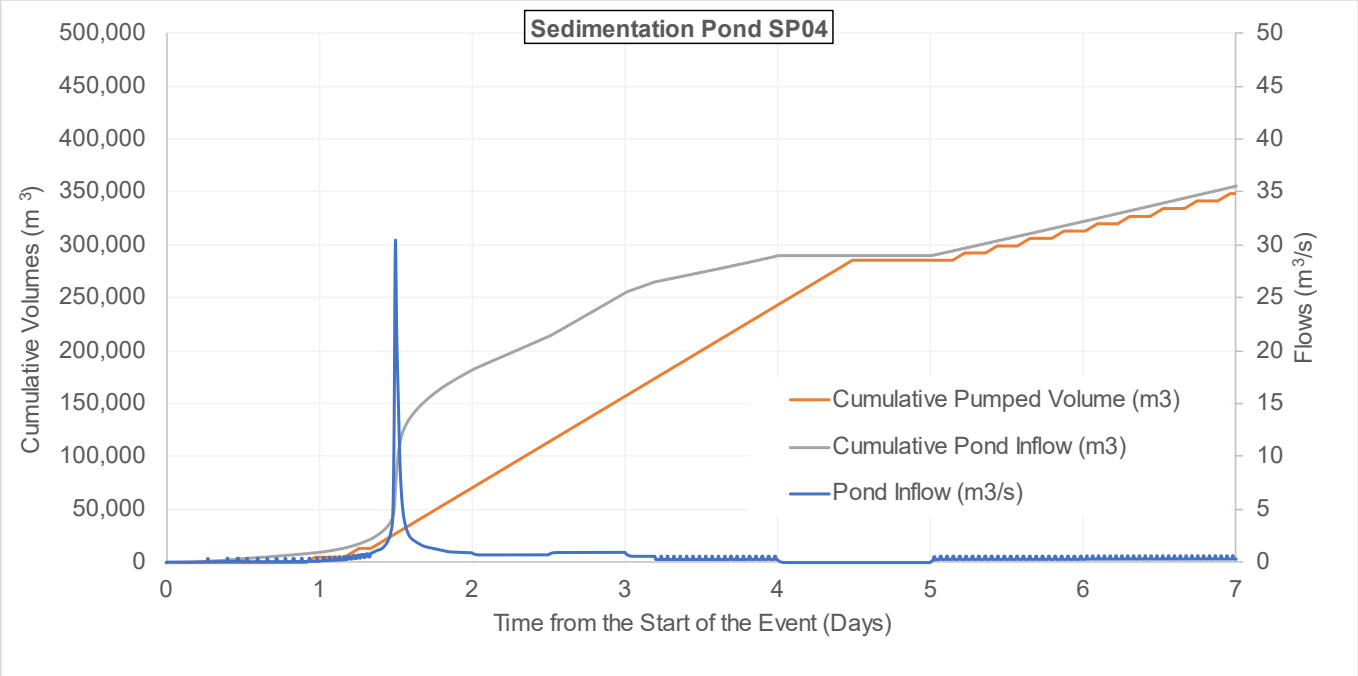


Figure 11: Sedimentation Pond SP04 – Simulation of 100-Year Inflows and Outflows

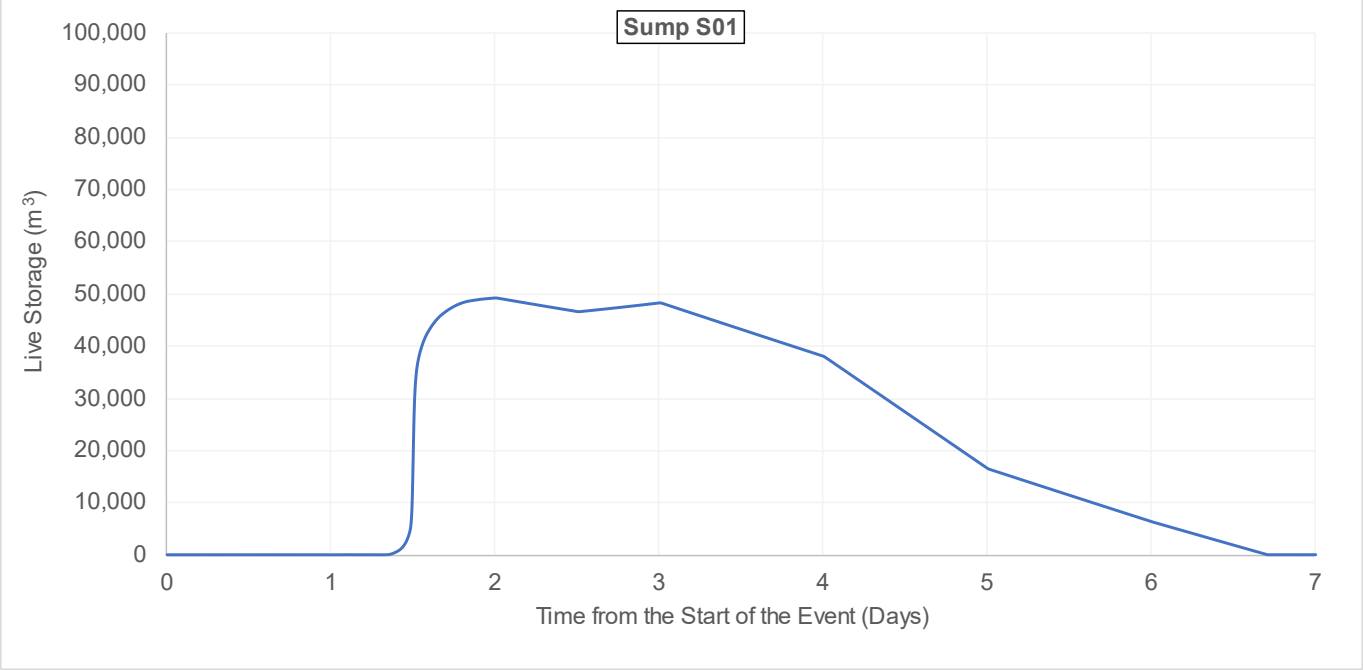


Figure 12: Sump S01 – Simulation of 100-Year Live Storage Volume

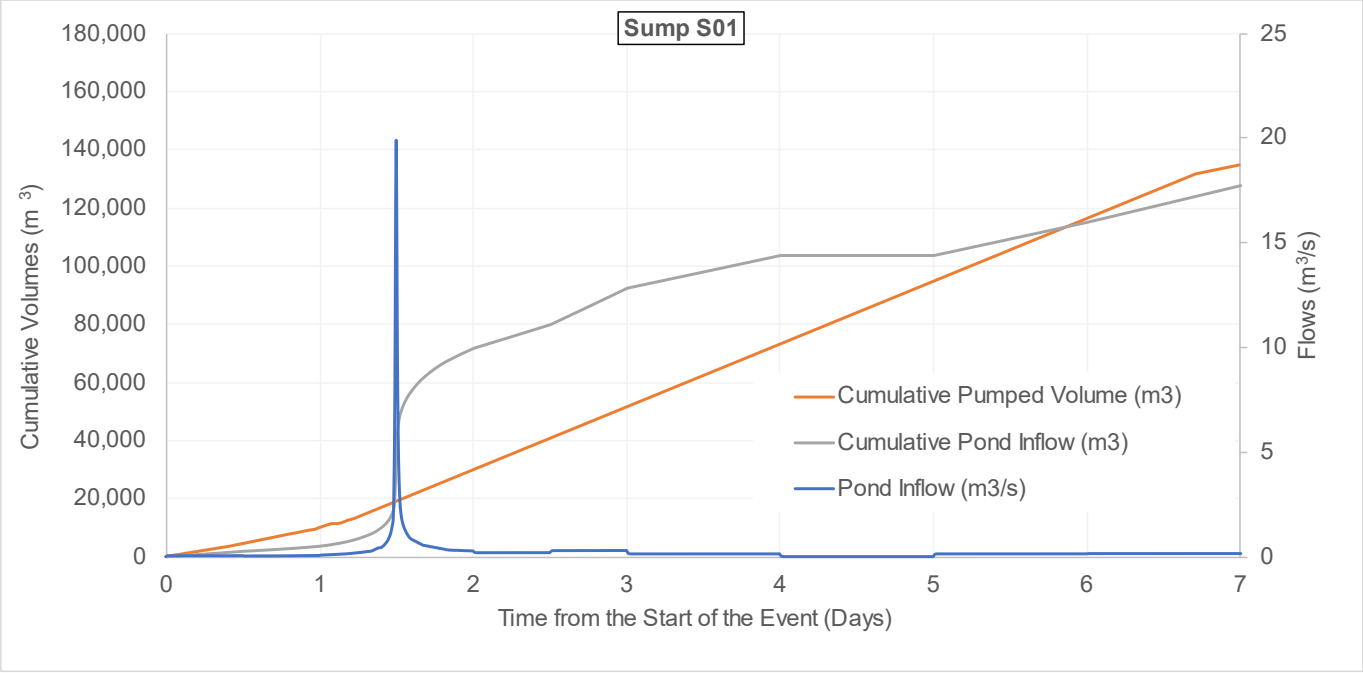


Figure 13: Sump S01 – Simulation of 100-Year Inflows and Outflows

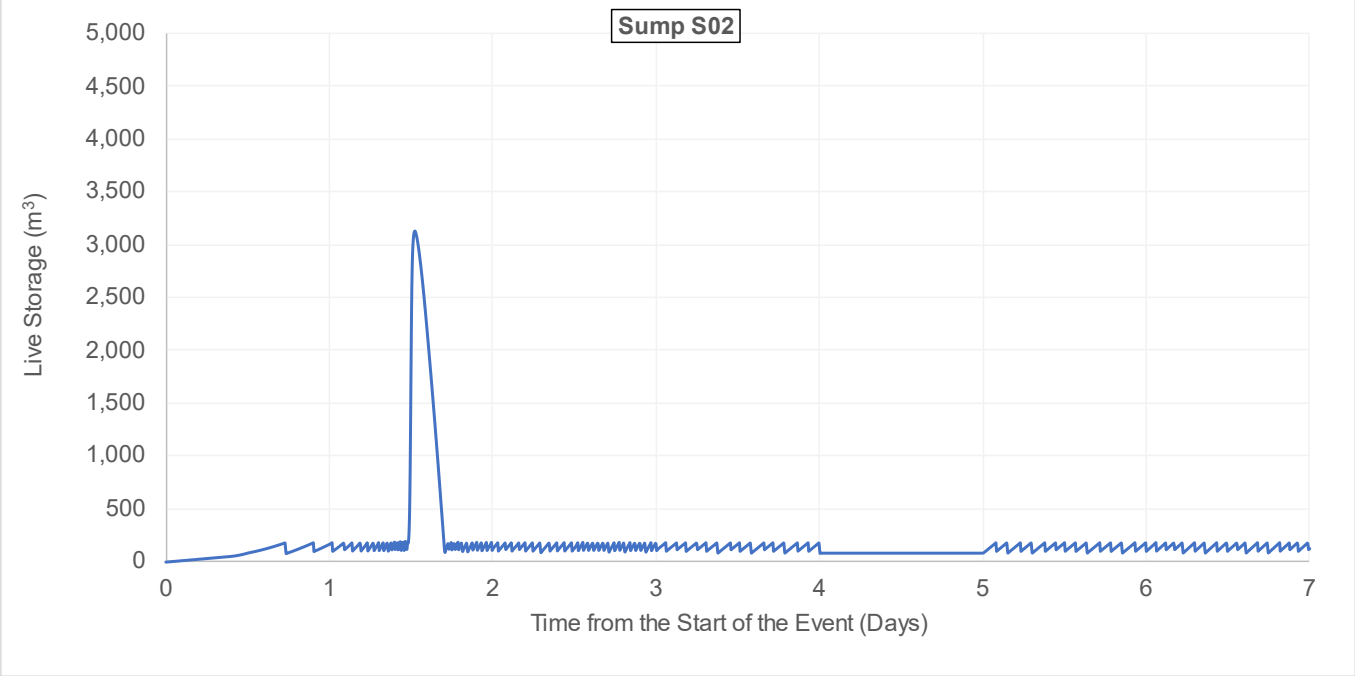


Figure 14: Sump S02 – Simulation of 100-Year Live Storage Volume

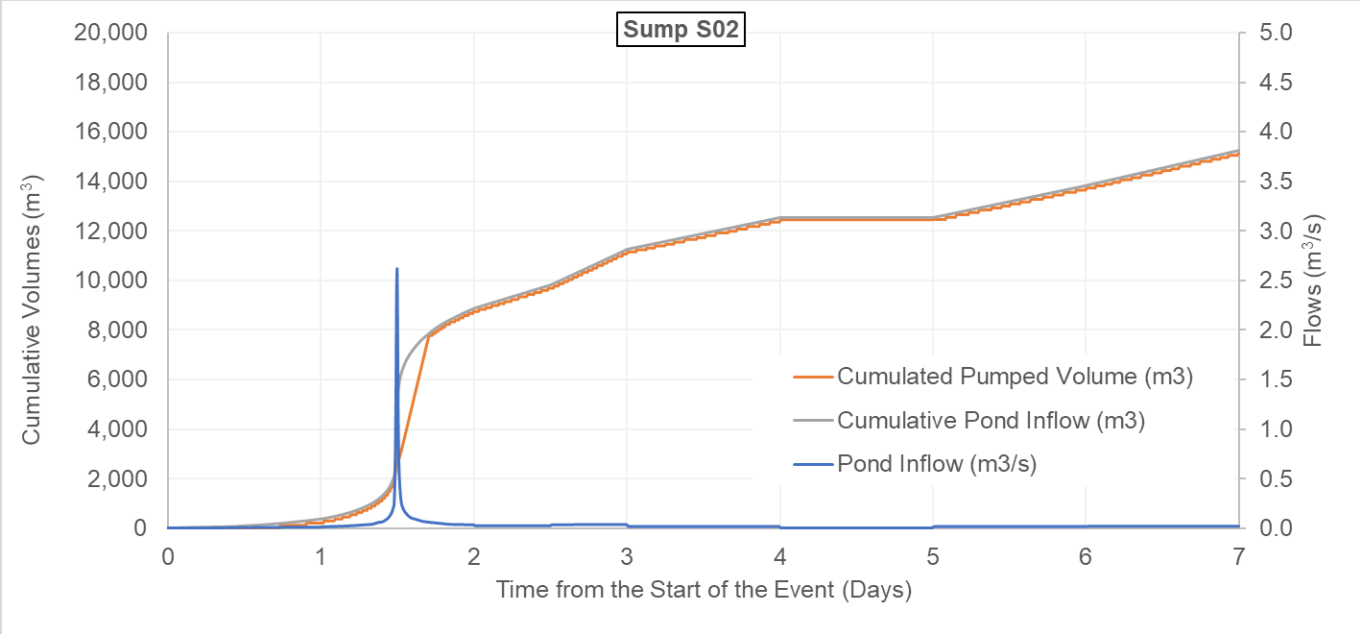


Figure 15: Sump S02 – Simulation of 100-Year Inflows and Outflows

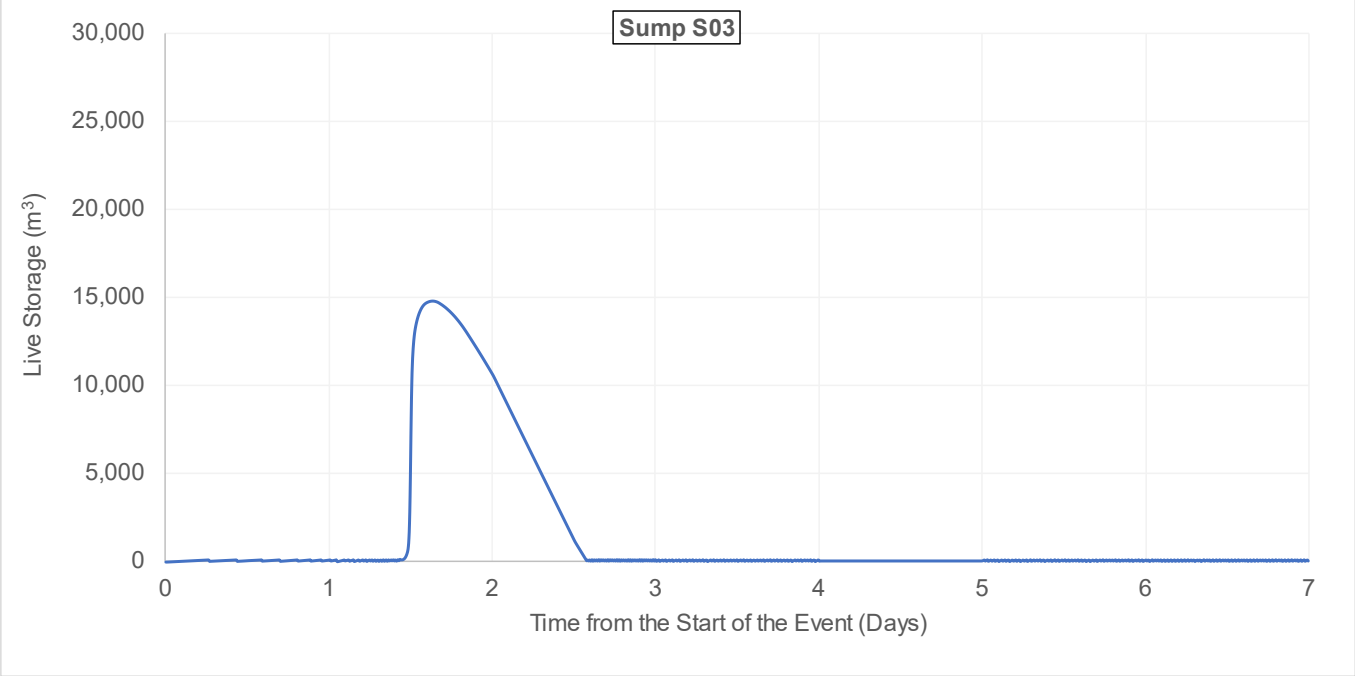


Figure 16: Sump S03 – Simulation of 100-Year Live Storage Volume

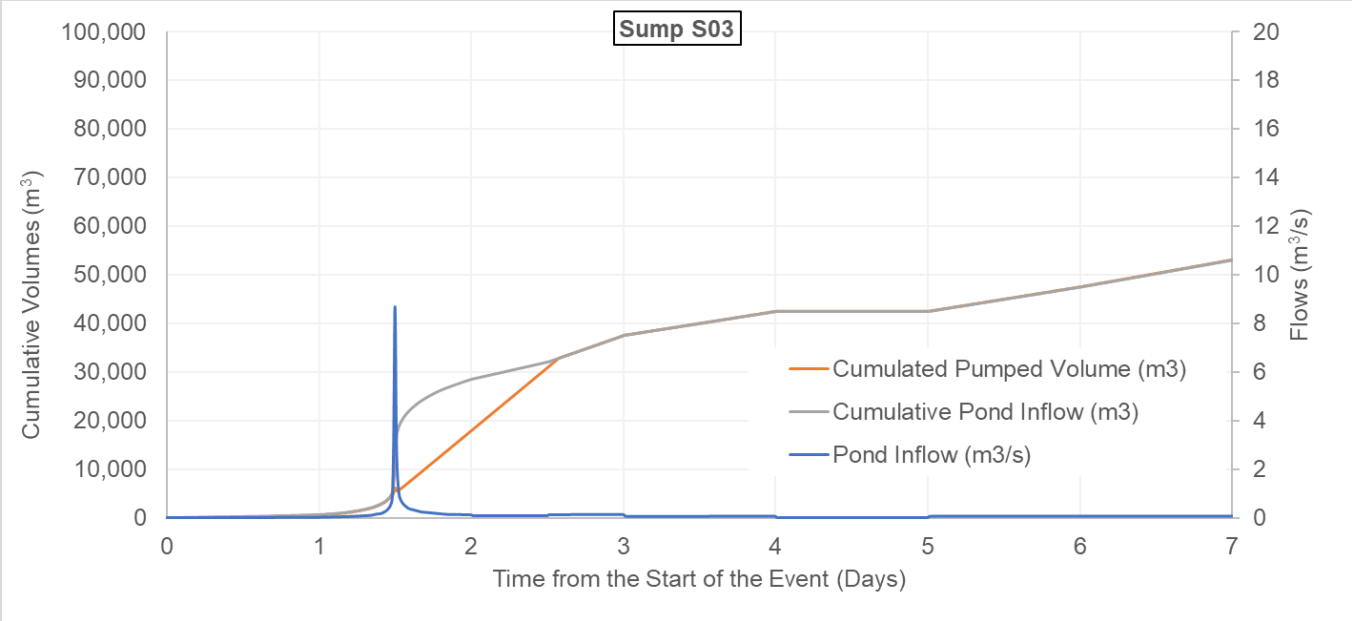


Figure 17: Sump S03 – Simulation of 100-Year Inflows and Outflows

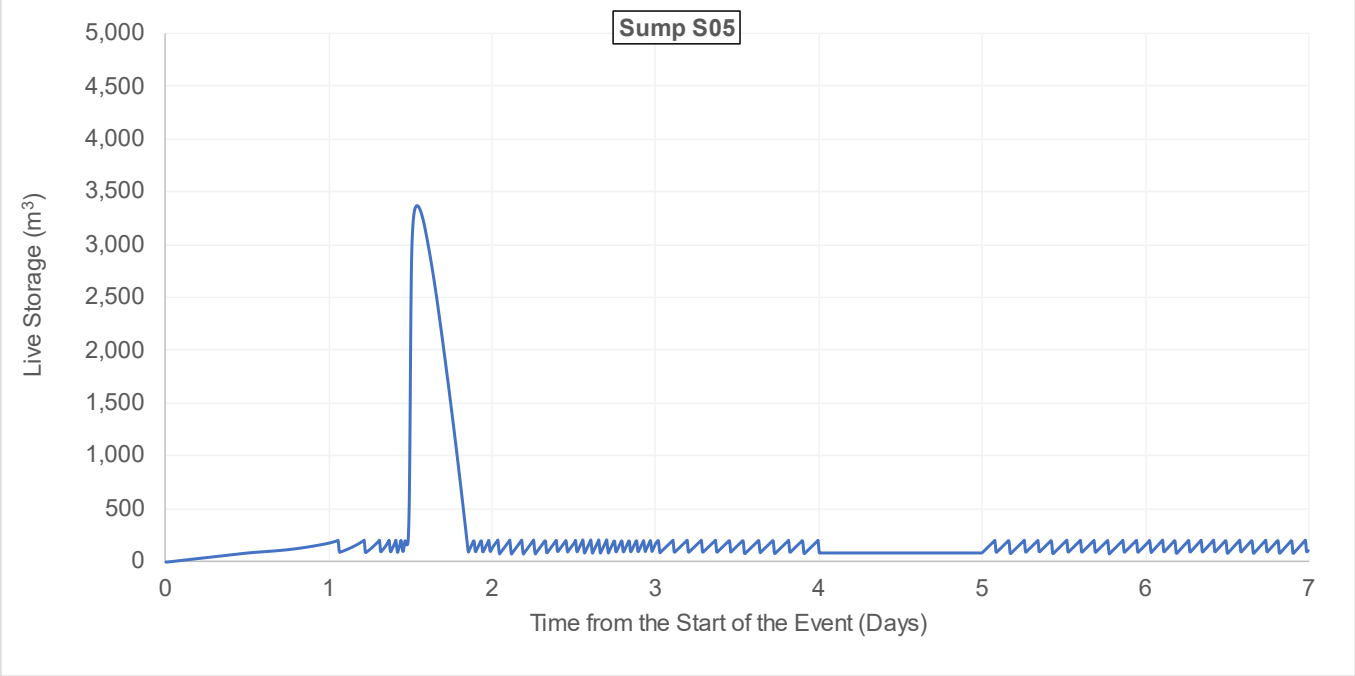


Figure 18: Sump S05 – Simulation of 100-Year Live Storage Volume

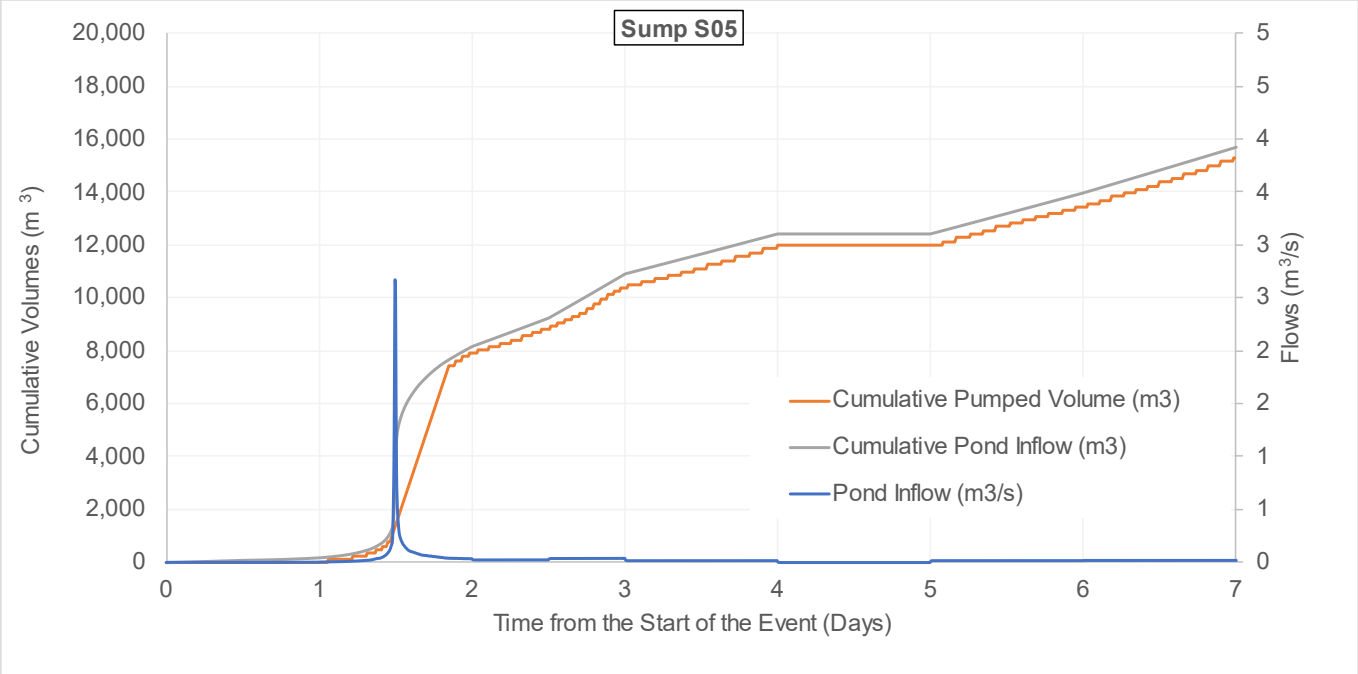


Figure 19: Sump S05 – Simulation of 100-Year Inflows and Outflows

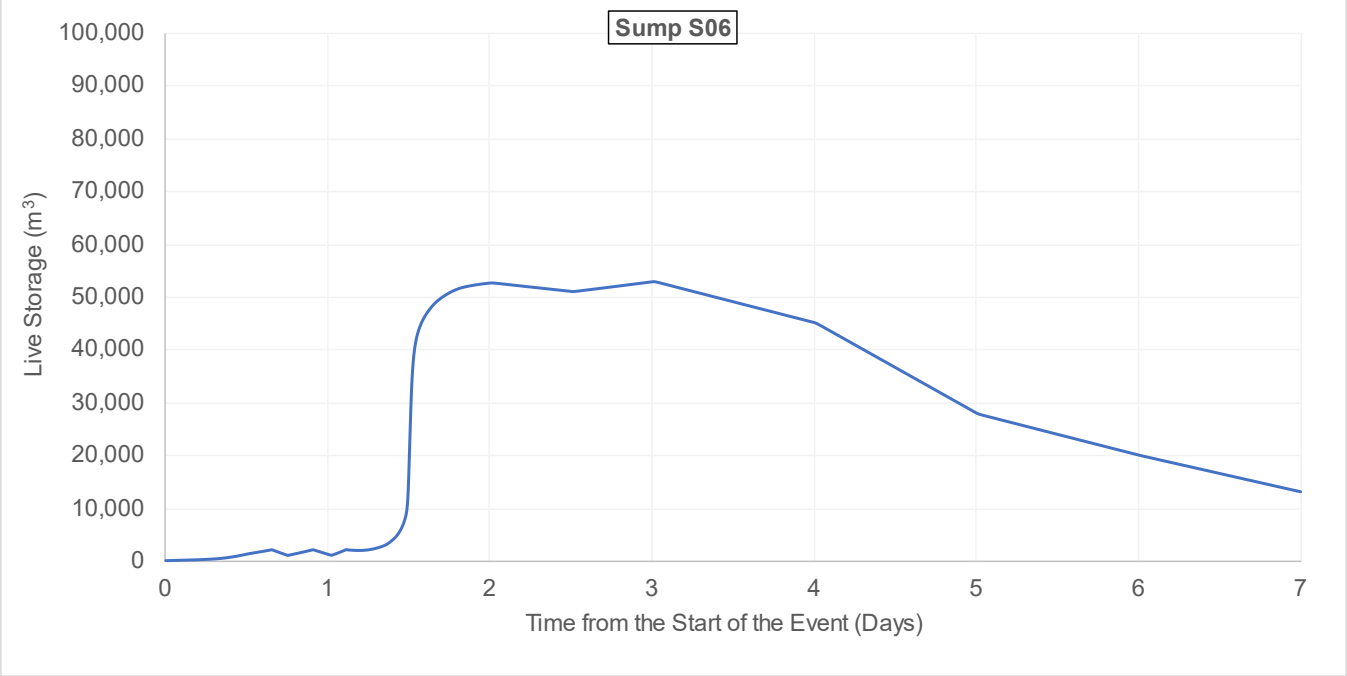


Figure 20: Sump S06 – Simulation of 100-Year Live Storage Volume

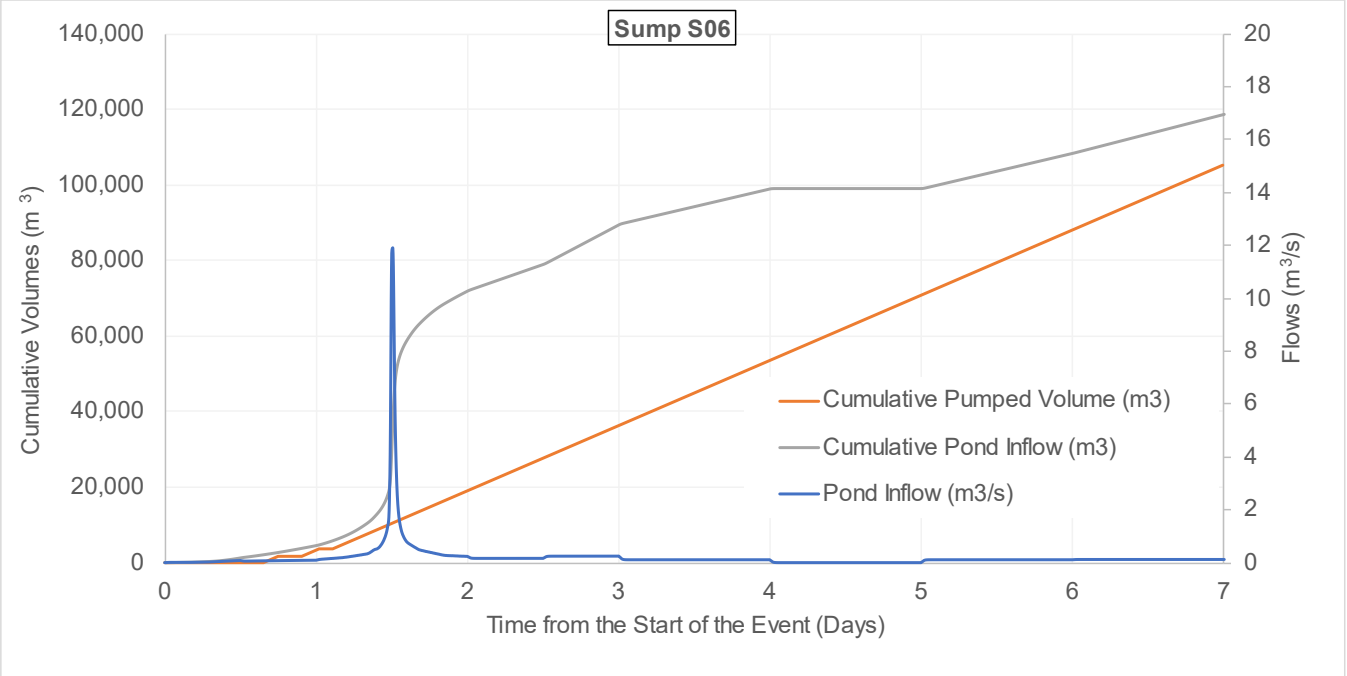


Figure 21: Sump S06 – Simulation of 100-Year Inflows and Outflows

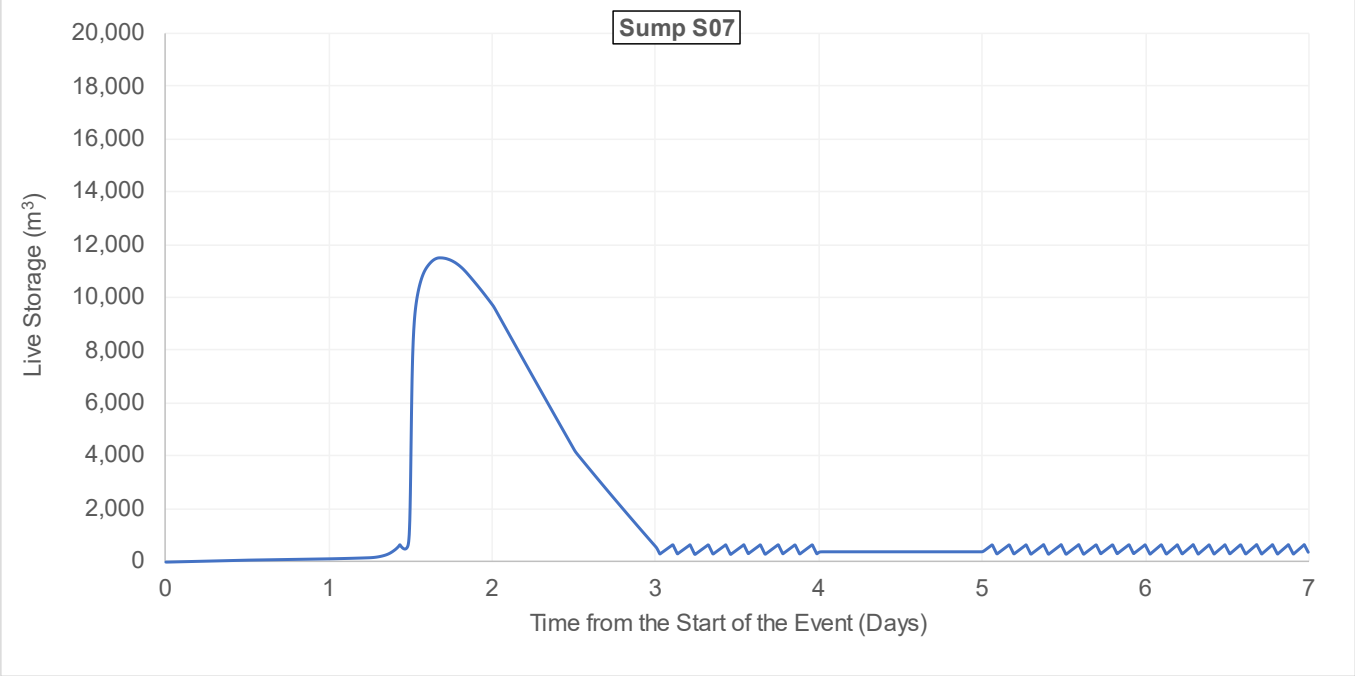


Figure 22: Sump S07 – Simulation of 100-Year Live Storage Volume

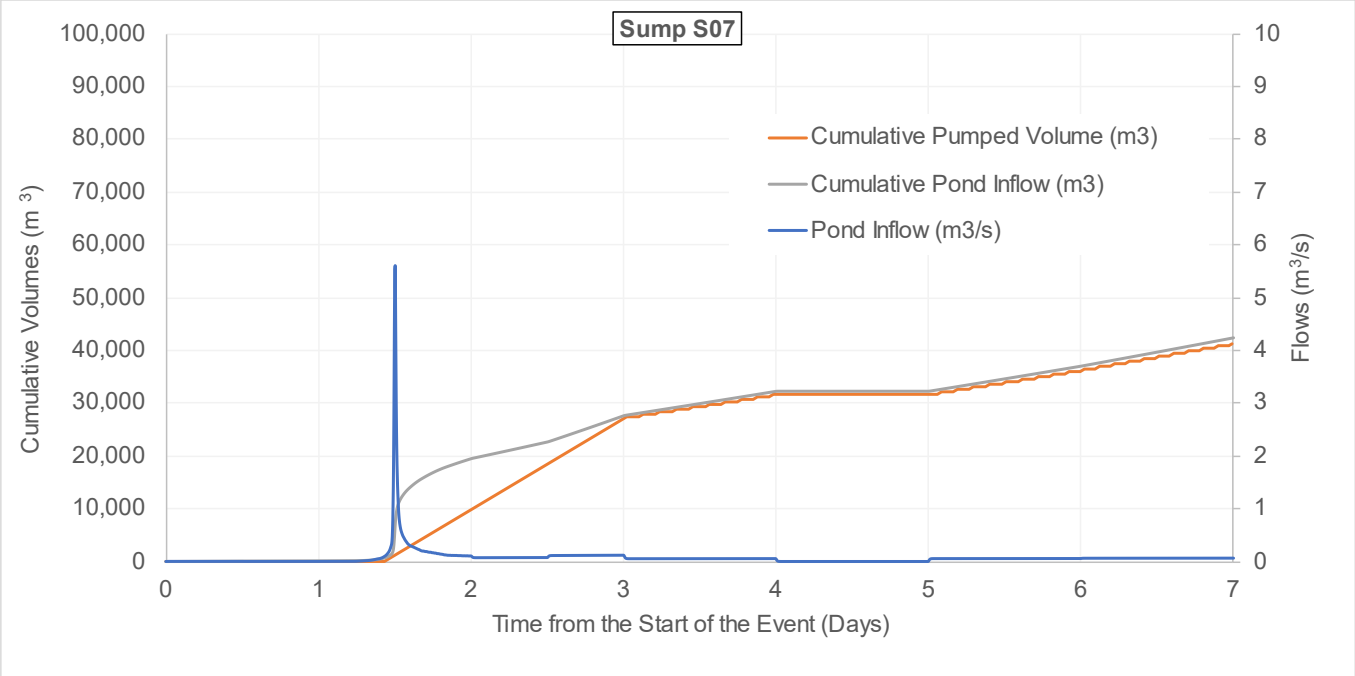


Figure 23: Sump S07 – Simulation of 100-Year Inflows and Outflows

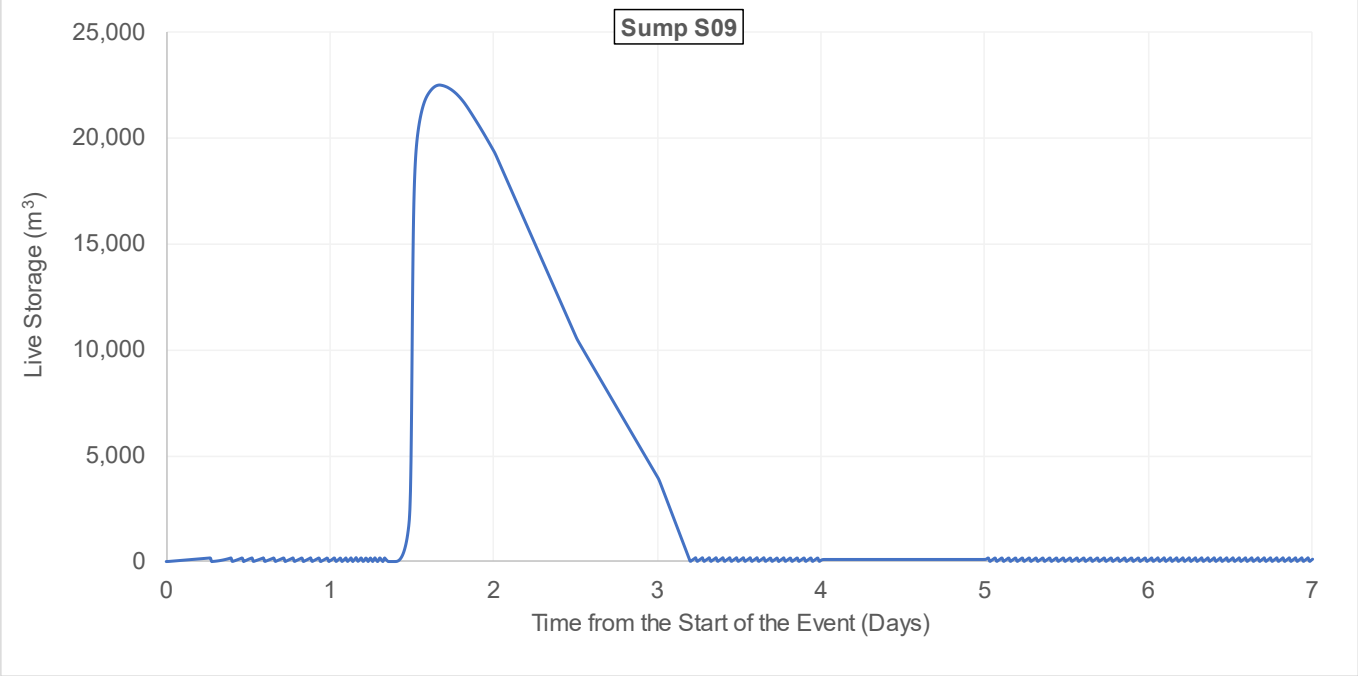


Figure 24: Sump S09 – Simulation of 100-Year Live Storage Volume

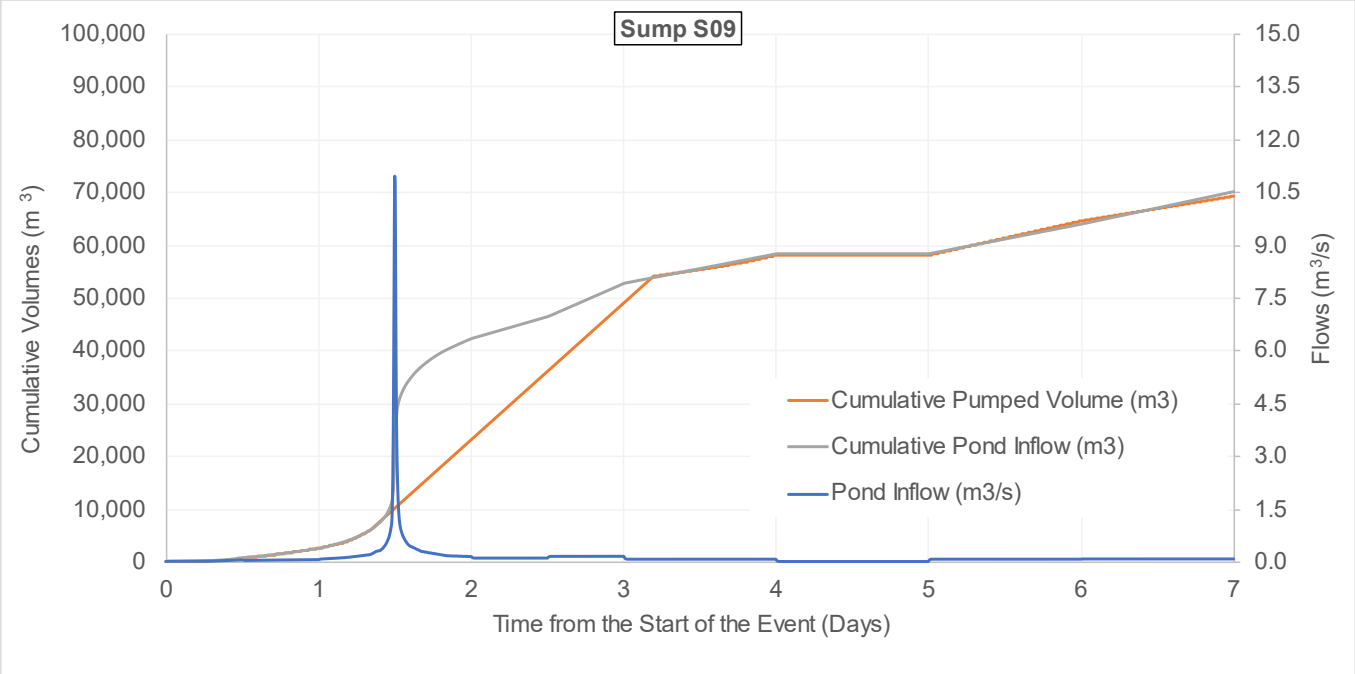


Figure 25: Sump S09 – Simulation of 100-Year Inflows and Outflows

2.0 GEOTECHNICAL INPUTS

2.1 Ditches and Channels

Borehole (BH) information from the site was used to determine peat thickness and bedrock depth for each segment of the ditch. The estimated peat thickness for each segment was calculated, ensuring that the ditches are at least 0.5 m above the channel invert in competent mineral soil.

Design cases for side slopes and slope stability were derived for a range of expected cases and are based on the following criteria:

- Assess which boreholes were close to each of the structures (sump, ditch, ponds).
- Assess the characteristics of each borehole (soil layers info, groundwater [GW] level, and bedrock level).
- Calculate excavation depth on ditch profiles.
- Design cases were categorized based on:
  - Presence and depth of bedrock relative to the channel invert.
  - Presence and thickness of peat.
  - Approximate water table elevation relative to the channel invert.

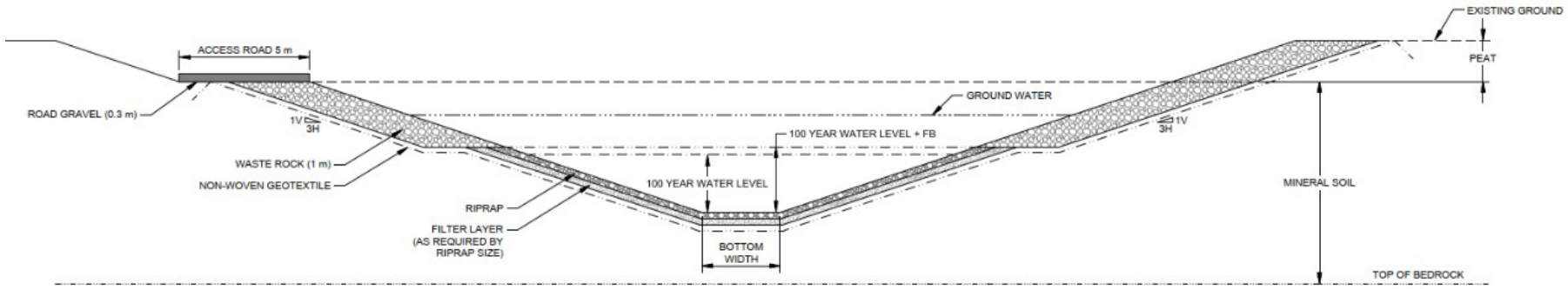
Table 6 lists the typical cross-section design case used for the ditches. The design cases are based on the following requirements:

- To reduce the number of analyses required to confirm side slope assumptions.
- To review geotechnical requirements for slope stability, using assumed channel side slopes.
- To provide filter layer recommendations (gravel or sand between the rock and in-situ material) for design cases where they are required.
- To identify cases where further analysis is required.
- Analysis for the ditches is at a high level and not on a case-by-case basis.

Typical cross-sections for each design case are included in Figure 26 through Figure 33.

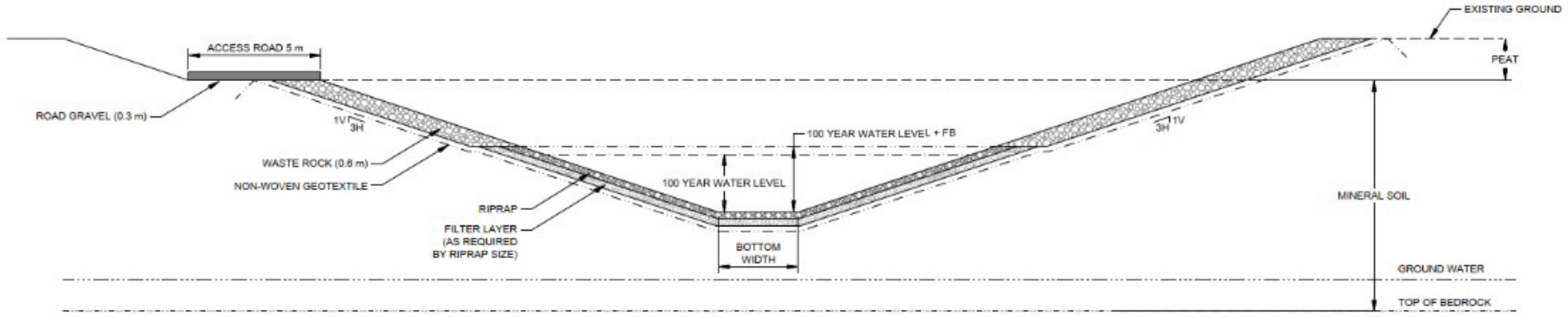
Table 6: Ditch and Channel Design Cases

Ditch Design Case	Figure	Groundwater (GW)	General Description Based on In-Situ Material and Average Excavation Depth (in m)
1.1	Figure 26	GW near top of excavation	Excavation in mineral soil, < 5 m
1.2	Figure 27	GW low in or below excavation	Excavation in mineral soil, < 5 m
2.1	Figure 28	GW near top of excavation	Excavation in Bedrock, < 5 m
2.2	Figure 29	GW not considered (in bedrock)	Excavation in Bedrock, < 5 m
3.1	Figure 30	GW at top of excavation	Excavation in mineral soil, > 5 m
3.2	Figure 31	GW low in or below excavation	Excavation in mineral soil, > 5 m
4	Figure 32	GW in mineral soil	Excavation in bedrock and mineral soil, >5 m
5	Figure 33	GW near top of excavation	Excavation in Bedrock, > 5 m



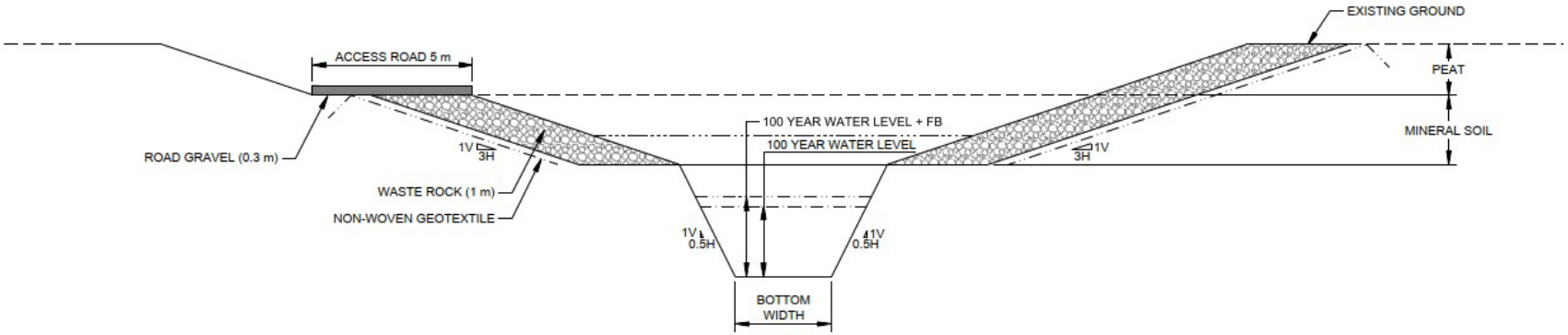
Typical 1.1: Mineral Soils and Excavation < 5 m

Figure 26: Typical Section 1.1



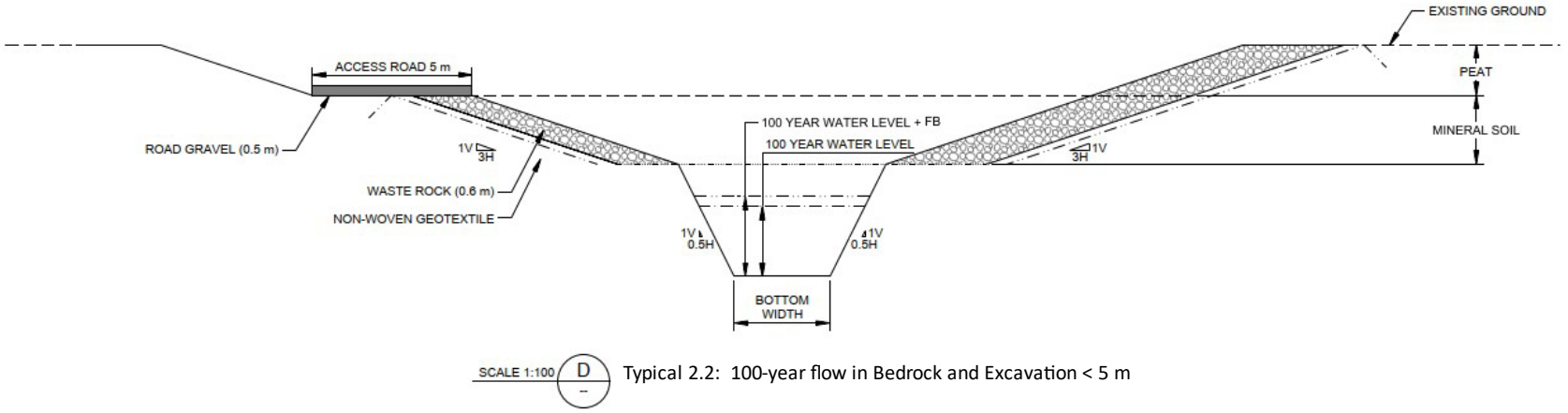
Typical 1.2: Mineral Soils and Excavation < 5 m

Figure 27: Typical Section 1.2



Typical 2.1: 100-year flow in Bedrock and Excavation < 5 m

Figure 28: Typical Section 2.1



Typical 2.2: 100-year flow in Bedrock and Excavation < 5 m

Figure 29: Typical Section 2.2

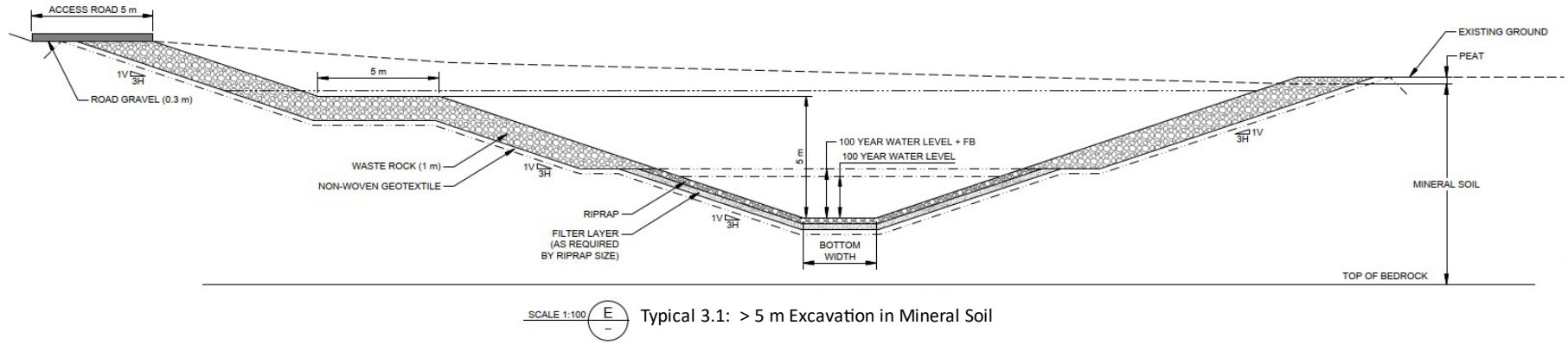


Figure 30: Typical Section 3.1

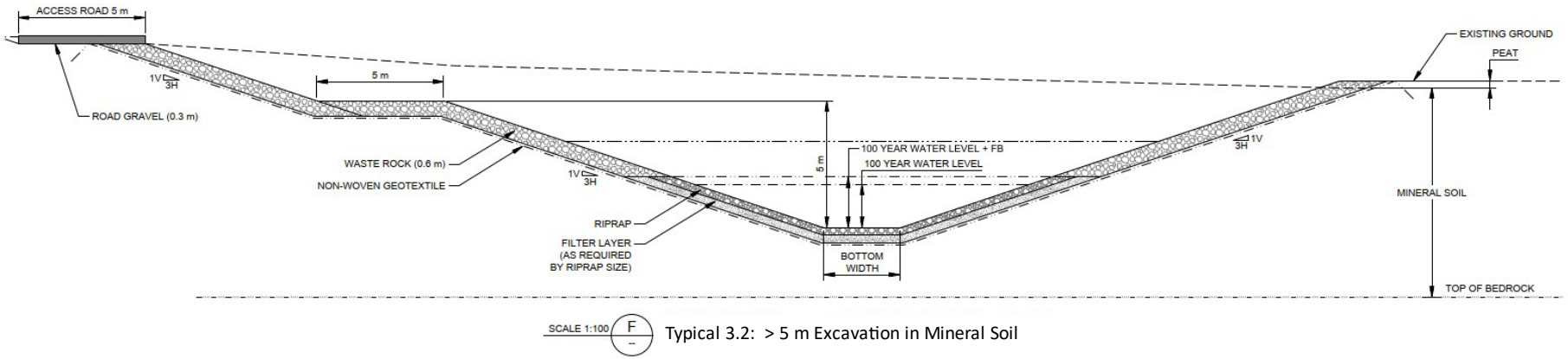
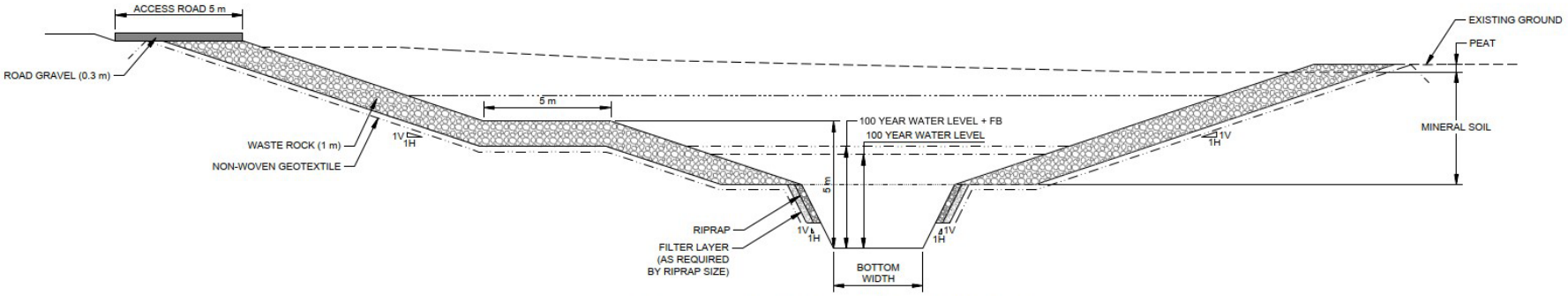
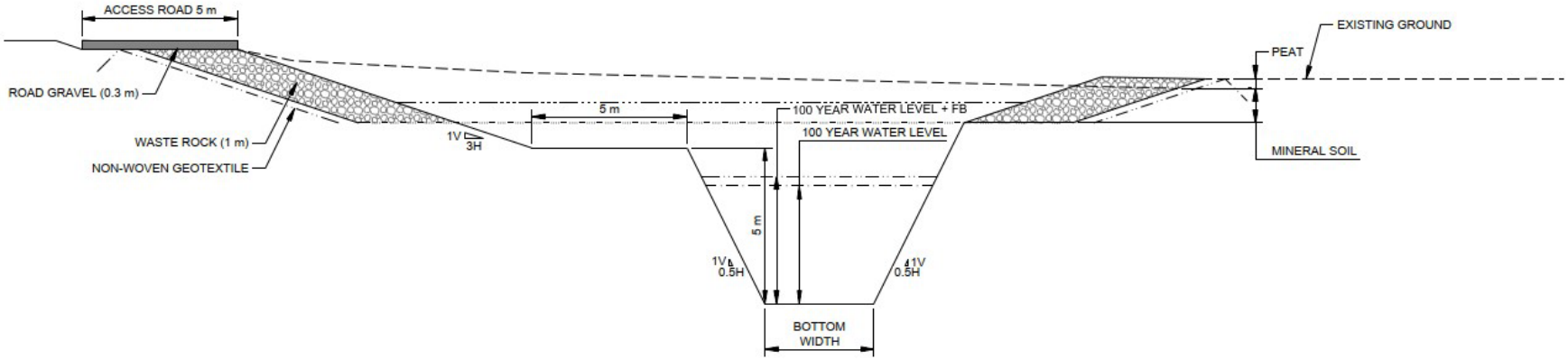


Figure 31: Typical Section 3.2



Typical 4: 100-year Depth within Bedrock and > 5 m Excavation (Bedrock below Bench)

Figure 32: Typical Section 4



Typical 5: 100-year Depth within Bedrock and > 5 m Excavation (Bedrock above Bench)

Figure 33: Typical Section 5

Table 7 summarizes the station, borehole, bed rock depth, peat thickness and ground water depth information used for design of the ditches and secondary diversion channels. Borehole data is from WSP (2022) and WSP (2023).

Table 7: Geotechnical Inputs for Ditch Design

Ditch	Station		Borehole	Bedrock depth (m)	Peat thickness (m)	Groundwater depth below surface (m)
	From	To				
D01a	0	1379	BH-23-77	4.3	0.61	1.83
D01b	0	438	BH-23-79-TP	16.8	0	1.525
D01c	0	305	BH-23-23	9.8	0	0.38
D02	0	1649	MW-21-16	4	0.3	0.28
D03	0	405	BH-23-80	2.68	0.61	1.525
D04	0	429	BH-23-17	5.18	0.77	No Data
D05	0	640	MW-23-24	6.73	0.61	No Data
	640	2176	MW-21-10	5	0.8	0.93
D06a	0	949	BH-21-05	1.01	0	0.5
D06b	0	470	BH-21-10	1.15	0.15	0.86
	470	1247	BH-21-08	13.22	0	3.7
D06c	0	545	BH-23-20	24.58	0	1.83
D07b	0	838	BH-23-40	6.45	0.61	1.525
D07c	0	350	BH-23-39	24.04	No Data	No Data
D08	0	571	BH-23-41	3.19	0.61	No Data
D09	0	272	BH-23-42	1.22	0.71	0.915
D10a	0	553	BH-23-44	4.55	0.45	No Data
D10b	0	435	BH-23-73	7.79	0.61	1.525
	435	1195	BH-23-72	10.7	0.61	0.915
D11	0	330	BH-23-49-TP	5.13	0.5	No Data
	330.2	1012	BH-23-48	5.13	0.76	4.85
	1012.7	1513	MW-21-14	5.13	0.2	4.84
	1512.5	1660	BH-23-87-TP	5.13	1.5	No Data
D12	0	671	BH-23-59	3.07	0	No Data
D14a	0	1347.0	BH-23-51	6.23	0.15	No Data
D14b	0	1561.9	BH-23-52	10.76	0.61	1.525
D14c	0	627.7	BH-23-52	10.76	0.61	1.525
D15	0	762	BH-23-50	4.32	0	No Data

2.2 Ponds and Sumps

Geotechnical recommendations for the ponds and sumps, including boreholes referenced to characterize peat thickness, bedrock depths, and in situ till are summarized in Table 8. Borehole data is from WSP (2022) and WSP (2023).

Table 8: Geotechnical Considerations for Sumps and Ponds

Sump / Pond	Referenced Borehole or Monitoring Well Log	Sub-Surficial Geology	Side Slopes	Recommended Offsets	Underdrain Requirements	Filter Layers	Recommendation for Future Assessment
SP01	MW-21-02	Silt to silty sand for full depth of excavation.	Slopes (3H:1V) are generally acceptable – with conditions.	Maintain pond at least 30m from the toe of dumps.	Engineered drain system not required. Granular fill/filter may be required on bottom of pond depending on pond level management and specific overburden exposure (could be considered during initial operations).	Filter layer of 0.5m thick sandy gravel (3” minus) on non-woven geo-textile (NWG) should be a requirement at this stage on slopes below groundwater level to prevent erosion during dewatering. Additional flow controls may be required on surface where runoff can concentrate.	The rate of dewatering may need to be regulated to prevent loss of fines on side slopes below water table. Complete additional test pitting prior to detailed design.
SP02	N/A	In-Pit	N/A	N/A	N/A	N/A	N/A
SP03	MW-23-21	Silt to silty sand for full depth of excavation.	Slopes (3H:1V) are generally acceptable – with conditions.	Maintain pond at least 30m from the toe of dumps.	Engineered drain system not required. Granular fill/filter may be required on bottom of pond depending on pond level management and specific overburden exposure (could be considered during initial operations).	Filter layer of 0.5m thick sandy gravel (3” minus) on NWG should be a requirement at this stage on slopes below groundwater level to prevent erosion during dewatering. Additional flow controls may be required on surface where runoff can concentrate.	The rate of dewatering may need to be regulated to prevent loss of fines on side slopes below water table. Complete additional test pitting prior to detailed design.
SP04	BH-23-52	Fine to medium sand followed by coarse sand and gravel to full depth of excavation.	Slopes (3H:1V) are generally acceptable – with conditions.	Maintain pond at least 30m from the toe of dumps.	Engineered drain system not required. Granular filter may be required on the bottom of the pond where fine sand or silt zones exist. Suggest filter fabric and 30 cm of -3 inch gravel.	Filter layer of 0.5m thick sandy gravel (3” minus) on NWG should be a requirement at this stage on slopes below groundwater level to prevent erosion during dewatering. Additional flow controls may be required on surface where runoff can concentrate.	The rate of dewatering may need to be regulated to prevent loss of fines on side slopes below water table. Coarse sand and gravel zone may be subjected to high inflows and slope erosion. Complete additional test pitting prior to detailed design.
S01 / S01b	MW-21-26	Compact sand to sand and gravel for full depth of excavation.	Slopes (3H:1V) are generally acceptable – with conditions. Additional measures may be required on or above slopes where concentrated inflow occurs. Slope breaks or benches should be considered to control surface water flow and potential slope erosion where greater than 5m above pond bottom.	Maintain pond at least 30m from the toe of dumps and 50 m from pit crest.	Not required based on available data	Not expected based on existing borehole information. Perimeter test pitting recommended.	Where overburden is coarse and compact as suggested by the borehole, additional slope erosion protection likely not required. If finer and weaker soils are encountered, erosion protection measures may be required. High inflows expected.
S02	MW-23-80	Shallow bedrock at about 1.4 m depth. Peat and compact Sand above.	Slopes can be steepened in bedrock. 3:1 overburden slope should be stepped out at least 1 m from the crest of the bedrock excavation.	Maintain pond at least 30m from the toe of dumps and 50 m from pit crest.	Not required based on available data	Not required based on available data	Actual top of bedrock around pond required to better determine excavation quantity of bedrock and overburden and to determine if erosion protection might be required in some areas.
S03	MW-21-02	Compact silt, some fine sand.	Slopes (3:1) are generally acceptable – with conditions. Additional measures may be required on or above slopes where concentrated inflow occurs. Slope breaks or benches should be considered to control surface water flow and potential slope erosion where greater than 5m above pond bottom.	Maintain pond at least 30m from the toe of dumps and 50 m from pit crest.	Engineered drain system not required. Granular filter may be required on the bottom of the pond where fine sand or silt zones exist. Suggest filter fabric and 30 cm of -3 inch gravel (assume 25% coverage required at this stage.	Filter layer of 0.5m thick sandy gravel (3” minus) on NWG should be a requirement at this stage on slopes below groundwater level to prevent erosion during dewatering. Additional flow controls may be required on surface where runoff can concentrate.	The rate of dewatering may need to be regulated to prevent loss of fines on side slopes below water table. Coarse sand and gravel zone may be subjected to high inflows and slope erosion.
S05	BH-23-42	Shallow bedrock at about 1.22 m depth. Peat and loose Silty Sand above.	Slopes can be steepened in bedrock. 3:1 overburden slope should be stepped out at least 1 m from the crest of the bedrock excavation.	Maintain pond at least 30m from the toe of dumps.	Not required based on available data	Not required based on available data	Actual top of bedrock around pond required to better determine excavation quantity of bedrock and overburden and to determine if erosion protection might be required in some areas.
S06	MW-21-23	Shallow bedrock at about 2.5 m depth. Sand, cobbles and boulders above.	Consideration of steeper overburden slope is possible but suggest 3H:1V because variability of material around pond is expected.	Maintain pond at least 30m from the toe of dumps and 50 m from pit crest.	Not required based on available data	Not required based on available data	Actual top of bedrock around pond required to better determine excavation quantity of bedrock and overburden and to determine if erosion protection might be required in some areas.

Sump / Pond	Referenced Borehole or Monitoring Well Log	Sub-Surficial Geology	Side Slopes	Recommended Offsets	Underdrain Requirements	Filter Layers	Recommendation for Future Assessment
S07	MW-21-08	Shallow bedrock at about 2.6 m depth. Compact Silt and Sand, followed by gravelly sand above.	Slopes can be steepened in bedrock. 3:1 overburden slope should be stepped out at least 1 m from the crest of the bedrock excavation.	Maintain pond at least 30m from the toe of dumps.	Not required based on available data	Not required based on available data	Actual top of bedrock around pond required to better determine excavation quantity of bedrock and overburden and to determine if erosion protection might be required in some areas.
S09			Slopes (3H:1V) are generally acceptable – with conditions. Additional measures may be required on or above slopes where concentrated inflow occurs. Slope breaks or benches should be considered to control surface water flow and potential slope erosion where greater than 5m above pond bottom.	Maintain pond at least 30m from the toe of dumps and 50 m from pit crest.	Not required based on available data	Not required based on available data	

3.0 DITCHES AND CHANNELS

3.1 Erosion Protection and Channel Lining Materials

The channels are designed to contain the 100-year design flow with a minimum 0.3 m freeboard. Erosion protection is selected to be capable of withstanding the design flow without damage. Channels are designed to be excavated into the natural ground. When necessary, general waste rock is planned as fill material. For the riprap size D_{50} greater than or equal to 300 mm, a 300 mm thick filter layer is included in the design. Riprap is placed on NWG that lines channel to the top of slope and is keyed in one meter on each side.

If the channel excavation exceeds the depth of the 100-year plus freeboard, and mineral soil or peat is exposed above the erosion protection or bedrock:

- Waste rock is assumed to be placed between the top of riprap and the channel's top of bank at the same thickness as the riprap and the filter. The thickness of the waste rock is a minimum of 1 m (which may be thicker than the riprap/filter) if the ditch is excavated in peat. Groundwater elevation is considered for the design, and if the water elevation is at or near the ground, waste rock is placed 1 m thick.
- Waste rock is placed a minimum of 0.6 m thick in areas where the channels are excavated in mineral soil.
- Lining materials are not used in areas where ditches are excavated fully in bedrock.

Average excavation depths for each channel segment are assumed to be at the centerline of the channel. A 5 m wide bench is assumed on any channel segment that has a majority of the channel excavated over 5 m deep; small zones with excavation over 5 m deep do not include a bench. Service road gravel volume is calculated based on a 5-meter-wide buffer on one side of the ditch, with material placed 0.3 m thick. Peat is assumed to be stripped within a 5-meter-wide zone on both sides of each ditch.

3.2 Hydraulic design

The hydraulic design of the channels was based on open-channel flow calculations using 100-year flows from the HEC-HMS hydrological models. Channel slopes and excavation depths were selected based on channel centerline topography extracted from 2019 LiDAR, with the goal of limiting excavation volumes where possible. Median riprap sizes (D_{50}) were calculated using USACE (1994). The riprap sizes for each segment were rounded up to 100 mm, 300 mm, or 500 mm. The Mannings uniform flow equation was used to determine the normal water depth for various return periods (2-year, 10-year, and 100-year). Channel slopes were also selected to keep riprap D_{50} below 300 mm wherever practical, with a maximum upper bound D_{50} of 500 mm. The Mannings roughness values for the various riprap size ranges are summarized in Table 9.

Table 9: Mannings Roughness Values

Rock Size D_{50} (mm)	Mannings Roughness (n) as a Function of the Riprap Size
100 mm or less	0.030
Greater than 100 mm to 300 mm	0.035
Greater than 300 mm	Calculated using Smith (1995), typically 0.035 to 0.045

Individual ditches discharging directly into ponds or sumps were set a minimum of one meter above the pond or sump invert.

3.3 Secondary Diversions – Design Summary

There are three diversion channels required by the design in addition to the Main Diversion Channel DC1 (described in Appendix D to the main report). The channels are mostly built by excavation into the natural ground. When required, general waste rock is planned as fill material with a natural low-permeability liner to limit exfiltration. The channel was designed to contain the 100-year design flow with a minimum 0.3 m freeboard and with erosion protection riprap that can withstand the design flow without damage. Conceptual cross-sections are shown in Figure 29.

Table 10 summarizes the design of the east diversion channels DC2a and DC2b and the temporary diversion channel DCB. The associated channel geometry is presented in Section 3.5.

Table 10: Secondary Diversions – Design Summary

Ditch ID	Year Constructed	Total Length (m)	100-year Design Flow (m^3/s)	Maximum 100-year Flow Depth (m)	Maximum 100-year Velocity (m/s)	Riprap Erosion Protection D_{50} (mm)
DC2a	-2	0.95	6.8	1.59	3.13	300
DC2b	-2	1.25	13.0	1.90	3.66	500
DCB	-2	0.56	25.1	2.50	1.31	100

The East Diversion system is assumed not to require fish passage as a design criterion. This was decided following a desktop assessment of the existing channel connecting Lake B to Lake A. The channel was observed to have isolated reaches with slopes of 5% over a rocky channel, as well as a shallow outflow over a sandbar at the Lake B outlet and numerous beaver dams along the channel reach (Wachiih 2019). This design decision should be verified during the following engineering stage.

As DC2a serves only to collect runoff from local drainage paths down the steep slopes to Lake B, it is not expected that fish passage will be a consideration.

There is a 250 m long section on DC2b, which has a 4.6% slope, and a 500 m long section, which has a 9% slope. These sections are designed to minimize excavation and keep erosion protection rock D_{50} at 500 mm or less. If the channel was required to provide fish passage, the steeper slopes would need to be shallowed out, and the channel would be expanded to include shelter features and appropriate substrate for fish passage.

The temporary bypass channel DCB is expected to be required to provide fish passage connectivity between the upstream and downstream portions of the existing diversion. It was designed with a similar slope and geometry to the existing diversion, and, as such, it would have the same fish passage properties as the existing diversion.

3.4 Contact Water Ditches – Design Summary

A total of 22 contact water ditches were designed. The total length of the collection ditches is 18.9 km. Table 11 summarizes the geometry details and 100-year design flows for each ditch. The associated ditch geometry is presented in Section 3.5.

Table 11: Contact Ditches Design Summary

Ditch ID	Year Constructed	Total Length (m)	100-year Design Flow (m^3/s)	Maximum 100-year Flow Depth (m)	Maximum 100-year Velocity (m/s)	Maximum 100-year Erosion Protection D50 (mm)
D06a	-2	0.95	5.60	1.39	3.93	500
D06b	-2	1.25	8.20	1.60	3.88	500
D06c	-2	0.54	15.10	1.52	3.25	500
D12	-2	0.67	1.10	0.55	2.83	300
D14a	-2	1.35	10.90	1.13	3.28	500
D14b	-2	1.56	12.70	1.82	2.95	500
D14c	-2	0.63	20.50	1.65	3.59	500
D03	-1	0.40	2.00	0.53	2.94	300
D08	-1	0.57	1.90	0.72	2.83	300
D09	-1	0.27	0.40	0.24	1.56	100
D15	-1	0.72	5.50	1.02	3.68	500
D01a	1	1.38	7.60	1.38	3.32	500
D01b	1	0.44	4.50	0.88	2.94	500
D01c	1	0.30	12.50	1.71	2.41	300
D04	1	0.43	2.90	0.75	2.90	300
D05	1	2.19	7.40	1.36	2.43	300
D07b	5	0.84	3.20	0.93	3.03	300
D07c	5	0.57	5.50	1.19	3.15	500
D10a	5	0.55	9.60	0.83	2.59	300
D11	5	1.66	8.70	1.34	2.68	500
D02	6	1.52	15.84	1.52	3.52	500
D10b	6	1.19	6.00	1.06	2.84	300

3.5 Ditches and Channels – Detailed Design Inputs and Outputs by Reach

Table 12 provides a list of all design inputs and outputs for the secondary diversion channels and contact water ditches, with detailed parameters for each channel reach.

Table 12: Detailed Design Inputs and Results for Ditches and Secondary Diversion Channel

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	To		(m)	%	(H:1V	(m)	(m)	(mm)	(Years)	(m3/s)	(m)	(m/s)
D01a	1	0	30	1.2	30	0.10%	3	2	1.79	100	2 yr	1.42	0.63	0.58
											10 yr	3.91	1.02	0.76
											100 yr	7.6	1.38	0.9
	2	30	80	1.2	50	2.80%	3	3	1.69	300	2 yr	1.42	0.24	1.61
											10 yr	3.91	0.42	2.21
											100 yr	7.6	0.59	2.68
	3	80	260	1.2	180	0.10%	3	2	3.99	100	2 yr	1.42	0.63	0.58
											10 yr	3.91	1.02	0.76
											100 yr	7.6	1.38	0.9
	4	260	450	1.2	190	7.00%	3	4	2.73	500	2 yr	1.42	0.17	1.81
											10 yr	3.91	0.31	2.55
											100 yr	7.6	0.45	3.14
	5	450	805	1.2	355	0.10%	3	2	3.94	100	2 yr	1.42	0.63	0.58
											10 yr	3.91	1.02	0.76
											100 yr	7.6	1.38	0.9
	6	805	880	1.2	75	6.60%	3	4	2.48	500	2 yr	1.42	0.18	1.78
											10 yr	3.91	0.32	2.5
											100 yr	7.6	0.46	3.08
	7	880	930	1.2	50	7.00%	3	4	2.61	500	2 yr	1.42	0.17	1.81
											10 yr	3.91	0.31	2.55
											100 yr	7.6	0.45	3.14
	8	930	1015	1.2	85	8.50%	3	4	2.31	500	2 yr	1.42	0.17	1.9
											10 yr	3.91	0.3	2.68
											100 yr	7.6	0.43	3.31
	9	1015	1060	1.2	45	0.30%	3	2	3.15	100	2 yr	1.42	0.48	0.87
											10 yr	3.91	0.79	1.14
											100 yr	7.6	1.07	1.35
	10	1060	1260	1.2	200	8.60%	3	4	2.63	500	2 yr	1.42	0.17	1.91
											10 yr	3.91	0.3	2.69
											100 yr	7.6	0.43	3.32
	11	1260	1379	1.2	119	0.20%	3	2	2	100	2 yr	1.42	0.53	0.75
											10 yr	3.91	0.87	0.98
											100 yr	7.6	1.18	1.16

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D01b	1	0	20	1.2	119	0.20%	3	2	2	100	2 yr	1.53	0.22	1.86
											10 yr	2.9	0.32	2.28
											100 yr	4.5	0.41	2.61
	2	20	110	1.2	20	4.00%	3	3	0.96	300	2 yr	1.53	0.5	0.88
											10 yr	2.9	0.68	1.05
											100 yr	4.5	0.84	1.18
	3	110	170	1.2	90	0.30%	3	2	1.9	100	2 yr	1.53	0.22	1.94
											10 yr	2.9	0.31	2.38
											100 yr	4.5	0.4	2.72
	4	170	230	1.2	60	4.50%	3	3	1.09	300	2 yr	1.53	0.4	1.2
											10 yr	2.9	0.55	1.43
											100 yr	4.5	0.69	1.61
	5	230	280	1.2	60	0.70%	3	2	1.3	100	2 yr	1.53	0.2	2.07
											10 yr	2.9	0.29	2.55
											100 yr	4.5	0.37	2.92
	6	280	310	1.2	50	5.50%	3	3	1.13	300	2 yr	1.53	0.33	1.56
											10 yr	2.9	0.46	1.87
											100 yr	4.5	0.57	2.11
	7	310	345	1.2	30	2.00%	3	2	1.76	300	2 yr	1.53	0.5	0.88
											10 yr	2.9	0.68	1.05
											100 yr	4.5	0.84	1.18
	8	345	355	1.2	35	0.30%	3	2	1.2	100	2 yr	1.53	0.2	2.07
											10 yr	2.9	0.29	2.55
											100 yr	4.5	0.37	2.92
	9	355	370	1.2	10	5.50%	3	3	0.82	300	2 yr	1.53	0.44	1.06
											10 yr	2.9	0.6	1.27
											100 yr	4.5	0.75	1.43
	10	370	390	1.2	15	0.50%	3	2	1.62	100	2 yr	1.53	0.17	2.04
											10 yr	2.9	0.24	2.54
											100 yr	4.5	0.31	2.94
	11	390	400	1.2	20	8.50%	3	4	0.82	500	2 yr	1.53	0.17	2.04
											10 yr	2.9	0.24	2.54
											100 yr	4.5	0.31	2.94
	12	400	438.3	1.2	10	6.50%	3	4	0.92	300	2 yr	1.53	0.52	0.83
											10 yr	2.9	0.71	0.98
											100 yr	4.5	0.88	1.1

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D01c	1	0	25	1.1	25	1.00%	3	2	1.24	300	2 yr	3.01	0.52	1.65
											10 yr	6.98	0.78	2.07
											100 yr	12.5	1.02	2.41
	2	25	65	1.1	40	0.60%	3	2	1.40	100	2 yr	3.01	0.59	1.37
											10 yr	6.98	0.88	1.71
											100 yr	12.5	1.15	1.99
	3	65	105	1.1	40	0.10%	3	2	3.68	100	2 yr	3.01	0.9	0.71
											10 yr	6.98	1.33	0.88
											100 yr	12.5	1.71	1.02
	4	105	175	1.1	70	0.50%	3	2	1.59	100	2 yr	3.01	0.61	1.28
											10 yr	6.98	0.92	1.6
											100 yr	12.5	1.2	1.86
	5	175	229.2	1.1	54.2	0.50%	3	2	1.55	100	2 yr	3.01	0.77	0.91
											10 yr	6.98	1.13	1.14
											100 yr	12.5	1.47	1.32

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D02	1	0	100	1.2	100	0.10%	3	1	4.64	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.12	0.8
											100 yr	7.64	1.46	1.04
	2	100	110	1.2	10	0.10%	3	1	4.24	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.12	0.8
											100 yr	7.64	1.46	1.04
	3	110	270	1.2	160	0.10%	3	1	4.59	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.12	0.8
											100 yr	7.64	1.46	1.04
	4	270	330	4	60	0.10%	3	1	6.06	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.12	0.8
											100 yr	7.64	1.46	1.04
	5	330	375	4	45	0.10%	3	1	5.72	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.12	0.8
											100 yr	7.64	1.46	1.04
	6	375	575	1.1	200	0.10%	3	1	5.01	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.15	0.76
											100 yr	7.64	1.52	0.91
	7	575	815	1.1	240	6.80%	3	6	2.09	300	2 yr	1.42	0.12	1.78
											10 yr	3.91	0.23	2.58
											100 yr	7.64	0.33	3.26
	8	815	905	1.1	90	13.00%	3	6	3.28	500	2 yr	1.42	0.12	1.92
											10 yr	3.91	0.21	2.78
											100 yr	7.64	0.31	3.52
	9	905	1055	1.1	150	1.90%	3	4	2.15	300	2 yr	2.45	0.31	1.59
											10 yr	7.64	0.59	2.27
											100 yr	15.84	0.86	2.8
	10	1055	1115	1.1	60	1.90%	3	4	1.91	300	2 yr	2.45	0.31	1.59
											10 yr	7.64	0.59	2.27
											100 yr	15.84	0.86	2.8
	11	1115	1515.3	1.1	400	0.50%	3	2	2.9	100	2 yr	2.45	0.55	1.21
											10 yr	7.64	0.96	1.64
											100 yr	15.84	1.33	1.98

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D03	1	0.0	30.0	1.2	30	2.50%	3	2	1.45	300	2 yr	0.59	0.18	1.26
											10 yr	1.23	0.27	1.58
											100 yr	2	0.36	1.83
	2	30.0	80.0	1.2	50	12.00%	3	3	1.61	300	2 yr	0.59	0.09	1.92
											10 yr	1.23	0.14	2.49
											100 yr	2.00	0.19	2.94
	3	80.0	100.0	1.2	20	8.50%	3	2	1.37	300	2 yr	0.59	0.13	1.91
											10 yr	1.23	0.20	2.42
											100 yr	2.00	0.26	2.81
	4	100.0	110.0	1.2	10	7.00%	3	2	1.35	300	2 yr	0.59	0.14	1.79
											10 yr	1.23	0.21	2.27
											100 yr	2.00	0.27	2.63
	5	110.0	160.0	1.2	50	5.00%	3	2	1.59	300	2 yr	0.59	0.15	1.60
											10 yr	1.23	0.23	2.02
											100 yr	2.00	0.30	2.34
	6	160.0	180.0	1.2	20	5.00%	3	2	1.52	300	2 yr	0.59	0.15	1.60
											10 yr	1.23	0.23	2.02
											100 yr	2.00	0.30	2.34
	7	180.0	220.0	1.2	40	1.00%	3	2	1.61	100	2 yr	0.59	0.22	1.03
											10 yr	1.23	0.32	1.28
											100 yr	2.00	0.42	1.47
	8	220.0	260.0	1.2	40	2.10%	3	2	2.09	300	2 yr	0.59	0.19	1.19
											10 yr	1.23	0.29	1.49
											100 yr	2.00	0.37	1.72
	9	260.0	280.0	1.2	20	5.50%	3	2	1.37	300	2 yr	0.59	0.15	1.65
											10 yr	1.23	0.22	2.08
											100 yr	2.00	0.29	2.42
	10	280.0	305.0	1.2	25	1.00%	3	2	2.18	100	2 yr	0.59	0.22	1.03
											10 yr	1.23	0.32	1.28
											100 yr	2.00	0.42	1.47
	11	305.0	322.0	1.2	17	12.00%	3	3	1.69	300	2 yr	0.59	0.09	1.92
											10 yr	1.23	0.14	2.49
											100 yr	2.00	0.19	2.94
	12	322.0	387.0	1.2	65	0.0055	3	2	1.82	100	2 yr	0.59	0.28	0.75
											10 yr	1.23	0.41	0.93
											100 yr	2.00	0.53	1.06
	13	387.0	405.0	1.2	18	9.00%	3	2	1.64	300	2 yr	0.59	0.13	1.95
											10 yr	1.23	0.19	2.47
											r	2.00	0.25	2.87
	14	405.0	432.6	1.2	28	0.50%	3	2	1.72	100	r	0.59	0.29	0.72
											1yr	1.23	0.42	0.89
											10 yr	2.00	0.54	1.02

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D04	1	0	15	1.1	15	8.00%	3	3	1.6	300	2 yr	0.75	0.12	1.84
											10 yr	1.65	0.19	2.41
											100 yr	2.9	0.26	2.9
	2	15	135	1.1	120	0.20%	3	2	1.55	100	2 yr	0.75	0.38	0.63
											10 yr	1.65	0.57	0.78
											100 yr	2.9	0.75	0.91
	3	135	225	1.1	90	0.30%	3	2	1.59	100	2 yr	0.75	0.34	0.72
											10 yr	1.65	0.52	0.9
											100 yr	2.9	0.68	1.05
	4	225	250	1.1	25	4.40%	3	2	1.56	300	2 yr	0.75	0.18	1.65
											10 yr	1.65	0.28	2.11
											100 yr	2.9	0.37	2.49
	5	250	350	1.1	100	1.30%	3	2	1.72	100	2 yr	0.75	0.23	1.21
											10 yr	1.65	0.35	1.53
											100 yr	2.9	0.47	1.79
	6	350	383	1.1	33	2.00%	3	2	1.57	300	2 yr	0.75	0.22	1.26
											10 yr	1.65	0.34	1.6
											100 yr	2.9	0.46	1.87
	7	383	428.7	1.1	46	0.50%	3	2	1.51	100	2 yr	0.75	0.3	0.87
											10 yr	1.65	0.45	1.09
											100 yr	2.9	0.6	1.27

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D05	1	0	70	1.1	70	0.60%	3	2	1.43	100	2 yr	0.9	0.31	0.97
											10 yr	3.28	0.61	1.4
											100 yr	7.4	0.9	1.74
	2	70	200	1.1	130	0.90%	3	2	1.62	100	2 yr	0.9	0.28	1.12
											10 yr	3.28	0.55	1.62
											100 yr	7.4	0.82	2.02
	3	200	300	1.1	100	0.30%	3	2	1.34	100	2 yr	0.9	0.38	0.76
											10 yr	3.28	0.72	1.09
											100 yr	7.4	1.06	1.34
	4	300	630	1.1	330	0.30%	3	2	1.44	100	2 yr	0.9	0.38	0.76
											10 yr	3.28	0.72	1.09
											100 yr	7.4	1.06	1.34
	5	630	680	1.1	50	1.50%	3	2	1.53	300	2 yr	0.9	0.24	1.34
											10 yr	3.28	0.49	1.95
											100 yr	7.4	0.73	2.43
	6	680	730	1.1	50	0.10%	3	2	1.56	100	2 yr	0.9	0.5	0.51
											10 yr	3.28	0.94	0.72
											100 yr	7.4	1.36	0.89
	7	730	1680	1.1	950	0.10%	3	2	2.63	100	2 yr	0.9	0.5	0.51
											10 yr	3.28	0.94	0.72
											100 yr	7.4	1.36	0.89
	8	1680	1880	1.1	200	0.49%	3	2	1.63	100	2 yr	0.9	0.33	0.91
											10 yr	3.28	0.64	1.3
											100 yr	7.4	0.95	1.61
	9	1880	2193.2	1.1	313	1.30%	3	4	3.86	300	2 yr	0.9	0.18	1.11
											10 yr	3.28	0.37	1.71
											100 yr	7.4	0.59	2.19

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D06a	1	0	90	2.2	90	5.60%	0.5	4	3.21	300	2 yr	0.406182	0.08	1.24
											10 yr	0.972277	0.14	1.74
											100 yr	1.791037	0.2	2.19
	2	90	245	2.2	155	18.00%	0.5	4	2.5	300	2 yr	0.41	0.06	1.77
											10 yr	0.97	0.1	2.48
											100 yr	1.79	0.14	3.14
	3	245	345	2.2	100	0.70%	0.5	4	1.54	100	2 yr	0.41	0.14	0.72
											10 yr	0.97	0.24	1
											100 yr	1.79	0.34	1.25
	4	345	395	2.2	50	7.10%	0.5	2	1.5	300	2 yr	0.41	0.12	1.7
											10 yr	0.97	0.2	2.34
											100 yr	1.79	0.29	2.89
	5	395	535	2.2	140	15.00%	0.5	4	3.19	500	2 yr	1.27	0.14	2.26
											10 yr	3.04	0.23	3.15
											100 yr	5.6	0.34	3.93
	6	535	760	5	225	0.10%	0.5	4	5.43	100	2 yr	1.27	0.56	0.53
											10 yr	3.04	0.96	0.71
											100 yr	5.6	1.39	0.85
	7	760	820	2.2	60	9.00%	0.5	4	1.79	500	2 yr	1.27	0.16	1.99
											10 yr	3.04	0.27	2.76
											100 yr	5.6	0.39	3.44
	8	820	900	2.2	80	3.90%	0.5	4	3.28	300	2 yr	1.27	0.18	1.72
											10 yr	3.04	0.31	2.37
											100 yr	5.6	0.45	2.95
	9	900	949.4	2.2	49	8.48%	0.5	4	4.42	500	2 yr	1.27	0.16	1.98
											10 yr	3.04	0.27	2.75
											100 yr	5.6	0.39	3.43

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D06b	1	0	75	2.1	75	13.30%	0.5	4	4.08	300	2 yr	0.75	0.09	2.04
											10 yr	1.47	0.14	2.65
											100 yr	2.68	0.2	3.34
	2	75	225	2.1	150	15.80%	0.5	4	1.99	500	2 yr	0.75	0.09	1.99
											10 yr	1.47	0.14	2.58
											100 yr	2.68	0.2	3.24
	3	225	375	2.1	150	10.50%	0.5	4	3.18	300	2 yr	0.75	0.1	1.9
											10 yr	1.47	0.15	2.47
											100 yr	2.68	0.21	3.1
	4	375	440	2.1	65	12.00%	0.5	4	3.6	300	2 yr	0.75	0.09	1.98
											10 yr	1.47	0.14	2.57
											100 yr	2.68	0.2	3.23
	5	440	470	2.1	30	9.50%	0.5	4	2.05	500	2 yr	2.28	0.23	2.45
											10 yr	4.48	0.34	3.14
											100 yr	8.2	0.5	3.88
	6	470	670	2.1	200	0.10%	0.5	4	4.09	100	2 yr	2.28	0.73	0.72
											10 yr	4.48	1.1	0.89
											100 yr	8.2	1.6	1.06
	7	670	870	1.2	200	0.10%	3	2	3.94	100	2 yr	2.28	0.79	0.66
											10 yr	4.48	1.09	0.79
											100 yr	8.2	1.42	0.92
	8	870	960	1.2	90	9.50%	3	4	4.99	500	2 yr	2.28	0.23	2.45
											10 yr	4.48	0.32	2.86
											100 yr	8.2	0.44	3.46
	9	960	1247	1.2	287	0.40%	3	2	3.97	100	2 yr	2.28	0.56	1.09
											10 yr	4.48	0.78	1.31
											100 yr	8.2	1.04	1.54
D06c	1	0	420	3.1	420	0.25%	3	2	4.26	100	2 yr	3.85	0.82	1.06
											10 yr	8.59	1.18	1.31
											100 yr	15.1	1.52	1.51
	2	420	495	1.1	75	4.50%	3	4	1.69	500	2 yr	3.85	0.35	2.15
											10 yr	8.59	0.55	2.75
											100 yr	15.1	0.75	3.25
	3	495	544.6	1.1	60	1.50%	3	2	2.12	300	2 yr	3.85	0.57	1.83
											10 yr	8.59	0.84	2.26
											100 yr	15.1	1.09	2.62

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D07b	1	0	70	1.1	70	0.10%	3	2	2.07	100	2 yr	1.11	0.56	0.54
											10 yr	2.06	0.75	0.64
											100 yr	3.2	0.93	0.72
	2	70	100	1.1	30	1.50%	3	2	1.31	100	2 yr	1.11	0.27	1.43
											10 yr	2.06	0.38	1.71
											100 yr	3.2	0.48	1.94
	3	100	315	1.1	215	0.10%	3	2	1.39	100	2 yr	1.11	0.56	0.54
											10 yr	2.06	0.75	0.64
											100 yr	3.2	0.93	0.72
	4	315	340	1.1	25	1.30%	3	2	1.37	100	2 yr	1.11	0.29	1.36
											10 yr	2.06	0.4	1.63
											100 yr	3.2	0.5	1.84
	5	340	545	1.1	205	0.10%	3	2	2.11	100	2 yr	1.11	0.56	0.54
											10 yr	2.06	0.75	0.64
											100 yr	3.2	0.93	0.72
	6	545	610	1.1	65	10.00%	3	4	2	300	2 yr	1.11	0.12	2.09
											10 yr	2.06	0.17	2.61
											100 yr	3.2	0.23	3.03
	7	610	648	1.1	38	0.30%	3	2	1.25	100	2 yr	1.11	0.42	0.81
											10 yr	2.06	0.58	0.96
											100 yr	3.2	0.72	1.08
	8	648	838	3.1	190	0.10%	3	2	1.93	100	2 yr	1.11	0.56	0.54
											10 yr	2.06	0.75	0.64
											100 yr	3.2	0.93	0.72
D07c	1	0	100	1.2	100	0.10%	3	2	5.51	100	2 yr	1.73	0.69	0.61
											10 yr	3.4	0.96	0.73
											100 yr	5.5	1.19	0.83
	2	100	420	1.2	320	0.10%	3	2	7.54	100	2 yr	1.73	0.69	0.61
											10 yr	3.4	0.96	0.73
											100 yr	5.5	1.19	0.83
	3	420	495	1.2	75	9.00%	3	4	5.59	500	2 yr	1.73	0.18	2.14
											10 yr	3.4	0.26	2.69
											100 yr	5.5	0.35	3.15
	4	495	567.2	1.2	72	0.10%	3	2	2.59	100	2 yr	1.73	0.69	0.61
											10 yr	3.4	0.96	0.73
											100 yr	5.5	1.19	0.83

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D08	1	0	125	1.1	125	0.70%	3	2	1.52	100	2 yr	0.37	0.18	0.78
											10 yr	0.98	0.32	1.05
											100 yr	1.9	0.45	1.27
	2	125	325	1.1	200	2.30%	3	2	1.97	300	2 yr	0.37	0.14	1.06
											10 yr	0.98	0.25	1.44
											100 yr	1.9	0.35	1.75
	3	325	345	1.1	20	9.00%	3	2	1.7	300	2 yr	0.37	0.1	1.66
											10 yr	0.98	0.17	2.3
											100 yr	1.9	0.25	2.83
	4	345	370	1.1	25	1.00%	3	2	1.4	100	2 yr	0.37	0.17	0.88
											10 yr	0.98	0.29	1.2
											100 yr	1.9	0.41	1.45
	5	370	571	1.1	201	0.10%	3	2	2.7	100	2 yr	0.37	0.32	0.4
											10 yr	0.98	0.52	0.53
											100 yr	1.9	0.72	0.63
D09	1	0	120	2.1	120	0.30%	3	2	1.78	100	2 yr	0.01	0.03	0.17
											10 yr	0.14	0.14	0.43
											100 yr	0.4	0.24	0.6
	2	120	140	2.1	20	5.00%	3	2	1.77	100	2 yr	0.01	0.01	0.39
											10 yr	0.14	0.06	1.07
											100 yr	0.4	0.11	1.56
	3	140	230	2.1	90	0.70%	3	2	2.15	100	2 yr	0.01	0.02	0.22
											10 yr	0.14	0.11	0.57
											100 yr	0.4	0.19	0.8
	4	230	271.7	2.1	42	4.00%	3	2	1.9	100	2 yr	0.01	0.01	0.37
											10 yr	0.14	0.06	1
											100 yr	0.4	0.12	1.44

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D10a	1	0	30	1.2	30	1.10%	3	2	2.32	100	2 yr	0.41	0.17	0.95
											10 yr	1.04	0.29	1.26
											100 yr	1.93	0.4	1.51
	2	30	270	1.2	240	0.10%	3	2	2.84	100	2 yr	0.41	0.33	0.41
											10 yr	1.04	0.54	0.53
											100 yr	1.93	0.73	0.63
	3	270	390	1.2	120	9.00%	3	2	2.05	300	2 yr	0.41	0.12	1.5
											10 yr	1.04	0.2	2.03
											100 yr	1.93	0.28	2.45
	4	390	435	1.2	45	3.30%	3	2	1.85	300	2 yr	0.41	0.15	1.13
											10 yr	1.04	0.25	1.5
											100 yr	1.93	0.35	1.81
	5	435	480	1.2	45	7.00%	3	2	1.93	300	2 yr	0.41	0.13	1.38
											10 yr	1.04	0.21	1.86
											100 yr	1.93	0.3	2.25
	6	480	533	1.2	53	2.50%	3	2	2.18	300	2 yr	0.41	0.17	0.99
											10 yr	1.04	0.28	1.32
											100 yr	1.93	0.39	1.58
	7	533	553	1.1	20	2.00%	3	2	1.81	300	2 yr	2.05	0.38	1.7
											10 yr	5.16	0.61	2.19
											100 yr	9.6	0.83	2.59

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D10b	1	0	20	1.2	20	0.50%	3	2	2.45	100	2 yr	0.87	0.32	0.9
											10 yr	1.7	0.46	1.1
											100 yr	2.74	0.58	1.25
	2	20	80	1.2	60	4.50%	3	2	1.53	300	2 yr	0.87	0.19	1.75
											10 yr	1.71	0.28	2.15
											100 yr	2.74	0.36	2.47
	3	80	285	1.2	205	0.10%	3	2	3.26	100	2 yr	0.87	0.49	0.51
											10 yr	1.71	0.69	0.61
											100 yr	2.74	0.86	0.69
	4	285	300	1.2	15	2.00%	3	2	1.86	300	2 yr	0.87	0.24	1.32
											10 yr	1.71	0.35	1.61
											100 yr	2.74	0.45	1.84
	5	300	375	1.2	75	8.50%	3	3	1.74	300	2 yr	0.87	0.14	1.78
											10 yr	1.71	0.21	2.24
											100 yr	2.74	0.27	2.61
	6	375	435	1.2	60	1.40%	3	2	1.46	100	2 yr	0.87	0.25	1.3
											10 yr	1.71	0.35	1.58
											100 yr	2.74	0.45	1.81
	7	435	505	1.2	70	8.50%	3	4	1.78	300	2 yr	0.87	0.11	1.82
											10 yr	1.71	0.16	2.31
											100 yr	2.74	0.22	2.73
	8	505	655	1.2	150	0.20%	3	2	1.45	100	2 yr	1.91	0.61	0.81
											10 yr	3.74	0.85	0.97
											100 yr	6	1.06	1.1
	9	655	970	1.2	315	0.20%	3	2	1.58	100	2 yr	1.91	0.61	0.81
											10 yr	3.74	0.85	0.97
											100 yr	6	1.06	1.1
	10	970	1005	1.2	35	2.00%	3	2	1.4	300	2 yr	1.91	0.37	1.67
											10 yr	3.74	0.52	2.01
											100 yr	6	0.66	2.29
	11	1005	1035	1.2	30	2.00%	3	2	1.45	300	2 yr	1.91	0.37	1.67
											10 yr	3.74	0.52	2.01
											100 yr	6	0.66	2.29
	12	1035	1065	1.2	30	0.50%	3	2	1.21	100	2 yr	1.91	0.49	1.13
											10 yr	3.74	0.68	1.36
											100 yr	6	0.85	1.54
	13	1065	1194.9	1.2	130	4.50%	3	4	1.77	300	2 yr	1.91	0.21	1.95
											10 yr	3.74	0.31	2.45
											100 yr	6	0.4	2.84

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D11	1	0	55	1.2	55	2.55%	3	2	2.15	300	2 yr	0.19	0.1	0.87
											10 yr	0.66		
											100 yr	1.43	0.3	1.67
	2	55	110	1.2	55	6.00%	3	2	1.76	300	2 yr	0.19	0.07	1.15
											10 yr	0.66	0.15	1.76
											100 yr	1.43	0.23	2.25
	3	110	195	1.2	85	10.00%	3	2	2.47	300	2 yr	0.19	0.06	1.36
											10 yr	0.66	0.13	2.09
											100 yr	1.43	0.2	2.68
	4	195	245	1.2	50	0.80%	3	2	1.73	100	2 yr	1.16	0.33	1.16
											10 yr	4.04	0.63	1.65
											100 yr	8.7	0.91	2.02
	5	245	925	1.2	680	0.15%	3	2	2.02	100	2 yr	1.16	0.51	0.64
											10 yr	4.04	0.94	0.89
											100 yr	8.7	1.34	1.08
	6	925	975	1.2	50	1.00%	3	2	1.87	100	2 yr	1.16	0.31	1.26
											10 yr	4.04	0.6	1.78
											100 yr	8.7	0.87	2.19
	7	975	1225	1.2	250	0.30%	3	2	1.86	100	2 yr	1.16	0.43	0.82
											10 yr	4.04	0.8	1.15
											100 yr	8.7	1.14	1.4
	8	1225	1415	1.2	190	0.60%	3	2	1.93	100	2 yr	1.16	0.36	1.05
											10 yr	4.04	0.68	1.48
											100 yr	8.7	0.97	1.81
	9	1415	1615	1.2	200	0.30%	3	2	2.2	100	2 yr	1.16	0.43	0.82
											10 yr	4.04	0.8	1.15
											100 yr	8.7	1.14	1.4
	10	1615	1659.8	1.2	45	2.00%	3	2	2.38	500	2 yr	1.16	0.31	1.29
											10 yr	4.04	0.59	1.83
											100 yr	8.7	0.85	2.24

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D12	1	0	65	1.2	65	0.10%	3	2	1.80	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
	2	65	145	1.2	80	0.10%	3	2	1.87	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
	3	145	295	1.2	150	0.10%	3	2	1.76	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
	4	295	375	1.2	80	4.00%	3	2	0.80	300	2 yr	0.16	0.08	0.95
											10 yr	0.54	0.15	1.44
											100 yr	1.1	0.23	1.8
	5	375	605	3.2	230	0.10%	3	2	3.03	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
	6	605	630	1.2	25	20.00%	3	3	2.00	300	2 yr	0.16	0.04	1.39
											10 yr	0.54	0.08	2.19
											100 yr	1.1	0.12	2.83
	7	630	640	1.2	10	0.10%	3	2	1.88	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
	8	640	650	1.2	10	0.10%	3	2	1.63	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
	9	650	716.79	1.2	67	0.10%	3	2	1.98	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D14a	1 - 6	0	1130	Contact water runoff management will be incorporated into the future stockpile design							2 yr	1.39	Contact water runoff management will be incorporated into the future stockpile design	
											10 yr	4.92		
											100 yr	10.9		
	7	1130	1250	3.1	120	7.00%	3	6	2.05	500	2 yr	1.39	0.14	1.59
											10 yr	4.92	0.29	2.51
											100 yr	10.9	0.45	3.28
	8	1250	1300	3.1	50	0.50%	3	2	3.18	100	2 yr	1.39	0.41	1.03
											10 yr	4.92	0.78	1.46
											100 yr	10.9	1.13	1.8
	9	1300	1347	3.1	47	0.50%	3	2	2.53	100	2 yr	1.39	0.41	1.03
											10 yr	4.92	0.78	1.46
											100 yr	10.9	1.13	1.8
	1	0	75	1.2	75	0.10%	2.5	2	4.18	100	2 yr	1.95	0.76	0.65
											10 yr	3.18	0.97	0.74
											100 yr	4.53	1.14	0.82
	2	75	290	3.2	215	8.30%	2.5	5	3.74	300	2 yr	1.95	0.17	2.09
											10 yr	3.18	0.23	2.5
											100 yr	4.53	0.28	2.83
	3	290	540	3.2	250	0.10%	2.5	2	5.19	100	2 yr	1.95	0.76	0.65
											10 yr	3.18	0.97	0.74
											100 yr	4.53	1.14	0.82
	4	540	634	3.2	94	8.70%	2.5	5	4.04	300	2 yr	1.95	0.17	2.13
											10 yr	3.18	0.23	2.54
											100 yr	4.53	0.28	2.87

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D14b	5	634	1024	1.2	390	0.10%	2.5	2	2.38	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.7	1.82	1.06
	6	1024	1109	1.2	85	0.30%	2.5	2	1.72	100	2 yr	5.45	0.96	1.28
											10 yr	8.92	1.21	1.46
											100 yr	12.7	1.43	1.6
	7	1109	1339	1.2	230	3.80%	2.5	6	3.21	500	2 yr	5.45	0.36	2.23
											10 yr	8.92	0.47	2.63
											100 yr	12.7	0.58	2.95
	8	1339	1359	1.2	20	0.10%	2.5	2	2.03	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.7	1.82	1.06
	9	1359	1459	1.2	100	0.10%	2.5	2	1.9	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.7	1.82	1.06
	10	1459	1533	1.2	74	0.10%	2.5	2	2.2	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.7	1.82	1.06
	11	1533	1553	1.2	20	0.10%	2.5	2	2.7	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.7	1.82	1.06
	12	1553	1561.9	3.2	9	0.10%	2.5	2	2.3	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.7	1.82	1.06
	1	0	70	1.2	70	0.20%	2.5	4	2.15	100	2 yr	6.13	0.89	1.1
											10 yr	12.07	1.27	1.33
											100 yr	20.5	1.65	1.53
	2	70	260	1.2	190	5.00%	2.5	6	3.56	500	2 yr	6.13	0.37	2.42
											10 yr	12.07	0.54	3.04
											100 yr	20.5	0.73	3.59
	3	260	627.7	3	368	0.50%	2.5	4	6.23	100	2 yr	6.13	0.7	1.52
											10 yr	12.07	1	1.85
											100 yr	20.5	1.31	2.14
	1	0	15	1.2	15	3.00%	3	2	1.32	500	2 yr	0.91	0.22	1.54
											10 yr	2.71	0.4	2.13
											100 yr	5.5	0.57	2.59

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
D14c	2	15	50	1.2	35	9.50%	3	6	0.96	300	2 yr	0.91	0.09	1.68
											10 yr	2.71	0.17	2.52
											100 yr	5.5	0.25	3.24
	3	50	205	1.2	155	0.30%	3	2	2.41	100	2 yr	0.91	0.38	0.76
											10 yr	2.71	0.66	1.03
											100 yr	5.5	0.93	1.24
	4	205	240	1.2	35	4.00%	3	2	1.49	500	2 yr	0.91	0.2	1.7
											10 yr	2.71	0.37	2.36
											100 yr	5.5	0.53	2.87
D15	5	240	345	1.2	105	0.20%	3	2	1.98	100	2 yr	0.91	0.42	0.66
											10 yr	2.71	0.73	0.89
											100 yr	5.5	1.02	1.07
	6	345	420	1.2	75	15.00%	3	4	1.85	500	2 yr	0.91	0.11	1.97
											10 yr	2.71	0.2	2.9
											100 yr	5.5	0.3	3.68
	7	420	520	1.2	100	2.50%	3	2	2.14	300	2 yr	0.91	0.21	1.61
											10 yr	2.71	0.39	2.23
											100 yr	5.5	0.55	2.71
	8	520	650	1.2	130	0.50%	3	2	2.58	100	2 yr	0.91	0.33	0.92
											10 yr	2.71	0.58	1.24
											100 yr	5.5	0.82	1.5
	9	650	722.6	1.2	73	0.50%	3	2	3.78	100	2 yr	0.91	0.33	0.92
											10 yr	2.71	0.58	1.24
											100 yr	5.5	0.82	1.5
	1	0	60	1.1	60	0.20%	2.5	2	1.28	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
	2	60	410	1.1	350	0.20%	2.5	2	3.71	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
	3	410	570	1.1	160	0.20%	2.5	2	5.84	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
	4	570	1070	1.1	500	0.20%	2.5	2	4.95	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
DCB	5	1070	1250	1.1	180	0.20%	2.5	2	4.84	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
	6	1250	1310	1.1	60	0.20%	2.5	2	4.41	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
	7	1310	1901.2	1.1	591	0.20%	2.5	2	5.02	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
	1	0	50	1.2	50	1.00%	3	2	1.55	100	2 yr	0.29	0.16	0.74
											10 yr	2.22	0.48	1.35
											100 yr	6.8	0.83	1.83
	2	50	250	1.2	200	0.50%	3	2	1.91	100	2 yr	0.29	0.18	0.65
											10 yr	2.22	0.53	1.18
											100 yr	6.8	0.91	1.59
	3	250	390	2.2	140	1.30%	1	3	2.05	300	2 yr	0.29	0.12	0.76
											10 yr	2.22	0.41	1.58
											100 yr	6.8	0.8	2.25
	4	390	1110	2.2	720	0.15%	1	3	2.77	100	2 yr	0.29	0.23	0.39
											10 yr	2.22	0.78	0.76
											100 yr	6.8	1.46	1.04

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
DC2a	5	1110	1280	2.2	170	4.00%	1	4	2.7	300	2 yr	0.29	0.07	0.98
											10 yr	2.22	0.25	2.11
											100 yr	6.8	0.48	3.13
	6	1280	1320	2.2	40	0.15%	1	2	2.93	100	2 yr	0.29	0.27	0.47
											10 yr	2.22	0.88	0.88
											100 yr	6.8	1.59	1.19
	7	1320	1356.9	1.2	37	5.50%	3	5	1.57	300	2 yr	0.29	0.06	0.88
											10 yr	2.22	0.21	1.87
											100 yr	6.8	0.4	2.73
	1	0	380	1.2	380	0.50%	3	3	2.82	300	2 yr	0.59	0.22	0.75
											10 yr	3.94	0.61	1.34
											100 yr	12.96	1.11	1.86
	2	380	620	2.2	240	0.15%	1	3	3.11	100	2 yr	0.59	0.32	0.55
											10 yr	3.94	0.99	1
											100 yr	12.96	1.9	1.39
	3	620	715	2.2	95	2.50%	1	5	2.15	300	2 yr	0.59	0.11	1.03
											10 yr	3.94	0.35	2.09
											100 yr	12.96	0.72	3.16
	4	715	825	2.2	110	0.20%	1	3	3.1	100	2 yr	0.59	0.3	0.6
											10 yr	3.94	0.91	1.11
											100 yr	12.96	1.76	1.54

Ditch Name	Segment #	Station		Typical Cross-Section	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Riprap D50	Return Period	Design Flow	Flow Depth	Flow Velocity
		From	*To*		*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
DC2b	5	825	925	2.2	100	0.80%	1	2	2.86	100	2 yr	0.59	0.27	0.95
											10 yr	3.94	0.83	1.69
											100 yr	12.96	1.56	2.32
	6	925	1155	2.2	230	1.50%	1	2	2.45	300	2 yr	0.59	0.23	1.16
											10 yr	3.94	0.69	2.12
											100 yr	12.96	1.33	2.93
	7	1155	1405	1.2	250	4.60%	3	6	3.15	500	2 yr	0.59	0.09	1.03
											10 yr	3.94	0.28	2.06
											100 yr	12.96	0.55	3.06
	8	1405	1615	2.2	210	2.70%	1	5	2.46	300	2 yr	0.59	0.11	1.05
											10 yr	3.94	0.34	2.14
											100 yr	12.96	0.7	3.24
	9	1615	1660	2.2	45	1.30%	1	4	2.72	300	2 yr	0.59	0.16	0.91
											10 yr	3.94	0.49	1.79
											100 yr	12.96	0.99	2.63
	10	1660	1720	2.2	60	2.00%	1	5	2.16	300	2 yr	0.59	0.12	0.96
											10 yr	3.94	0.38	1.94
											100 yr	12.96	0.77	2.93
	11	1720	1995	1.2	275	0.50%	3	3	2.48	100	2 yr	0.59	0.22	0.75
											10 yr	3.94	0.61	1.34
											100 yr	12.96	1.11	1.86
	12	1995	2555	1.2	560	0.50%	3	3	3.04	100	2 yr	0.59	0.24	0.68
											10 yr	3.94	0.66	1.2
											100 yr	12.96	1.19	1.66
	13	2555	2620	1.2	65	9.00%	3	6	5.43	500	2 yr	0.59	0.08	1.21
											10 yr	3.94	0.24	2.44
											100 yr	12.96	0.48	3.66
	14	2620	2669.4	1.2	49	0.50%	3	3	2.11	100	2 yr	0.59	0.22	0.75
											10 yr	3.94	0.61	1.34
											100 yr	12.96	1.11	1.86

4.0 PONDS AND SUMPS

4.1 Sedimentation Ponds

Four sedimentation ponds, SP01, S0P2, SP03, and SP04, are included in the water management plan. Water collected in these ponds is discharged to the environment, to the main Diversion Channel for SP01 and SP02, and to a Lake A tributary for SP03 and SP04 after verification of the water quality conformity with applicable effluent quality requirements. SP02 is also recycled for process water supply when the TSF Pond or the in-pit deposition areas cannot provide the entire demand.

4.1.1 Pond Containment Capacity

The ponds are designed to contain the 100-year rainfall event and inflows from sumps and pit seepage. Sedimentation ponds SP01, SP03, and SP04 were designed with a side slope of 3H:1V and a dead storage allowance of 0.5 m. A minimum freeboard of 0.5 m is required for each sedimentation pond except for SP01, which has minimal freeboard allowance. In this case, overflow would follow the terrain profile and seep through the J Waste Sump until it reaches SP02, which has sufficient capacity to accommodate the excess water from SP01.

Where filter layers are required, ponds are lined with 0.5 m of sandy gravel over non-woven geotextile to stabilize side slopes. Erosion protection is provided by one meter of rock (general run-of-mine) over the pond lining material layer.

Table 13 outlines the parameters used in the design of the sedimentation ponds as well as the proposed design.

Table 13: Sedimentation Pond Design Parameters

Parameter	Unit	SP01	SP02	SP03	SP04
Total Drainage Area (including Ditches; not including pumping)	km^2	0.98	3.02	1.55	2.25
Upstream Inflow Sources	-	S01 / S01b pumped flows	S06 pumped flow	S05 pumped flow	S09 Pumped flow
Outlet to	-	DC1	DC1	Lake A Inlet Channel	Lake A Inlet Channel
Pump Capacity	m^3/s	0.4	1.0	1.0	1.0
Total Required Footprint	*ha*	4.3	14.9 (87 Pit Phase 0)	5.6	6.6
Shape	-	Rectangular	Irregular	Rectangular	Rectangular
Available Live Storage Volume	m^3	74,500	516,000	83,000	145,000
Required Live Storage Volume	m^3	63,000	150,000	80,000	125,000
Dead Storage Volume	m^3	8,800	127,700	11,600	18,400
Total Containment Volume	m^3	79,000	757,900	99,600	156,000
Excavation Volume	m^3	192,100	757,900	223,100	420,700
Length at Live Storage	*m*	187	87 Pit Phase 0 - Pit Shell	325	202
Width at Live Storage	*m*	120	87 Pit Phase 0 - Pit Shell	98	256
Depth (top of lining)	*m*	4.0	45	4.0	4.0
Side Slope	*xH:1V*	3	87 Pit Phase 0 - Pit Shell	3	3
Dead storage allowance	*m*	0.5	5	0.5	0.5
Freeboard Allowance	*m*	0	5	0.5	0.5
Minimum Crest Elevation	*masl*	372.80	330	353.08	354.67
Top of Live storage	*masl*	372.80	325.00	352.58	354.17
Top of Dead Storage	*masl*	369.33	300.00	349.58	351.17
Invert Elevation	*masl*	368.83	285	349.08	350.67
Pond Lining Material	*m*	1.0 m rock over 0.5 m sandy gravel over NWG	Pit shell	1.0 m rock over 0.5 m sandy gravel over NWG	1.0 m rock over 0.5 m sandy gravel over NWG

4.1.2 TSS Management

Water collected in the ponds is discharged by pumping to the environment after verification of the water quality conformity with applicable effluent quality requirements. Continuous turbidity sensors are installed on the outlet pipeline, such that discharge is stopped immediately if the TSS concentrations exceed regulatory discharge guidelines.

The sedimentation ponds were assessed as dry ponds. The pump stations (see Appendix G to the main report for more details) were designed to be installed on floating barges and the intakes are designed to withdraw water from the top of the water column. The water intake to the pumps would be approximately over the top 0.3 m below the water surface. The pond design verified that the minimum pond residence time is sufficient to allow for a minimum 0.3 m settling depth for the 10 µm critical (small) design particle; the verification was done at maximum pumping rate and at minimum water depth. Stoke's Law was used to calculate the settling velocity as a function of the particle size.

To avoid flow short-circuiting in the ponds, the pump stations were positioned in the opposite pond corner from the pond inflows. For pond SP03, an internal berm was added for the same purpose.

As a factor of safety, the pond design added a 4-hour pump stand-by capacity to account for situations when additional residence time is required during an extreme event.

Should water quality monitoring indicate higher than expected TSS concentrations, for example, because of a larger than expected clay and fine silt TSS fraction, Troilus would install pre-settling areas (deepened ditch segments upstream of the ponds) or would add flocculants at the pond inflows. The flocculation systems were not included in the current design as they are not expected to be required.

Stoke's Law settling velocities for 10 µm and 15 µm particles at 5ºC water temperature are summarized in Table 14.

Table 14: Particle Settling Velocities (BCMoE 2015)

Particle Size (µm)	Settling Velocity, V_S at 5°C (m/s)
10	0.0000592
15	0.0001332

Results for all four sedimentation ponds are summarized in Table 15. All four sedimentation ponds have sufficient area to settle the 10 µm and 15 µm particles below the pump intake. Pond SP02 has a small surface area relative to its volume and may be more vulnerable for short-circuiting. However, the available pond volume of 516,000 m^3 exceeds the required live storage volume of 150,000 m^3 by a factor of 3.4. Pumping may be managed to make use of the extra storage volume and increase the retention time as required to maintain effluent quality.

Table 15: Sedimentation Pond Settling Depths

Parameter	SP01	SP02	SP03	SP04
Required Minimum Settling Depth (m)	0.5	0.5	0.5	0.5
Area at Top of Dead Storage (m^2)	17,953	13,082	23,450	43,877
Design Pumping Rate (m^3/s)	0.4	1	1	1
Calculated Minimum Retention Time (hr) (1)	6.23	1.82	3.26	6.09
Settlement of 10 µm Particle During Minimum Retention Time (m)	1.33	0.39	0.69	1.30
Settlement of 15 µm Particle During Minimum Retention Time (m)	2.99	0.87	1.56	2.92
Meets Design Criteria (settling depth is below pump intake depth of 0.3 m)?	Yes	Yes	Yes	Yes

Note: 1. WSP calculated the minimum retention time as the Pond Minimum Area × 0.5 m Depth / Maximum Pumping Capacity. 0.5 m depth correspond to the minimum dead storage depth for SP01, SP03, and SP04. For SP02, the dead storage depth is much higher (>5 m), but the 0.5 m was kept since the small surface area may encourage short-circuiting.

4.2 Collection Sumps

Eight contact water collection sumps are included in the Stormwater Management Program (SWMP) to contain and transfer the 100-year design flood event to sedimentation ponds. The sumps collect water from natural drainage areas and ditches, which flow into the sumps. Water is then pumped via a pipeline to either a sedimentation pond, collector ditch or the Tailings Storage Facility.

The sumps are designed to be constructed by excavation in natural ground and operated dry to maximize the live storage capacity during a flood event. Required live storage volumes were calculated through the contact water management HEC-HMS model, which established the required size of the sumps.

Where filter layers are required, ponds are lined with 0.5 m of sandy gravel over non-woven geotextile to stabilize side slopes. Erosion protection is provided by one meter of rock (general run-of-mine) over the sump lining material layer.

Table 16 describes the design parameters of each sump.

Sump S06

The required 100-year live storage volume of Sump S06 is 53,000 m^3. Prior to the construction of Stockpile STK1 the maximum containment volume of S06 is 38,200 m^3. This volume is sufficient to contain the 10-year design event, which has a peak storage volume requirement of 34,300 m^3. Overtopping of S06 prior to construction of STK1 will send runoff north through existing ditches toward the existing 87 Pit.

The construction of STK1 later in Year -2 increases the total containment volume of S06 to approximately 106,000 m^3. To reduce the risk of overtopping from the 100-year design flood, if construction of STK1 is delayed beyond Year -2, a 2 m high berm may be constructed on the east side of Sump S06 to increase total containment volume to approximately 71,160 m^3.

Table 16: Sump Design Parameters

Parameter	Unit	S01	S01b	S02	S03	S05	S06 (a)	S07	S09
Total Drainage Area (including Ditches; not including pumping)	km^2	1.39	1.39 (assumed)	0.11	0.45	0.15	0.75	0.51	0.45
Upstream Inflow Sources	-	-	-	-	-	-	-	-	-
Outlet to	-	SP01	SP01 via D05	TSF	TSF	D10a	SP02 via D06c	TSF	SP04 via D14b
Pump Capacity	m^3/s	0.25	0.25	0.30	0.30	0.20	0.20	0.20	0.30
Total Required Footprint	*ha*	5.1	5.3	0.6	1.7	0.7	2.6	1.1	1.8
Shape	-	Irregular	Irregular	Oblong	Oblong	Rectangular	Irregular	Oblong	Rectangular
Available Live Storage Volume	m^3	75,000	75,000	4,000	15,000	4,000	38,200 (Year -2) 90,900 (after year -2)	12,000	23,000
Required Live Storage Volume	m^3	75,000	75,000	4,000	15,000	4,000	34,300 (10-year) 53,000 (100-year)	12,000	23,000
Dead Storage Volume	m^3	8,400	8,400	300	1,800	200	4,900	1,400	3,300
Total Containment Volume	m^3	94,800	94,800	5,400	20,100	4,800	38,200 (Year -2) 106,000 (after year -2)	16,100	31,600
Excavation Volume	m^3	109,000	142,500	8,500	63,000	9,600	103,400	19,800	73,500
Length at Live Storage	*m*	380	200	73	130	65	136	117	222
Width at Live Storage	*m*	160	315	34	61	42	130	49	81
Depth (top of lining)	*m*	5.0	2.5	4.0	4.0	3.6	3.6	4.0	4.0
Side Slope	*xH:1V*	3	3	3	3	3	3	3	3
Dead Storage Allowance	*m*	Existing Lac C1 Bathymetry	Existing Lac C Bathymetry	0.5	0.5	0.3	0.5	0.3	0.5
Freeboard Allowance	*m*	0.5	0.5	0.5	0.5	0.5	0.5	0	0.5
Minimum Crest Elevation	*masl*	378.20	379.00	388.25	373.50	371.50	381.20	427.00	388.00

Table 16: Sump Design Parameters

Parameter	Unit	S01	S01b	S02	S03	S05	S06 (a)	S07	S09
Top of Live storage	*masl*	377.70	378.50	387.75	373.00	370.96	381.00	427.00	387.50
Top of Dead Storage	*masl*	375.70	376.50	384.75	370.00	367.69	378.50	422.84	384.50
Invert Elevation	*masl*	375.70 (top of dead storage)	376.50	384.25	369.50	367.66	378.00	422.54	384.00
Pond Lining Material	*m*	1.0 m rock	1.0 m rock	1.0 m rock	1.0 m rock over 0.5m sandy gravel over NWG	1.0 m rock	1.0 m rock	1.0 m rock	1.0 m rock

Notes:

(a) Sump S06 design was based on existing topography to contain the 10-year event prior to development of the STK1 footprint. After STK1 development S06 will contain the 100-year event.

4.3 Outflow Design

Details of the design of pumps and pipes for each sedimentation pond and sump, including power requirements, are included in Appendix G.

5.0 REFERENCES

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APPENDIX F

Culvert Crossings

1.0 ROAD CROSSINGS

1.1 Culvert Assessment Types

WSP designed required crossings between the proposed ditches and channels and road crossings for the Troilus Project water management plan. Crossing locations were assumed along existing roads or planned future roads, and at places where an access road is likely to be needed. Up to four additional culverts were assumed for years where a collector ditch or diversion channel may not be built, but new roads may be required.

Road crossings with similar characteristics, such as similar headwater depth, flow rates, and slopes were grouped together to limit the variety of culverts required. Round corrugated steel pipe (CSP) culverts were used on all secondary diversion channels and contact water ditches. For the main diversion DC1, it was assumed that arch culverts lined with cobble for substrate would provide improved conditions for fish passage. At the Feasibility Study (FS) design level, typical dimensions for the concrete footings were assumed. Specific geotechnical conditions for the footings were not assessed.

Table 1 summarizes the fifteen types of culverts with their input criteria and calculated size and barrel number requirements. Culvert Master (Bentley 2024) software was used to calculate the number and size of the culvert barrels, to reduce the maximum headwater increase to 0.3 m for most cases.

Table 1: Culvert Type Summary

Type Number	Material	Number of Barrels	Barrel Diameter or Arch Width / Height	Channel Slope	Riprap D_{50}	100-Year Flow Depth	100-Year Flow Rate
			mm	*%*	*m*	*m/s*	*mm*
1	CSP	2	1,500	0.8%	300	0.39	2.9
2	CSP	3	3,300	3.9%	500	0.45	7.6
3	CSP	2	1,050	0.1%	175	0.55	1.67
4	CSP	2	3,300	0.3%	175	0.84	6
5	CSP	2	2,400	0.1%	175	1.18	7.6
6	CSP	3	2,400	0.1%	175	1.52	15.1
7	CSP	2	2,400	0.0%	175	0.39	8.2
8	CSP	2	3,300	0.1%	300	2.44	26.41
9	Arch Culvert	2	4,460 x 2,940	0.1%	175	2.06	26.21
10	CSP	3	3,300	0.4%	300	1.85	31.5
11	CSP	3	2,400	0.5%	300	1.31	15.1
12	CSP	2	2,400	1.0%	300	0.58	3.81
14	Arch Culvert	2	3,510 x 2,340	0.7%	300	1.53	17.44
15	CSP	3	2,400	0.2%	175	1.04	9.6
16	CSP	2	1,500	0.6%	300	0.53	2

Each culvert crossing is armored with erosion protection against the 100-year velocity 5 m upstream and downstream of the crossing. The size of riprap required is based on the 100-year exit velocity through the culvert. Table 2 summarized the riprap size requirement based on the velocity.

Table 2: D_{50} Riprap Size for the Culverts Upstream and Downstream Ditch Segments as Required Based on 100-year Exit Velocity

Riprap D50 (mm)	Velocity Range (m/s)
175	0 – 2
300	2 – 3
500	3 - 4

1.2 Culvert Locations

Road crossings are required to ensure continuous flow through diversion channels and collector ditches. Based on the current level of design, the locations of culverts and the number and sizes required have been estimated and are subject to modification and changes.

As already indicated, for the proposed ditches and diversion channels, culvert crossings were identified in locations where there is an existing road, a proposed road, or where access to a dump or stockpile is likely to be required. Ditch and channel locations are shown in the Surface Water Management Plan figures in Appendix B.

Additional contingency crossings were added for each year. For years with no new ditch or channel construction four culverts are assumed to be required and for each year where ditch or channel construction occurs two additional culverts are also included. The size of these contingency culverts is based on Type 1 and Type 7 culverts, the most common type of culvert calculated for the ditches and channels. Table 3 below summarizes the culvert design parameters of the culverts for specific ditches, and for the contingency culverts, as well as the expected year of construction.

Table 3: Culvert Crossings

Channel or Ditch ID	Channel Station	Construction Year [(a)]	Type	Actual Slope	Actual 100-Year Flow	Actual 100-year Depth	Actual 100-Year Velocity
				%	m3/s	m	m/s
DC2a	1270	-3	5	0.1%	6.8	1.31	0.87
DC2b	70	-3	6	0.2%	14.5	1.67	1.23
D06a	840	-2	2	3.9%	5.6	0.45	2.95
D06b	1070	-2	15	0.4%	8.2	1.04	1.54
D06b	560	-2	7	0.1%	8.2	1.42	0.92
D06c	600	-2	11	0.5%	15.1	1.31	1.95
D06c	160	-2	6	0.3%	15.1	1.52	1.51
D12	600	-2	3	0.1%	1.1	0.55	0.54
D14a	1520	-2	8	0.1%	26.41	2.44	1.19
D14b	50	-2	3	0.1%	1.67	0.71	0.63
D14b	2120	-2	7	0.1%	7.6	1.45	0.93
D14c	130	-2	10	0.4%	31.5	1.85	1.97
DCB	655	-2	8	0.2%	25.07	2.5	1.31
Year -2-1 [(b)]	n/a	-2	1	n/a	n/a	n/a	n/a
Year -2-2	n/a	-2	7	n/a	n/a	n/a	n/a
D03	330	-1	16	0.6%	2	0.53	1.06
D15	750	-1	12	1.0%	3.81	0.58	1.76
DC1	1780	-1	14	0.7%	17.44	1.53	2.14
DC1	650	-1	9	0.1%	17.44	2.06	1.27
DC1	9300	-1	9	0.1%	26.21	2.61	1.49
DC1	3620	-1	9	0.1%	25.64	2.73	1.13
Year -1-1	n/a	-1	1	n/a	n/a	n/a	n/a
Year -1-2	n/a	-1	7	n/a	n/a	n/a	n/a
D01a	1300	1	5	0.2%	7.6	1.18	1.16
D01a	870	1	2	6.6%	7.6	0.46	3.08

Table 3: Culvert Crossings

Channel or Ditch ID	Channel Station	Construction Year (a)	Type	Actual Slope	Actual 100-Year Flow	Actual 100-year Depth	Actual 100-Year Velocity
				%	m3/s	m	m/s
D01b	90	1	4	0.3%	4.5	0.84	1.18
D01c	80	1	6	0.1%	12.5	1.71	1.02
D04	270	1	1	1.3%	2.9	0.47	1.79
D05	1150	1	7	0.1%	7.4	1.36	0.89
D05	2050	1	7	0.1%	7.4	1.36	0.89
Year 01-1	n/a	1	1	n/a	n/a	n/a	n/a
Year 01-2	n/a	1	7	n/a	n/a	n/a	n/a
D17a	250	2	7	0.0%	7.4	1.36	0.89
D17a	1280	2	7	0.0%	7.4	1.36	0.89
D17b	250	2	7	0.4%	7.4	1.36	0.89
D17b	500	2	7	0.4%	7.4	1.36	0.89
D17c	500	2	7	0.2%	7.4	1.36	0.89
D17c	1000	2	7	0.2%	7.4	1.36	0.89
Year 02-1	n/a	2	1	n/a	n/a	n/a	n/a
Year 02-1	n/a	2	7	n/a	n/a	n/a	n/a
Year 02-2	n/a	2	1	n/a	n/a	n/a	n/a
Year 02-2	n/a	2	7	n/a	n/a	n/a	n/a
Year 02-3	n/a	2	1	n/a	n/a	n/a	n/a
Year 02-4	n/a	2	7	n/a	n/a	n/a	n/a
Year 03-1	n/a	3	1	n/a	n/a	n/a	n/a
Year 03-2	n/a	3	7	n/a	n/a	n/a	n/a
Year 04-1	n/a	4	1	n/a	n/a	n/a	n/a
Year 04-2	n/a	4	7	n/a	n/a	n/a	n/a
Year 04-3	n/a	4	1	n/a	n/a	n/a	n/a
Year 04-4	n/a	4	7	n/a	n/a	n/a	n/a

Table 3: Culvert Crossings

Channel or Ditch ID	Channel Station	Construction Year (a)	Type	Actual Slope	Actual 100-Year Flow	Actual 100-year Depth	Actual 100-Year Velocity
				%	m3/s	m	m/s
D07c	50	5	5	0.1%	5.5	1.19	0.83
D10a	530	5	1	2.5%	1.93	0.39	1.58
D10a	1340	5	15	0.2%	9.6	1.4	1.1
D11	1450	5	15	0.3%	8.7	1.14	1.4
Year 05-1	n/a	5	1	n/a	n/a	n/a	n/a
Year 05-2	n/a	5	7	n/a	n/a	n/a	n/a
Year 05-3	n/a	5	1	n/a	n/a	n/a	n/a
Year 05-4	n/a	5	7	n/a	n/a	n/a	n/a
D02	280	6	1	0.8%	2.02	0.44	1.36
D02	1650	6	7	0.1%	8.2	1.42	0.92
D10b	1040	6	4	0.5%	6	0.85	1.54
Year 06-1	n/a	6	1	n/a	n/a	n/a	n/a
Year 06-2	n/a	6	7	n/a	n/a	n/a	n/a
Year 06-3	n/a	6	1	n/a	n/a	n/a	n/a
Year 06-4	n/a	6	7	n/a	n/a	n/a	n/a
Year 07-1	n/a	7	1	n/a	n/a	n/a	n/a
Year 07-2	n/a	7	7	n/a	n/a	n/a	n/a
Year 07-3	n/a	7	1	n/a	n/a	n/a	n/a
Year 07-4	n/a	7	7	n/a	n/a	n/a	n/a
Year 08-1	n/a	8	1	n/a	n/a	n/a	n/a
Year 08-1	n/a	8	7	n/a	n/a	n/a	n/a
Year 08-2	n/a	8	1	n/a	n/a	n/a	n/a
Year 08-2	n/a	8	7	n/a	n/a	n/a	n/a
Year 08-3	n/a	8	1	n/a	n/a	n/a	n/a
Year 08-4	n/a	8	7	n/a	n/a	n/a	n/a

Table 3: Culvert Crossings

Channel or Ditch ID	Channel Station	Construction Year (a)	Type	Actual Slope	Actual 100-Year Flow	Actual 100-year Depth	Actual 100-Year Velocity
				%	m3/s	m	m/s
Year 09-1	n/a	9	1	n/a	n/a	n/a	n/a
Year 09-2	n/a	9	7	n/a	n/a	n/a	n/a
Year 09-3	n/a	9	1	n/a	n/a	n/a	n/a
Year 09-4	n/a	9	7	n/a	n/a	n/a	n/a
Year 10-1	n/a	10	1	n/a	n/a	n/a	n/a
Year 10-2	n/a	10	7	n/a	n/a	n/a	n/a
Year 10-3	n/a	10	1	n/a	n/a	n/a	n/a
Year 10-4	n/a	10	7	n/a	n/a	n/a	n/a
Year 11-1	n/a	11	1	n/a	n/a	n/a	n/a
Year 11-2	n/a	11	7	n/a	n/a	n/a	n/a
Year 11-3	n/a	11	1	n/a	n/a	n/a	n/a
Year 11-4	n/a	11	7	n/a	n/a	n/a	n/a
Year 12-1	n/a	12	1	n/a	n/a	n/a	n/a
Year 12-2	n/a	12	7	n/a	n/a	n/a	n/a
Year 12-3	n/a	12	1	n/a	n/a	n/a	n/a
Year 12-4	n/a	12	7	n/a	n/a	n/a	n/a
Year 13-1	n/a	13	1	n/a	n/a	n/a	n/a
Year 13-2	n/a	13	7	n/a	n/a	n/a	n/a
Year 13-3	n/a	13	1	n/a	n/a	n/a	n/a
Year 13-4	n/a	13	7	n/a	n/a	n/a	n/a
Year 14-1	n/a	14	1	n/a	n/a	n/a	n/a
Year 14-2	n/a	14	7	n/a	n/a	n/a	n/a
Year 14-3	n/a	14	1	n/a	n/a	n/a	n/a
Year 14-4	n/a	14	7	n/a	n/a	n/a	n/a
Year 15-1	n/a	15	1	n/a	n/a	n/a	n/a

Table 3: Culvert Crossings

Channel or Ditch ID	Channel Station	Construction Year (a)	Type	Actual Slope	Actual 100-Year Flow	Actual 100-year Depth	Actual 100-Year Velocity
				%	m3/s	m	m/s
Year 15-2	n/a	15	7	n/a	n/a	n/a	n/a
Year 15-3	n/a	15	1	n/a	n/a	n/a	n/a
Year 15-4	n/a	15	7	n/a	n/a	n/a	n/a
Year 16-1	n/a	16	1	n/a	n/a	n/a	n/a
Year 16-2	n/a	16	7	n/a	n/a	n/a	n/a
Year 16-3	n/a	16	1	n/a	n/a	n/a	n/a
Year 16-4	n/a	16	7	n/a	n/a	n/a	n/a
Year 17-1	n/a	17	1	n/a	n/a	n/a	n/a
Year 17-2	n/a	17	7	n/a	n/a	n/a	n/a
Year 17-3	n/a	17	1	n/a	n/a	n/a	n/a
Year 17-4	n/a	17	7	n/a	n/a	n/a	n/a
Year 18-1	n/a	18	1	n/a	n/a	n/a	n/a
Year 18-2	n/a	18	7	n/a	n/a	n/a	n/a
Year 18-3	n/a	18	1	n/a	n/a	n/a	n/a
Year 18-4	n/a	18	7	n/a	n/a	n/a	n/a

Notes: n/a = not available.

(a) In addition to the known crossings to the existing or planned roads, WSP added contingency crossings based on the experience that more access roads are required on a mine site than initially planned. For these additional crossings, WSP assumed standard dimensions that will be confirmed during next engineering phases or during operations.

(b) “Year -2-1” = Contingency crossing type 1 for Year -2; naming convention used through-out the table.

2.0 REFERENCES

Bentley Systems Incorporated. 2021. Culvert Master. Version 10.03.00.03.

APPENDIX G

Pumping Systems

CONFIDENTIAL - PRELIMINARY

TECHNICAL MEMORANDUM

DATE April 26, 2024 **Reference No.** 056-2257554004-MTA-RevA

TO Vlad Rojanschi, Project Director
WSP Canada Inc.

C.C

FROM Mike Valkenburg and Pierre Primeau **ADRESSE COURRIEL**
Michael.valkenburg@wsp.com

TROILUS PROJECT FEASIBILITY STUDY – DESIGN OF WATER PUMPING SYSTEMS INCLUDED IN THE SITE-WIDE WATER MANAGEMENT PLAN

1.0 INTRODUCTION

1.1 Background

WSP (WSP Canada Inc.), has been retained by Troilus Gold Corp. (Troilus) to prepare a feasibility-level site-wide water management plan for their Troilus Gold Project (Project) in northwestern Québec. Operations at the currently inactive open-pit gold and copper Troilus Mine Site (Site) stopped in 2009. Troilus is undertaking a feasibility-level assessment to restart mining operations. A part of the feasibility-level study is the preparation of a side-wide water management plan.

1.2 Scope

The water management plan considered the management of natural (non-contact) water and of contact water within the mine's development footprint that may contact waste rock, mine tailings, access roads and/or other site infrastructure.

As part of the water management plan, as the mine expands and multiple open pits come into production, dynamic water systems and facilities will be required to pump water between the changing mine infrastructure. This technical memorandum describes the pumping and pipeline systems required to support site-wide water management as developed at a feasibility-level engineering design.

2.0 STUDY OBJECTIVES

This technical memorandum presents the feasibility design of the pumping and piping systems needed to support the site-wide Water Management Plan (WMP) as part of the contact water management systems for the Troilus Project. The main design components of the pump and piping systems include:

- Sizing pipelines and pumps to handle the range of flows for each of the fourteen proposed pumping and gravity systems.

- Designing the infrastructure associated with the pump and pipeline (e.g., barges and e-houses).
- Developing supporting documents and drawings (e.g., P&IDs, Plan and Profiles, General Arrangements) for the various pumping systems.
- Estimating the capital expenditures by obtaining vendor quotes and developing construction quantities for the proposed water management infrastructure to a +30%/-20% level of accuracy.
- Preparing a feasibility engineering technical document.

Excluded from the objectives of this technical memorandum are the following:

- Engineering of the power supply for the pumping stations.
- Designing the sumps, sedimentation ponds, roadways and pipeline corridors along with the required earthwork.
- Engineering of the barge and electrical house (e-house) for the Tailings Storage Facility (TSF) overflow (carried out by other parties); the engineering for the pump and pipeline to feed the Water Treatment Plant (WTP) was within WSP's scope.
- Design of the in-pit water pumping systems (mining and in-pit tailings disposal phases), of the raw (fresh) water pumping systems, or of the water pumping systems within the ore processing plant.

Some of the excluded elements are included in WSP's scope and are included in separate documents; it is the case for the sump and sedimentation pond design. Other elements are outside of WSP's scope.

3.0 DESIGN CRITERIA

3.1 Overview of Pumping Systems

This section delineates the pipeline routes and design criteria developed for the thirteen pumping systems. A description of the role of each pumping system in the site-wide water management plan is included in the "Troilus Project Operational Site-Wide Water Management Plan" report (Main Report) of which the current document is an appendix. The thirteen pumping systems include the following:

- seven sump pipelines for surface water management;
  - Sump 1 (S01), Sump 2 (S02), Sump 3 (S03), Sump 5 (S05), Sump 6 (S06), Sump 7 (S07) and Sump 9 (S09).
  - These systems pump water collected in contact water sumps towards sedimentation ponds.
- five sedimentation pond pipelines for surface water management;
  - SP1, SP2A, SP2B, SP3 and SP4.
  - These systems pump water from the sedimentation pond towards the environment if the water quality meets the discharge guidelines. As an exception, the SP2B pumps, when required, collected water to the Ore Processing Plant to be used as process water.

- one water transfer system;
  - TSF to WTP for excess TSF pond water that needs treatment prior to discharge to the environment.
- one gravity overflow system;
  - WTP overflow to the environment (the nearby diversion channel).

3.2 Design Considerations

The overarching design philosophy prioritizes cost effectiveness across each system while ensuring heightened pump reliability for the sedimentation-pond pumping systems. Additional fail-safe redundancy for pumps at low points within the SP2B, SP3, and SP4 systems were included with spare pumps. The reader should refer to section 4.0 for the pump type description.

3.3 Pipeline Profile Description

All pipelines will be installed above ground with profiles that allow complete draining when pumping stops. This will mitigate against freezing during cold temperatures. Additional drain points will be installed when the grading of the line cannot satisfy the complete drainage of the pipeline. The drain valves are represented on the gradient lines. The hydraulic gradient design charts are presented in Appendix A.

3.4 Route Description

Route alignments were chosen by selecting paths with the shortest distance and minimum gradient declination for all pipelines while avoiding planned infrastructure and geotechnical features.

The SP2 pipelines (SP2A and SP2B) deviate from this norm, necessitating an initial ascent along the ramp; the SP2 sedimentation pond is constructed inside a small (approximately 75 m deep) pit to the south of Pit 87. This deviation is imperative due to the impracticality of installing a more direct pipe that would necessitate supporting pipes on the pit wall, which would hinder pipeline maintenance and increase operational and maintenance risks.

The pipeline routes are shown in the plan and profiles drawing package PLL-002 located in Appendix B.

3.5 Flow Rates

The design pumping flow rates were obtained based on the analysis of the 100-year flood event. More details on the hydrological analysis are provided in the Main Report. The design flow rates, pond low level and pipeline discharge elevations are presented in the following table. The length of the proposed pipelines is also indicated in Table 1.

Table 1: Pipeline Design Criteria – Flow Rates, Elevations and Length

Pumping System	Starting Elevation (masl)	Ending Elevation (masl)	Flowrate (m^3/h)	Pipeline Length (m)
S01	372	378	900	1615
S02	384	400	1080	290
S03	370	400	1080	585

Pumping System	Starting Elevation (masl)	Ending Elevation (masl)	Flowrate (m^3/h)	Pipeline Length (m)
S05	368	381	720	1140
S06	378	391	720	515
S07	423	427	720	205
S09	383	404	1080	395
SP1	369	376	1440	300
SP2A	300	375	3600	2700
SP2B	300	401	1351	3530
SP3	349	351	3600	10
SP4	351	356	3600	20
TSF to WTP	396	377	1200	3190
WTP Overflow	401	391	TBD	10

The P&IDs and General Arrangements of each dewatering system are presented in drawing packages PPL-001 and PP-003, respectively, in Appendix B.

4.0 DESIGN SUMMARY

All pipelines are designed for year-round operation. All pump barges or water intakes are equipped with agitation to mitigate surface freezing and allow pumps to operate all year.

All pipelines will be profiled to facilitate free draining, maintaining a single high point with no intermittent low points. The exception is the TSF-to-WTP pipeline, which will have low point drains, manually actuated in the winter months post-pump shut down due to constraints preventing the grading of intermittent low points. Pipelines encountering end-of-line slack flow necessitate a gooseneck vent to mitigate against pipe collapse and contribute to smooth pumping operation. The low-point drains and gooseneck vents are shown in the hydraulic gradient line graphs presented in Appendix A.

The submersible pumps located in the sumps operate based on a hydrostatic level control. Each sump pump raft is tethered to remain within the footprint of the pump cell (low point in the sump). This allows each submersible pump to lower the water level of the main sump completely when necessary. Sump 3 (S03) deviates from the other sumps because it utilizes a self-priming pump, with the intake tethered to the pump cell location. A self-priming pump was selected for S03 because of the greater required capacity and unavailability of a submersible pump for these conditions.

Redundant pumping capabilities were intentionally omitted for the submersible pumping systems within the sumps (S1-S9) and the vertical turbine pump for sedimentation pond 1 (SP1) in the design to reduce costs. In the event of sump pump failure, each sump is designed to overflow into the next downstream water infrastructure. A more detailed description of the overall site water management can be found in the Main Report.

Sedimentation pond pumps operate by hydrostatic level control and while total suspended solids (TSS) limits are respected. The pumps are designed to activate with rising pond levels and deactivate when the pond level is low or the TSS exceeds the specified discharge limit. The TSS limit adheres to *Directive 019 pour l'industrie minière* (of the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs of the Province of Quebec, 2012) with a maximum of 30 mg/L and a monthly average limit of 15 mg/L. In cases of pump shutdown due to high TSS, a predefined time delay precedes the automatic restart of the pump sequence, allowing particles time to settle. During commissioning, time values will be adjusted to ensure adequate settling time and prevent resuspension. Discharge into sedimentation ponds strategically occurs on the opposite bank of the sedimentation pond dewatering pumps to allow particles to settle out before environmental discharge.

The sump pump selection, summarized in Table 2, prioritized cost effectiveness, favouring submersible pumps, except for sump pump 3, which employs a self-priming pump due to its flow rate and required head exceeding standard submersible pump parameters. Lo-lift and vertical turbine pumps were chosen for their suitability in sedimentation ponds, offering ease of maintenance and additional pump reliability.

In the SP2A system, an additional backup pump was deemed necessary to minimize downtime. Electrical houses (e-house) are strategically positioned on land, along with the vertical turbine pumps wherever feasible. Given the substantial fluctuation in SP2's pit level, the e-house and pumps are situated on a barge to optimize top-water discharge and prevent solids discharge.

Table 2: Pump System Summary

System	Pump Type	Duty	Standby	Pump location	E-house location	Total flowrate (m^3/h)	Length (m) [TDH* m]	Motor size per pump (hp)
S01	Submersible	1	-	Barge	Shore	900	1615 [29]	200
S02	Submersible	2	-	Barge	Shore	1080	290 [52]	200
S03	Self Priming	1	-	Shore	Shore	1080	585 [69]	350
S05	Submersible	1	-	Barge	Shore	720	1140 [31]	200
S06	Submersible	1	-	Barge	Shore	720	515 [18]	100
S07	Submersible	1	-	Barge	Shore	720	205 [26]	200
S09	Submersible	1	-	Barge	Shore	1080	395 [29]	250
SP1	Vertical Turbine	1	-	Shore	Shore	1440	300 [13]	150

System	Pump Type	Duty	Standby	Pump location	E-house location	Total flowrate (m^3/h)	Length (m) [TDH* m]	Motor size per pump (hp)
SP2A	Vertical Turbine	3	1	Barge	Barge	3600	2700 [113]	700
SP2B	Vertical Turbine	3	2	Barge	Barge	1351	3530 [134]	700
SP3	Lo-Lift	1	1	Shore	Shore	3600	10 [3]	250
SP4	Lo-Lift	1	1	Shore	Shore	3600	20 [8]	250
TSF to WTP	N/A	N/A	N/A	N/A	N/A	1200	3190 [75]	N/A
WTP Overflow	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* TDH : Total Dynamic Head

5.0 COST ESTIMATES

The cost estimate has a precision of -20% to +30%. The basis of cost estimate can be found in Appendix C.

The estimation of the maintenance hours assumes pipeline access will be maintained throughout the year, including snow removal during the winter months. Sump 1 (S01) requires relocation in year 6 (sump 1b, S01B), with the same pumping requirements, allowing for re-use of the equipment. The TSF to WTP pipeline undergoing a realignment in year 20 was designed to re-use the same equipment.

Relocation of equipment or piping during the project is not included in this estimate and will be covered as part of the overall site operational costs in other parts of the Troilus feasibility study.

The operational expenditures are mostly given in dollars and direct man-hours. The assumption was made that personnel would be shared with other infrastructure or disciplines. The capital and operating cost are presented in Appendix C.

The capital costs, EPCM costs, spare parts, electricity consumption and maintenance man-hours are broken down by project year and are found in Table 3 and Table 4.

Table 3: Summary of Expenditures by Year

Total Capex by Annum[1]			Opex by Annum[1,2]		
Year	**Capital Cost ($CAD)**	**EPCM ($CAD)[3]**	**Spares**	**Kwh**	**Man-Hours[4]**
-3	$1,444,000	$74,000	$-	$-	0
-2	$13,415,000	$609,000	$204,000	$3,618,000	657
-1	$4,648,000	$234,000	$252,000	$3,947,000	800
1	$13,813,000	$618,000	$460,000	$5,062,000	1182
2	$1,830,000	$207,000	$495,000	$5,062,000	1344
3	$-	$-	$495,000	$5,062,000	1344
4	$1,350,000	$73,000	$495,000	$5,062,000	1344
5	$-	$-	$506,000	$5,590,000	1411
6	$-	$-	$506,000	$5,590,000	1411
7	$-	$-	$506,000	$5,590,000	1411
8	$697,000	$20,000	$515,000	$5,768,000	1431
9	$-	$-	$515,000	$5,768,000	1431
10	$-	$-	$515,000	$5,768,000	1431

1. Currency Specification: All financial figures presented herein are denominated in 2024 dollars, ensuring alignment with the current fiscal context.

2. Operational Expenditure Scope for TSF to Water Treatment Plant and Water Treatment Plant Overflow Systems: Within the evaluation of operational costs, it is pertinent to note that, for the TSF and Overflow systems, only operational expenditures related to piping have been considered. It is essential to underscore that pump-related expenses are expressly excluded from the scope of this assessment.

3. EPCM – Engineering Procurement and Construction Management (remote design clarification and support)

4. Man-Hours Clarification: The recorded man-hours explicitly represent direct working hours and do not encompass mobility hours.

Table 4: Summary of Expenditures by System

System	Year of Construction	First Year of Operation	OPEX – Spares (CAD)	OPEX (Hours per year)	OPEX (kWh)	CAPEX (CAD)	EPCM (CAD)
S01	1	1	$22,000	90	$142,000	$1,358,000	$95,000
S02	-1	-1	$19,000	39	$129,000	$1,214,000	$36,000
S03	-1	-1	$12,000	44	$143,000	$855,000	$54,000
S05	-1	-1	$17,000	60	$57,000	$1,143,000	$70,000
S06	-2	-2	$10,000	37	$101,000	$764,000	$39,000
S07	8	8	$9,000	20	$177,000	$697,000	$20,000
S09	-2	-2	$12,000	30	$190,000	$838,000	$33,000
SP1	-1	1	$11,000	105	$859,000	$1,436,000	$74,000
SP2A	-2	-2	$169,000	555	$3,055,000	$11,813,000	$538,000
SP2B	1	1	$176,000	187	$114,000	$12,456,000	$523,000
SP3	4	5	$11,000	67	$529,000	$1,350,000	$73,000
SP4	-3	-2	$13,000	35	$271,000	$1,444,000	$74,000
TSF to WTP	2	2	$31,000	161	$-	$1,664,000	$189,000
WTP Overflow	2	2	$3,000	1	$-	$166,000	$19,000
All Systems	N/A	N/A	$515,000	1,431	$5,768,000	$37,197,000	$1,836,000

6.0 CONCLUSIONS

Water management infrastructure is a critical part of a mine project's construction, operation, and closure. The design of pumping and pipeline systems to support the site-wide water management plan was completed in view of restarting mining operations on the Troilus Site.

The proposed operational water management plan infrastructure includes the following:

- seven sump pipelines with submersible pumps (except S03);
  - Sump 1 (S01), Sump 2 (S02), Sump 3 (S03), Sump 5 (S05), Sump 6 (S06), Sump 7 (S07) and Sump 9 (S09);

- five sedimentation pond pipelines with a vertical turbine or low-lift pumps installed on floating barges or shore-mounted pumping wells;
  - SP1, SP2A, SP2B, SP3 and SP4
- TSF to the WTP: the pump and barge are not part of this scope, only the pipeline is included.
- WTP overflow: not part of this scope, only the pipeline is included.

The construction of the pumping systems is planned to be staggered over the life of the project to defer costs. The construction staging was based on the available mine development schedule.

A cost estimate was developed for the site-wide Water Management Plan (WMP) pumping infrastructure.

7.0 RECOMMENDATIONS

WSP provides the following recommendations for the next engineering phase:

- Infrastructure integration: for the final design, special attention should be given to incorporate vehicle crossings and finalize drain locations. Furthermore, the site-wide instrumentation should be seamlessly integrated into the overall site Human-Machine Interface (HMI) for comprehensive system integration.
- System optimization: exploration of opportunities to optimize pumping capabilities is encouraged. This could involve minimizing the number of pumped sumps required by implementing a partly buried pipeline, allowing gravity flow to other collection ponds. A trade-off would need to be undertaken to consider all aspects of such modification, like excavation costs and accessibility of these systems over the life of mine. Review of SP2 pumping barge: SP2 is the highest cost pumping system. The system redundancy should be further evaluated in the objective of reducing costs. A trade-off could be completed to evaluate the system's acceptable redundancy and cost savings.

8.0 CLOSING

The reader is referred to the Study Limitations section, which precedes the text and forms an integral part of this report.

We trust the above meets your present requirements. If you have any questions or comments, please contact the undersigned.

9.0 SIGNATORIES

Wsp Canada inc.

PRELIMINARY

Mike Valkenburg, P.Eng. (ON)
Mechanical Engineer

PRELIMINARY

Pierre Primeau, P.Eng.
Senior Process Engineer

MV/PP/VR/js/cd

Attachments: Appendix A – Calculations

Appendix B – Drawings

Appendix C – Expenditures

Appendix D – Technical Documents

LIMITATIONS

WSP Canada Inc. (WSP) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

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APPENDIX A

Calculations

	Outlet Location:	SP01	TSF	TSF	D10a	D06a	TSF	D14B	Channel	Channel	Channel	Mill	Mill	D18	D16	D16
	Starting Location / Pipe ID:	Sump 1	Sump 2	Sump 3	Sump 5	Sump 6	Sump 7	Sump 9	SP1	SP2E_A	SP2E_B	SP2P_A	SP2P_B	SP3	SP4	TSF
Pipe Data	Pipe Material:	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE	HDPE
	Pipe Quality:	4710	4710	4710	4710	4710	4710	4710	4710	4710	4710	4710	4710	4710	4710	4710
	Pipe DR/SCHEDULE:	17	17	17	17	17	11	17	17	11	17	9	17	17	17	13.5
	Nominal Pipe Size (in):	16	20	20	16	16	10	16	18	32	28	24	24	28	28	16
	MAOP (psi):	126	126	126	126	126	202	126	126	202	126	252	126	126	126	161
	Roughness (m):	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05	4.57E-05
	Pipe Outer Diameter (in):	16.00	20.00	20.00	16.00	16.00	10.75	16.00	18.00	32.00	28.00	24.00	24.00	28.00	28.00	16.00
	^(m):	0.630	0.787	0.787	0.630	0.630	0.423	0.630	0.709	1.260	1.102	0.945	0.945	1.102	1.102	0.630
	Average Pipe Wall Thickness (in):	0.998	1.247	1.247	0.998	0.998	1.036	0.998	1.122	3.084	1.746	2.827	1.496	1.746	1.746	1.256
	^(m):	0.0393	0.0491	0.0491	0.0393	0.0393	0.0408	0.0393	0.0442	0.1214	0.0687	0.1113	0.0589	0.0687	0.0687	0.0495
	Liner Wall Thickness (in):	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pipe Inner Diameter (in):	14.00	17.51	17.51	14.00	14.00	8.68	14.00	15.76	25.83	24.51	18.35	21.01	24.51	24.51	13.49
	^(m):	0.355720	0.444649	0.444649	0.355720	0.355720	0.220426	0.355720	0.400184	0.656151	0.622509	0.466005	0.533579	0.622509	0.622509	0.342580
MD1	Flowrate (m3/hr):	900	1080	1080	720	720	720	1080	1440	3600	3600	1703	1703	3600	3600	1200
	Liquid Density (kg):	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
MD2	Viscosity (Pa.s):	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03
	Reynolds:	899,944	863,946	863,946	719,955	719,955	1,161,852	1,079,933	1,279,921	1,951,548	2,057,015	1,299,884	1,135,263	2,057,015	2,057,015	1,245,948
SF	SF Headloss:	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
V	Operating Velocity (m/s):	2.52	1.93	1.93	2.01	2.01	5.24	3.02	3.18	2.96	3.29	2.77	2.12	3.29	3.29	3.62
Headloss	Colebrook (m/km):	14.0	6.5	6.5	9.1	9.1	102.5	19.8	19.0	9.2	12.0	12.2	6.2	12.0	12.0	29.4
	Morrison (m/km):	12.0	5.7	5.7	8.0	8.0	80.6	16.8	16.1	7.9	10.2	10.5	5.4	10.2	10.2	24.4
	Niazkar (m/km):	13.9	6.4	6.4	9.1	9.1	102.3	19.8	19.0	9.2	11.9	12.2	6.2	11.9	11.9	29.3
	Hazen Williams (m/km):	15.8	7.5	7.5	10.4	10.4	107.2	22.1	21.2	10.4	13.5	13.8	7.1	13.5	13.5	32.3
HGL	Headloss select:	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook	Colebrook
	HGL Headloss (m/km):	14.0	6.5	6.5	9.1	9.1	102.5	19.8	19.0	9.2	12.0	12.2	6.2	12.0	12.0	29.4

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: Sump 1
Description:

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	900	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	0	m
TDH	29.1	m
	293	kpa
	42	psi
	3	bar
Power	127.0	kw
	170.1	hp

Pump Data

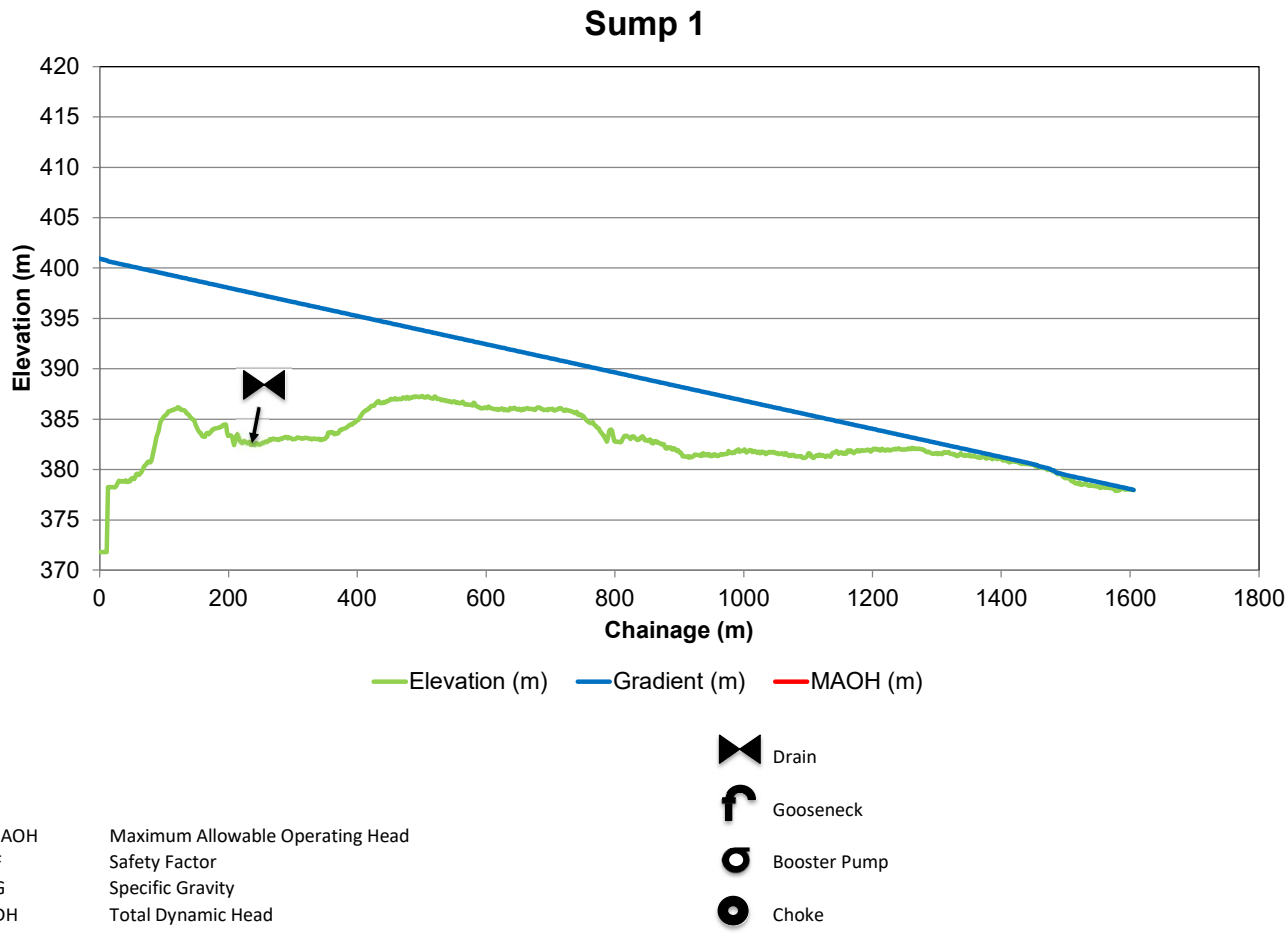
Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1

Pipe loss model: Colebrook with 10%SF

Power per pump	127.0	kw
	170.1	hp
Power per pump w/ SF	146.0	kw
	195.6	hp
Pump selection	200	hp



MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: Sump 2
Description:

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	1080	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	0	m
TDH	51.6	m
	518	kpa
	75	psi
	5	bar
Power	269.9	kw
	361.7	hp

Pump Data

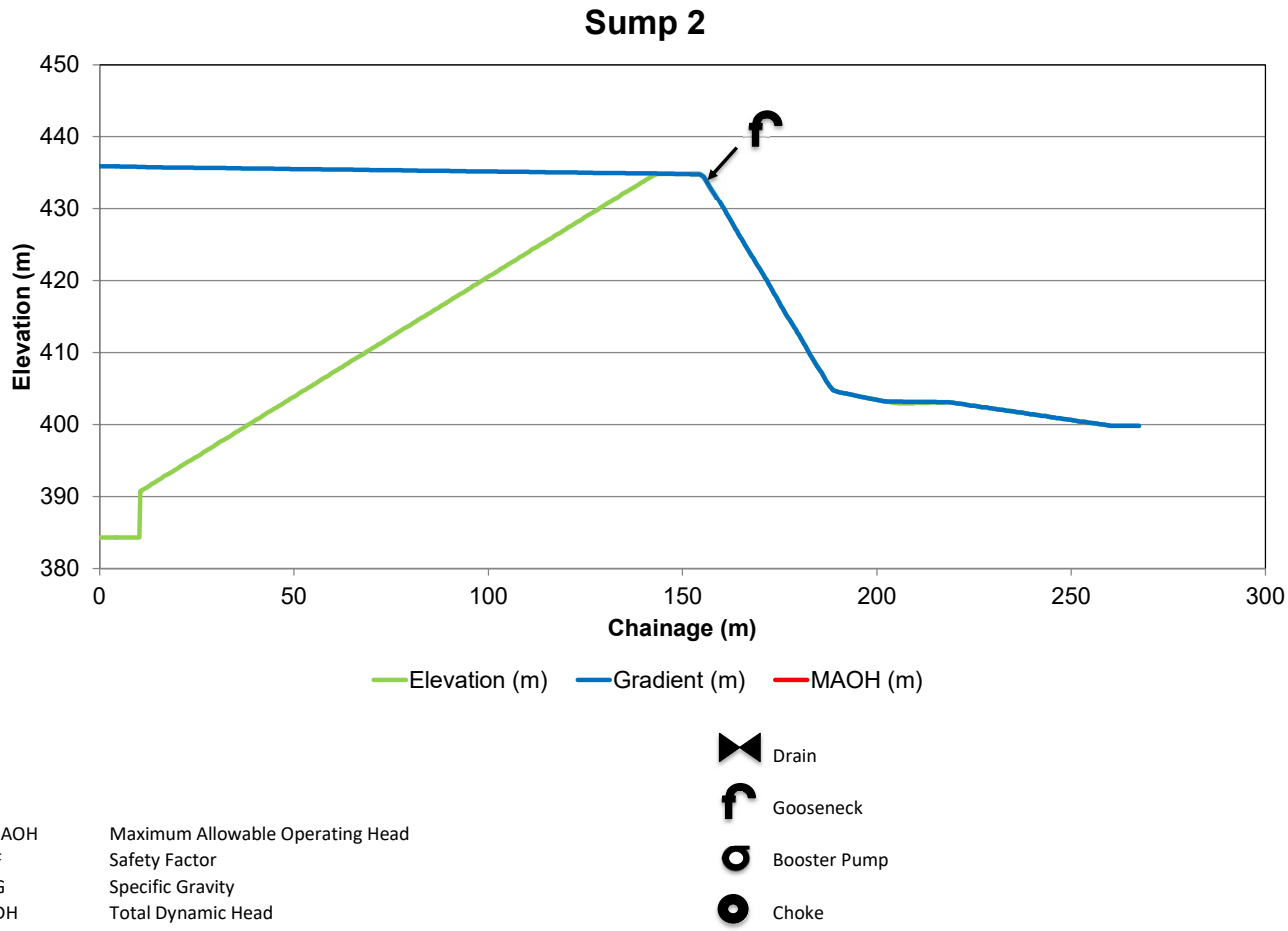
Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

Pump Configuration

Number of stages	1
Parallel lines	2
Total pumps	2

Pipe loss model: Colebrook with 10%SF

Flow per pump	540	m3/h
Power per pump	135.0	kw
	180.9	hp
Power per pump w/ SF	155.2	kw
	208.0	hp
Pump selection	200	hp



MAOH Maximum Allowable Operating Head
SF Safety Factor
SG Specific Gravity
TDH Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: Sump 3
Description:

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	1080	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	0	m
TDH	68.4	m
	688	kpa
	100	psi
	7	bar
Power	358.0	kw
	479.7	hp

Pump Data

Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

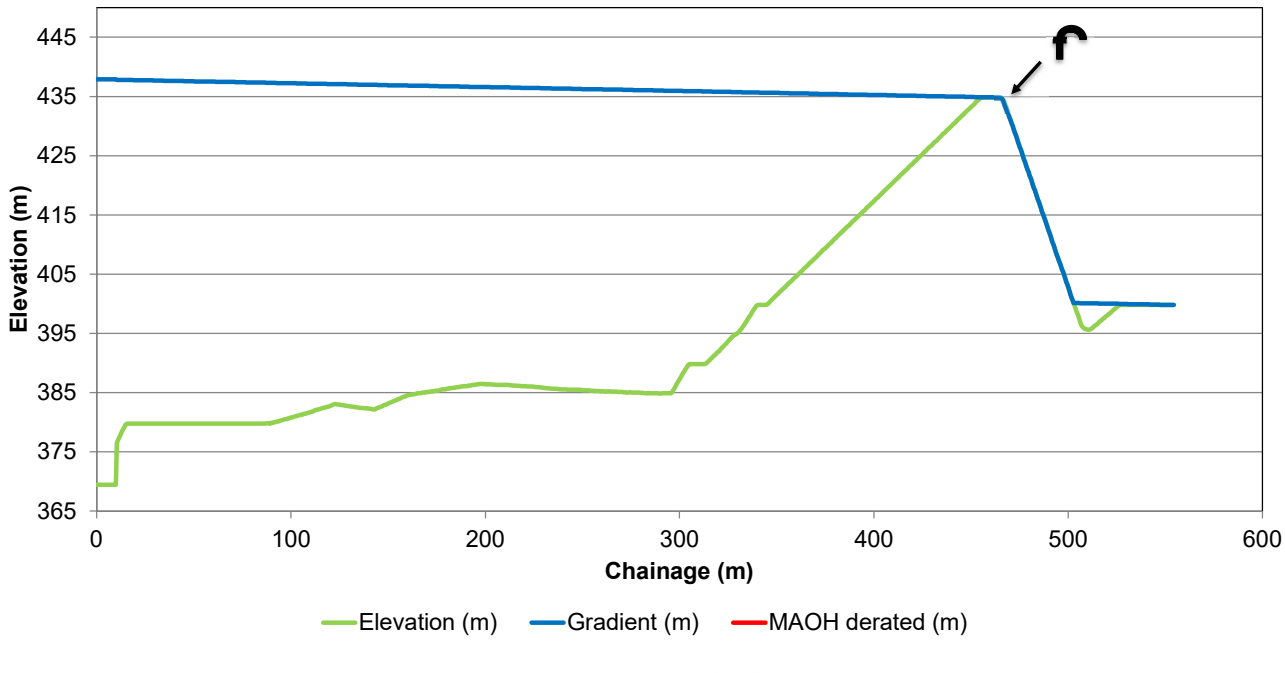
Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1

Pipe loss model: Colebrook with 10%SF

Power per pump	358.0	kw
	479.7	hp
Power per pump w/ SF	411.7	kw
	551.7	hp
Pump selection	600	hp

Sump 3



Drain
Gooseneck
Booster Pump
Choke

MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: Sump 5
Description:

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	720	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	0	m
TDH	31.0	m
	311	kpa
	45	psi
	3	bar
Power	108.0	kw
	144.7	hp

Pump Data

Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

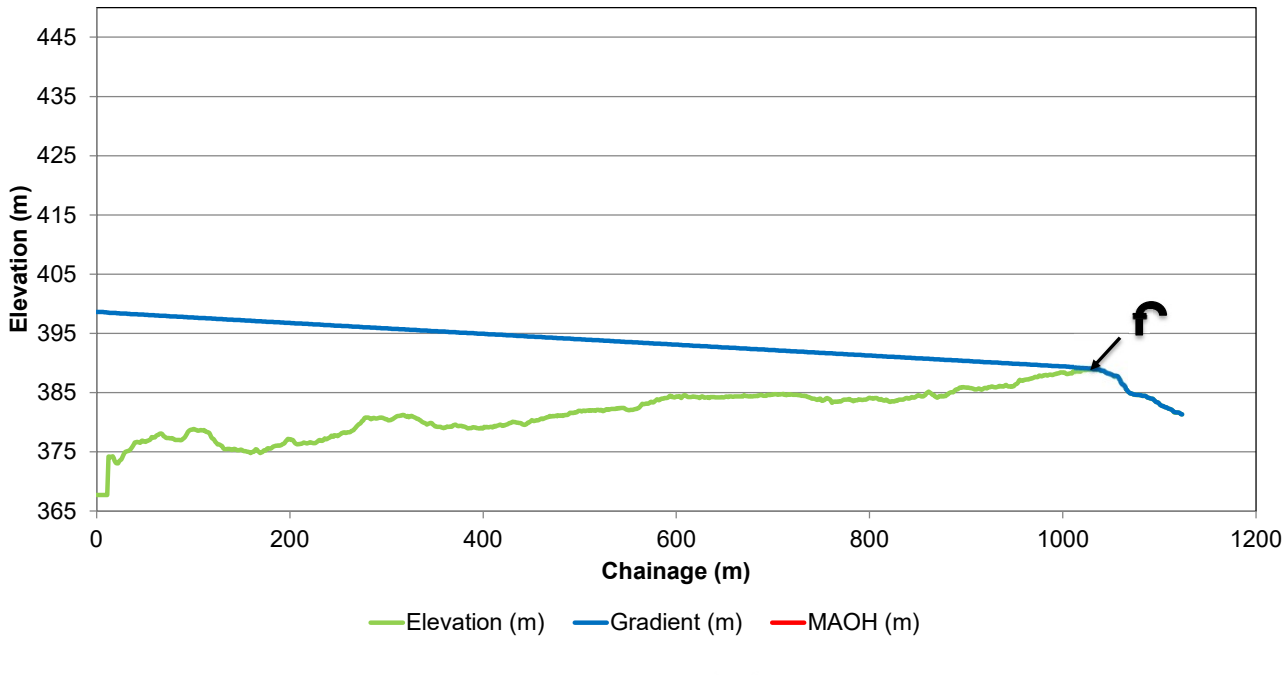
Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1

Pipe loss model: Colebrook with 10%SF

Power per pump	108.0	kw
	144.7	hp
Power per pump w/ SF	124.2	kw
	166.4	hp
Pump selection	200	hp

Sump 5



MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: Sump 6
Description:

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	720	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	0	m
TDH	17.5	m
	176	kpa
	26	psi
	2	bar
Power	61.2	kw
	82.0	hp

Pump Data

Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

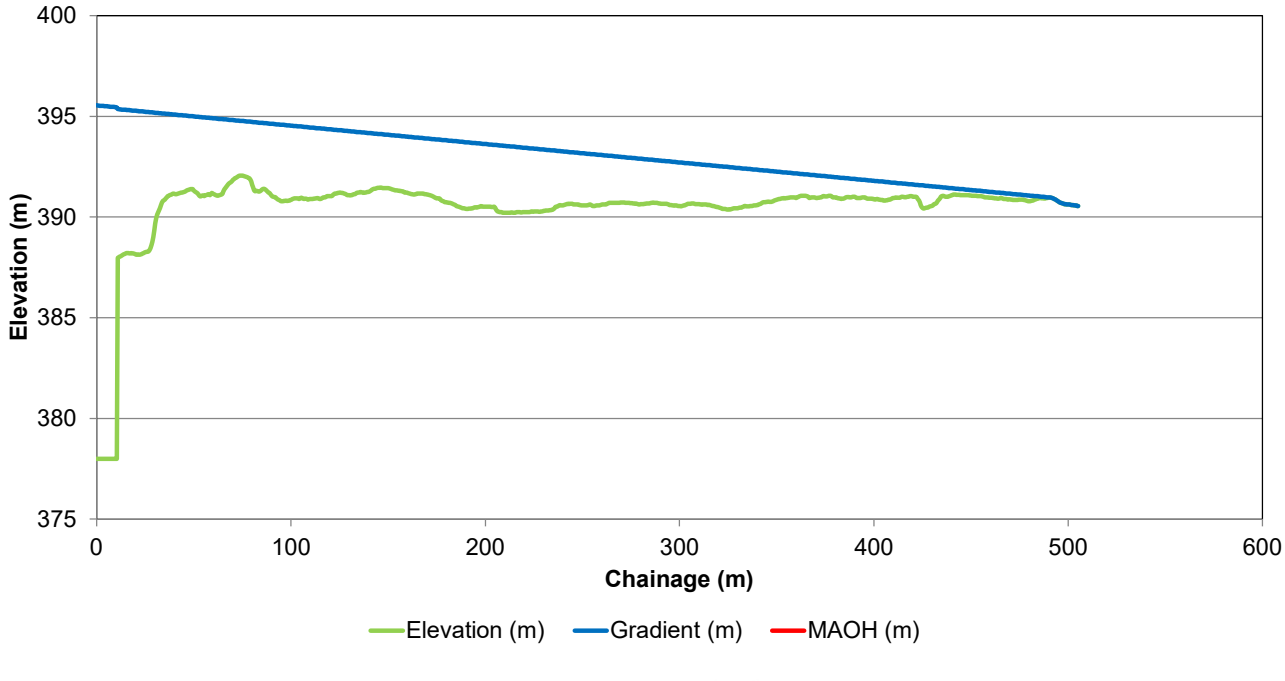
Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1

Pipe loss model: Colebrook with 10%SF

Power per pump	61.2	kw
	82.0	hp
Power per pump w/ SF	70.4	kw
	94.3	hp
Pump selection	100	hp

Sump 6



Drain
Gooseneck
Booster Pump
Choke

MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: Sump 7
Description:

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	720	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	0	m
TDH	25.5	m
	256	kpa
	37	psi
	3	bar
Power	89.0	kw
	119.3	hp

Pump Data

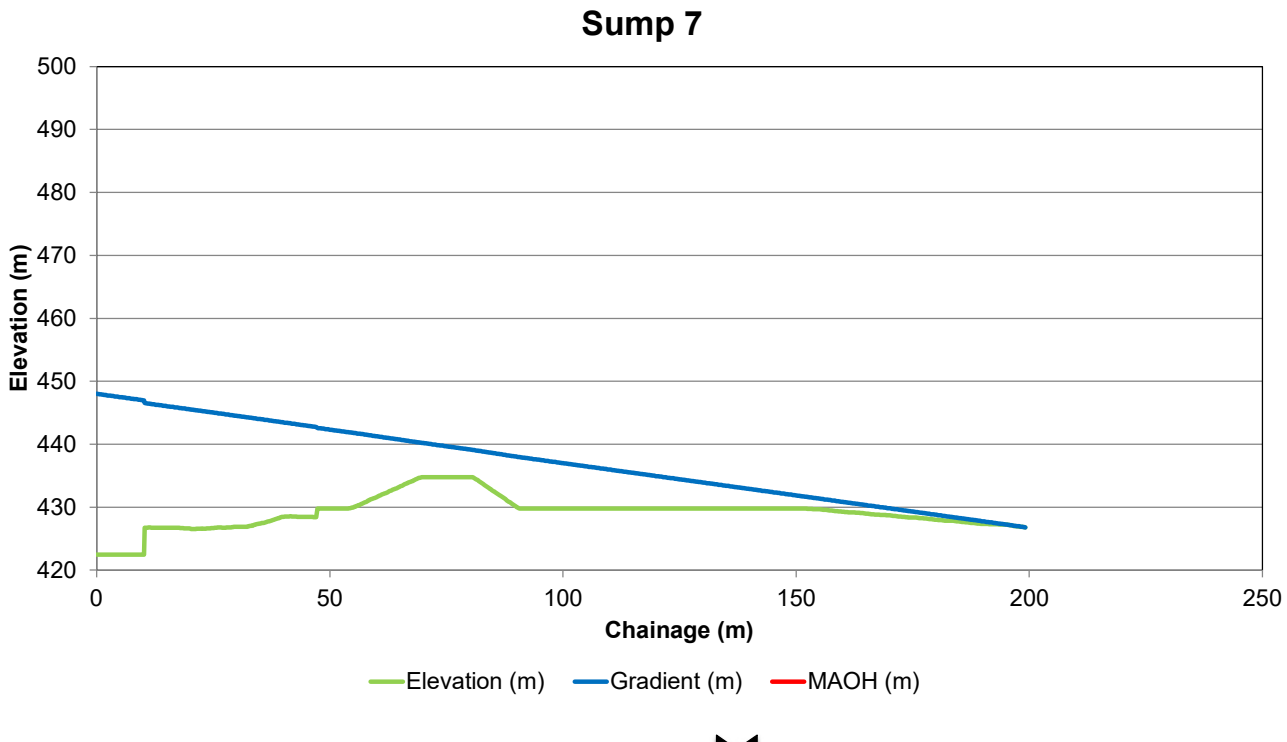
Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1

Pipe loss model: Colebrook with 10%SF

Power per pump	89.0	kw
	119.3	hp
Power per pump w/ SF	102.3	kw
	137.1	hp
Pump selection	150	hp



Drain
Gooseneck
Booster Pump
Choke

MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2024-01-05
Revision: **B**

Figure: Sump 9
Description:

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	1080	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	0	m
TDH	28.9	m
	290	kpa
	42	psi
	3	bar
Power	151.0	kw
	202.4	hp

Pump Data

Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

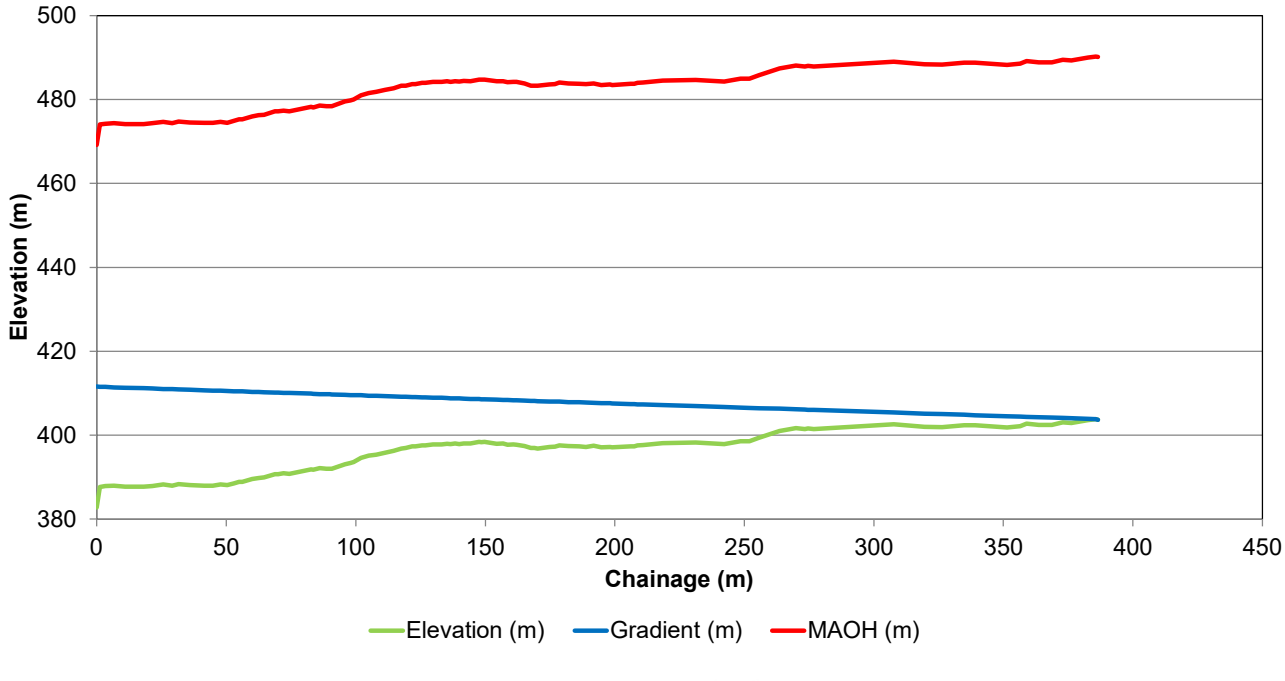
Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1

Pipe loss model: Colebrook with 10%SF

Power per pump	151.0	kw
	202.4	hp
Power per pump w/ SF	173.7	kw
	232.8	hp
Pump selection	250	hp

Sump 9



Drain
Gooseneck
Booster Pump
Choke

MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: SP1
Description:

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	1440	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	0	m
TDH	13.1	m
	132	kpa
	19	psi
	1	bar
Power	91.4	kw
	122.5	hp

Pump Data

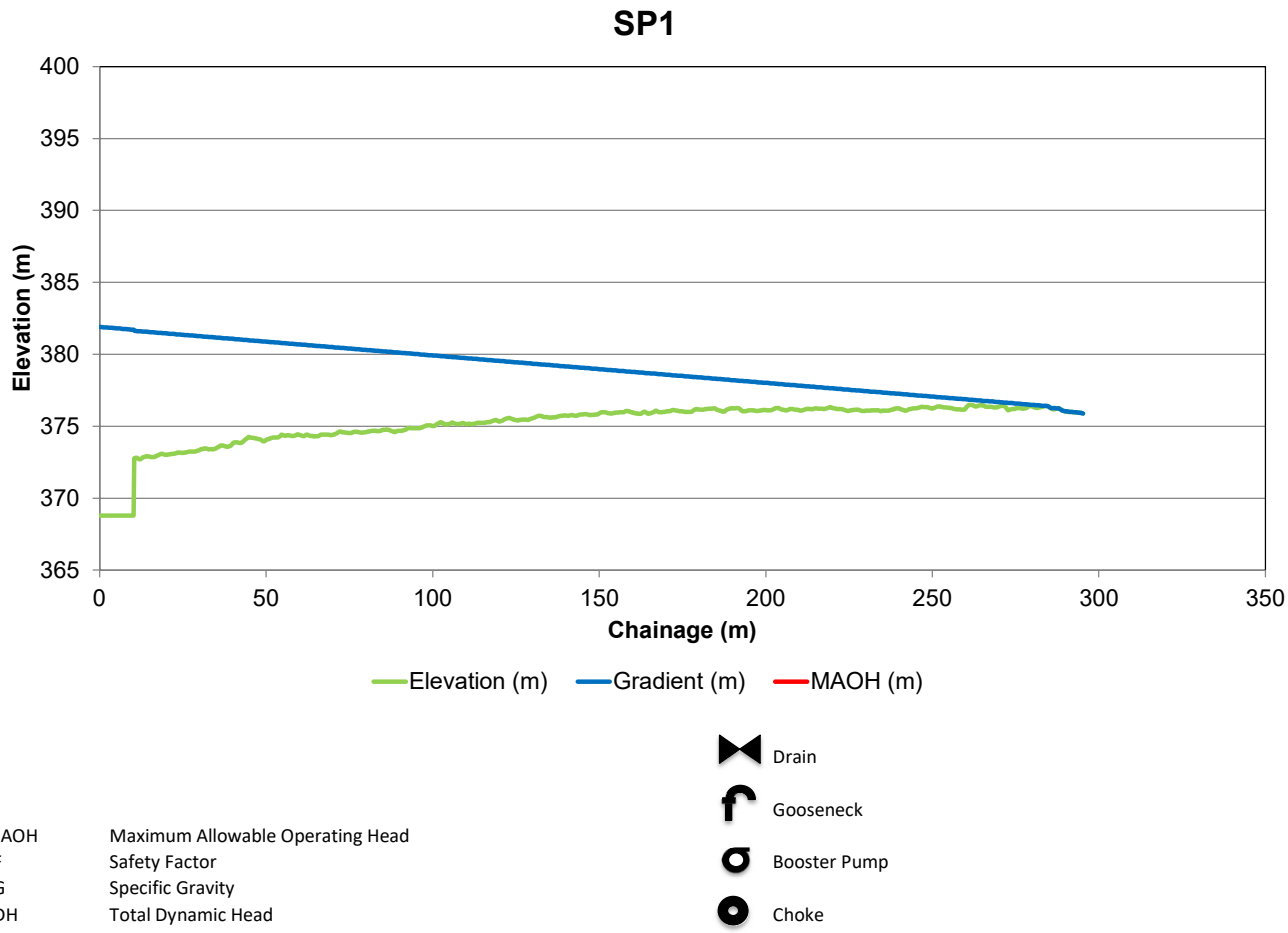
Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1

Pipe loss model: Colebrook with 10%SF

Power per pump	91.4	kw
	122.5	hp
Power per pump w/ SF	105.1	kw
	140.9	hp
Pump selection	150	hp



MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: SP2E_A
Description:

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	3600	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	0	m
TDH	113.0	m
	1136	kpa
	165	psi
	11	bar
Power	1689.8	kw
	2264.3	hp

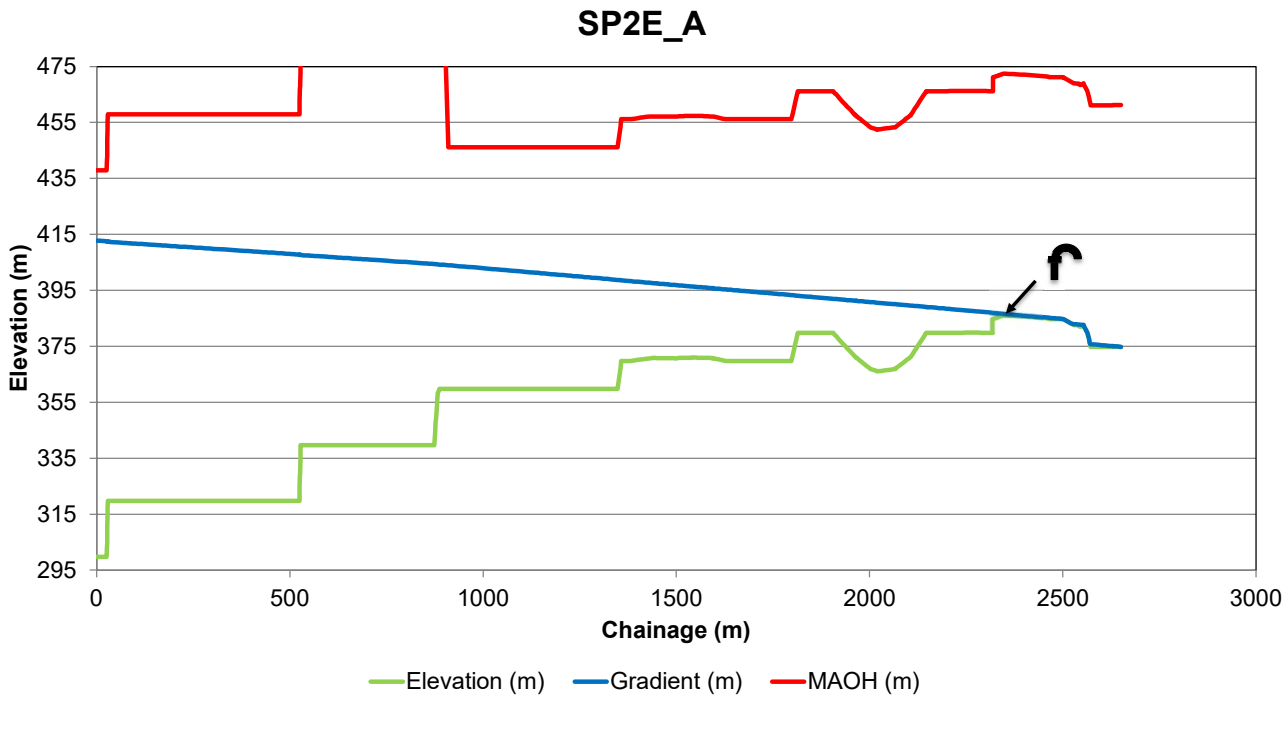
Pump Data

Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.7
Power Safety Factor	0.15

Pump Configuration

Number of stages	1	
Parallel lines	3	
Total pumps	3	
Flowrate per pump	1200	
Power per pump	563.3	kw
	754.8	hp
Power per pump w/ SF	647.7	kw
	868.0	hp
Pump selection	900	hp

Pipe loss model: Colebrook with 10%SF



Drain
Gooseneck
Booster Pump
Choke

MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: SP2P_A
Description: Alternative supply for process water tank at the Mill

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	1351	m3/h
Liquid SG	1	

Pipe loss model: Colebrook with 10%SF

Head and Power

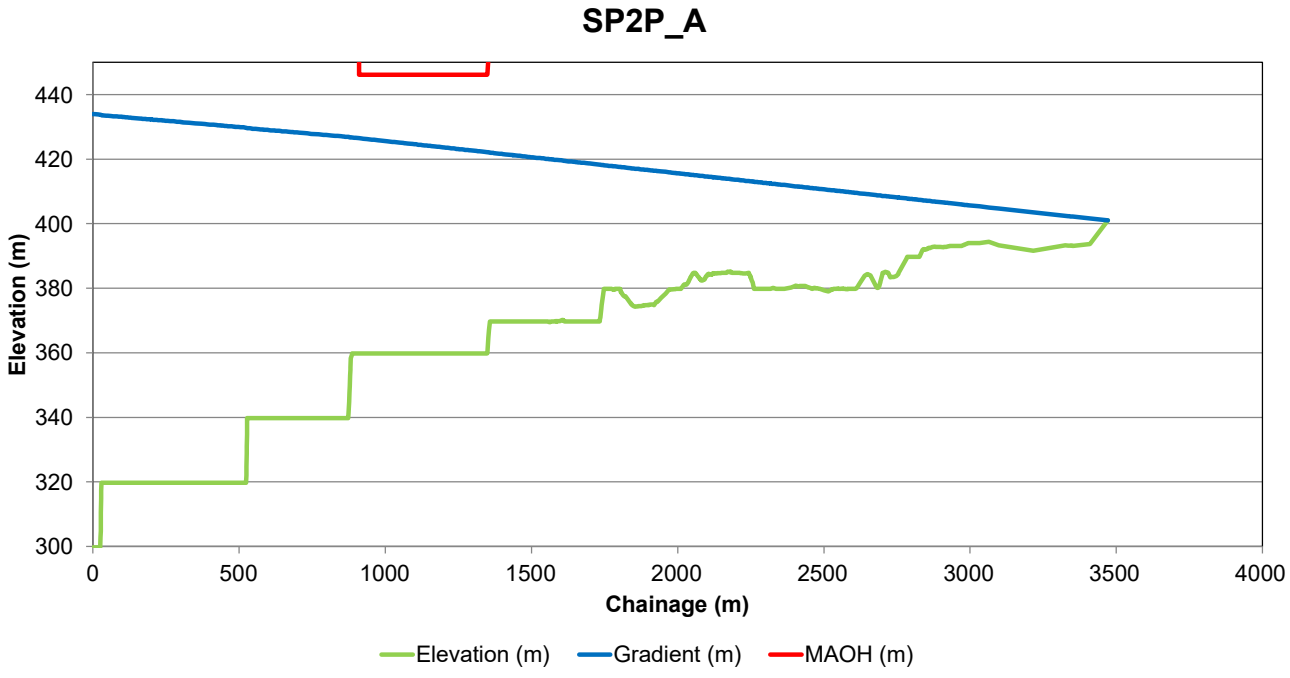
Static clearence	10	m
Fitting Loss	0	m
TDH	134.2	m
	1349	kpa
	196	psi
	13	bar
Power	878.6	kw
	1177.4	hp

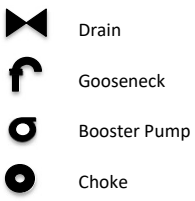
Pump Data

Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

Pump Configuration

Number of stages	1	
Parallel lines	2	
Total pumps	2	
Flowrate per pump	675.5	
Power per pump	439.3	kw
	588.7	hp
Power per pump w/ SF	505.2	kw
	677.0	hp
Pump selection	700	hp





MAOH Maximum Allowable Operating Head
SF Safety Factor
SG Specific Gravity
TDH Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: SP3
Description: SP3 extends 10 meters over 1.5 meters of elevation to discharge into channel 18

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	3600 m3/h
Liquid SG	1

Head and Power

Static clearence	10	m
Fitting Loss	1.530141	m
TDH	3.2	m
	32	kpa
	5	psi
	0	bar
Power	55.0	kw
	73.7	hp

Pump Data

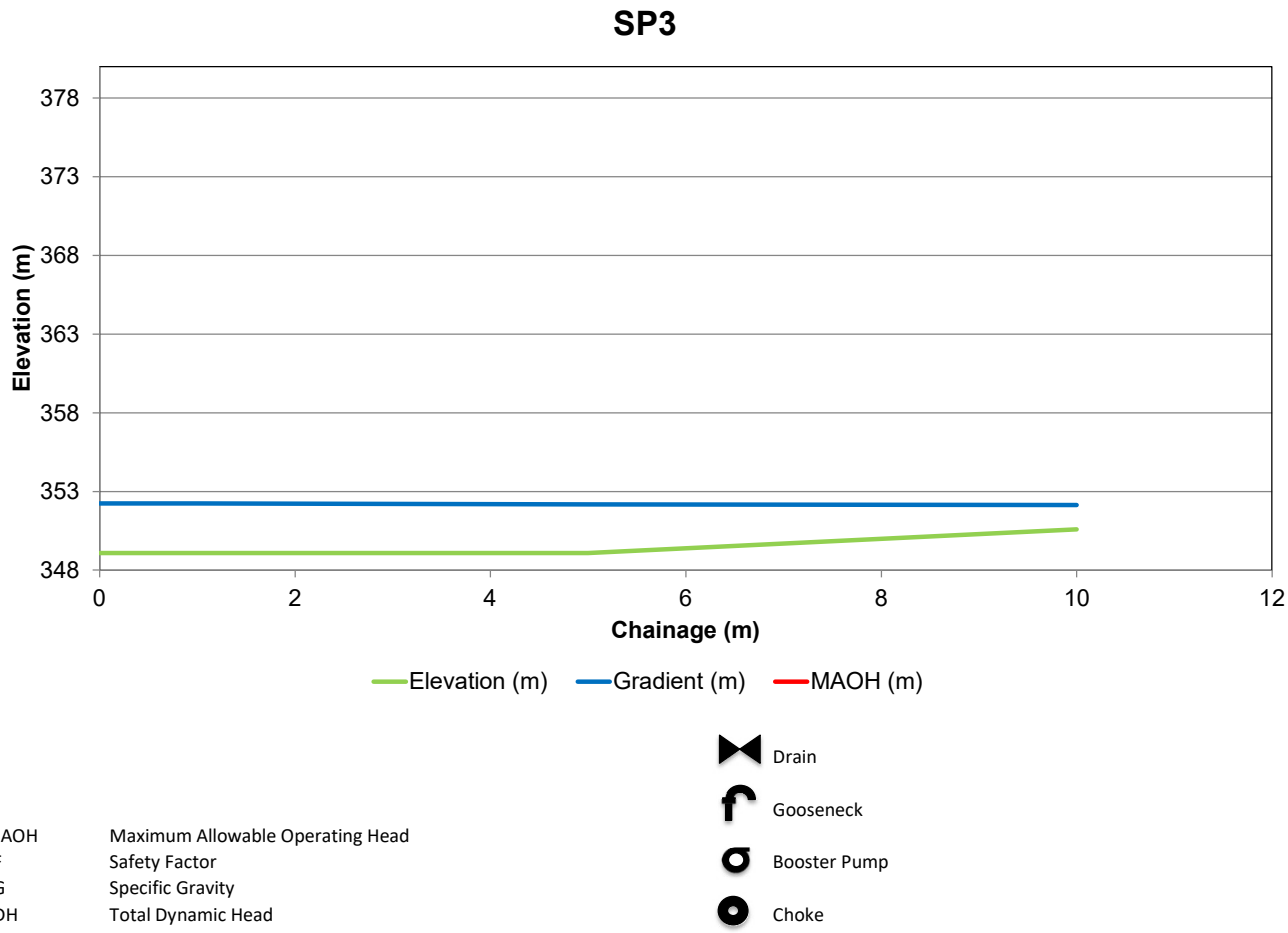
Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1

Pipe loss model: Colebrook with 10%SF

Power per pump	55.0	kw
	73.7	hp
Power per pump w/ SF	63.2	kw
	84.7	hp
Pump selection	100	hp



MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2023-09-06
Revision: **B**

Figure: SP4
Description: SP4 extends 20 meters over 1.5 meters of elevation to discharge into channel 16

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	3600	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	1.530141	m
TDH	7.4	m
	74	kpa
	11	psi
	1	bar
Power	128.5	kw
	172.3	hp

Pump Data

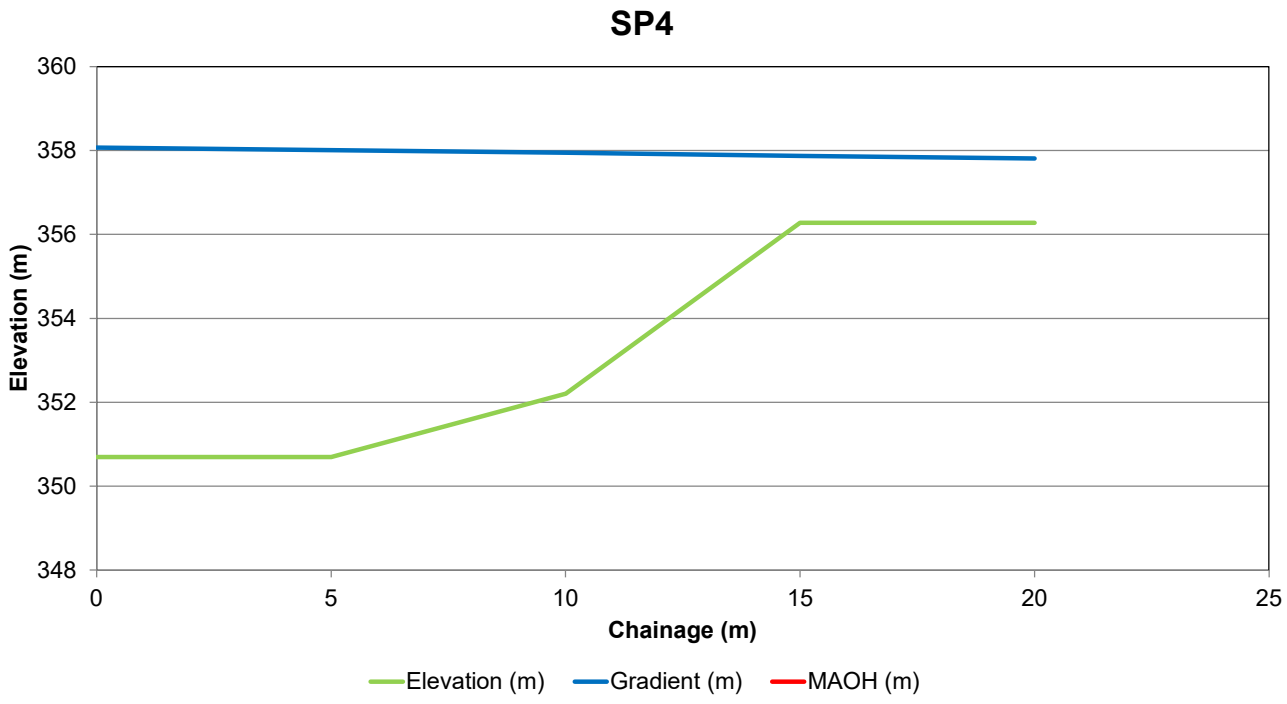
Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1

Pipe loss model: Colebrook with 10%SF

Power per pump	128.5	kw
	172.3	hp
Power per pump w/ SF	147.8	kw
	198.1	hp
Pump selection	200	hp



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MAOH Maximum Allowable Operating Head
SF Safety Factor
SG Specific Gravity
TDH Total Dynamic Head

Drain
Gooseneck
Booster Pump
Choke

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2024-01-16
Revision: **A**

Auther: M Valkenburg
Figure: TSF
Reviewer: O Abtahi
Description: The TSF dewatering pump shall convey TSF topwater back to the water treatment plant.
Approver: A Fontaine

Fluid Properties

Flow rate	1200 m3/h
Liquid SG	1
Pipe loss model	Colebrook with 10%SF

Head and Power

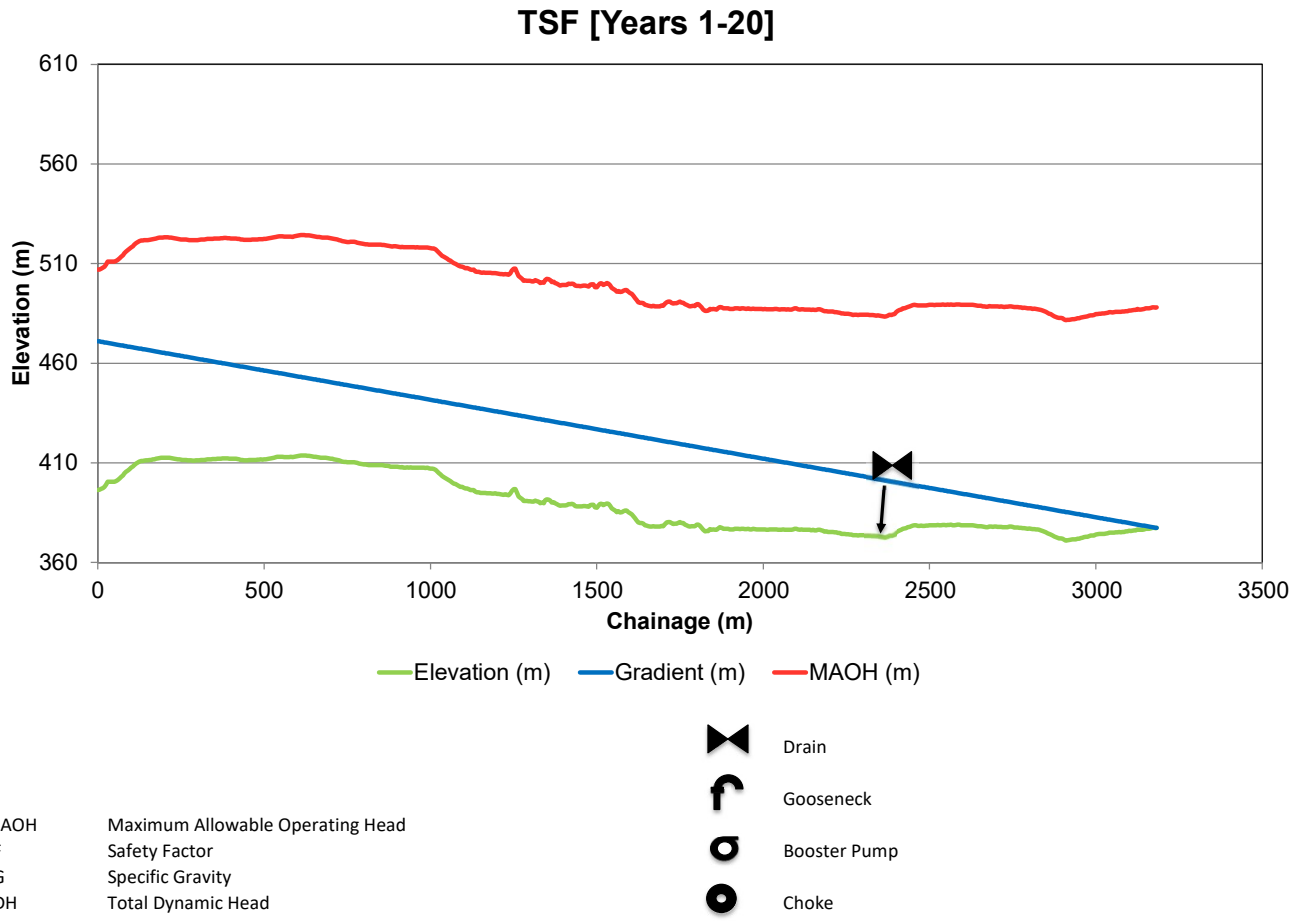
Static clearence	10	m
Fitting Loss	0	m
TDH	74.6	m
	750	kpa
	109	psi
	8	bar
Power	434.0	kw
	581.5	hp

Pump Data

Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1
Power per pump	434.0 kw
	581.5 hp
Power per pump w/ SF	499.1 kw
	668.7 hp
Pump selection	700 hp



MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

Pipeline Hydraulic Analysis

Project: 2257554004 Feasibility Study
Troilus - Site-Wide Water Management Plan

Date: 2024-01-16
Revision: **A**

Figure: TSF
Description: The TSF dewatering pump shall convey TSF topwater back to the water treatment plant.

Auther: M Valkenburg
Reviewer: O Abtahi
Approver: A Fontaine

Fluid Properties

Flow rate	1200	m3/h
Liquid SG	1	

Head and Power

Static clearence	10	m
Fitting Loss	0	m
TDH	60.0	m
	603	kpa
	88	psi
	6	bar
Power	348.9	kw
	467.5	hp

Pump Data

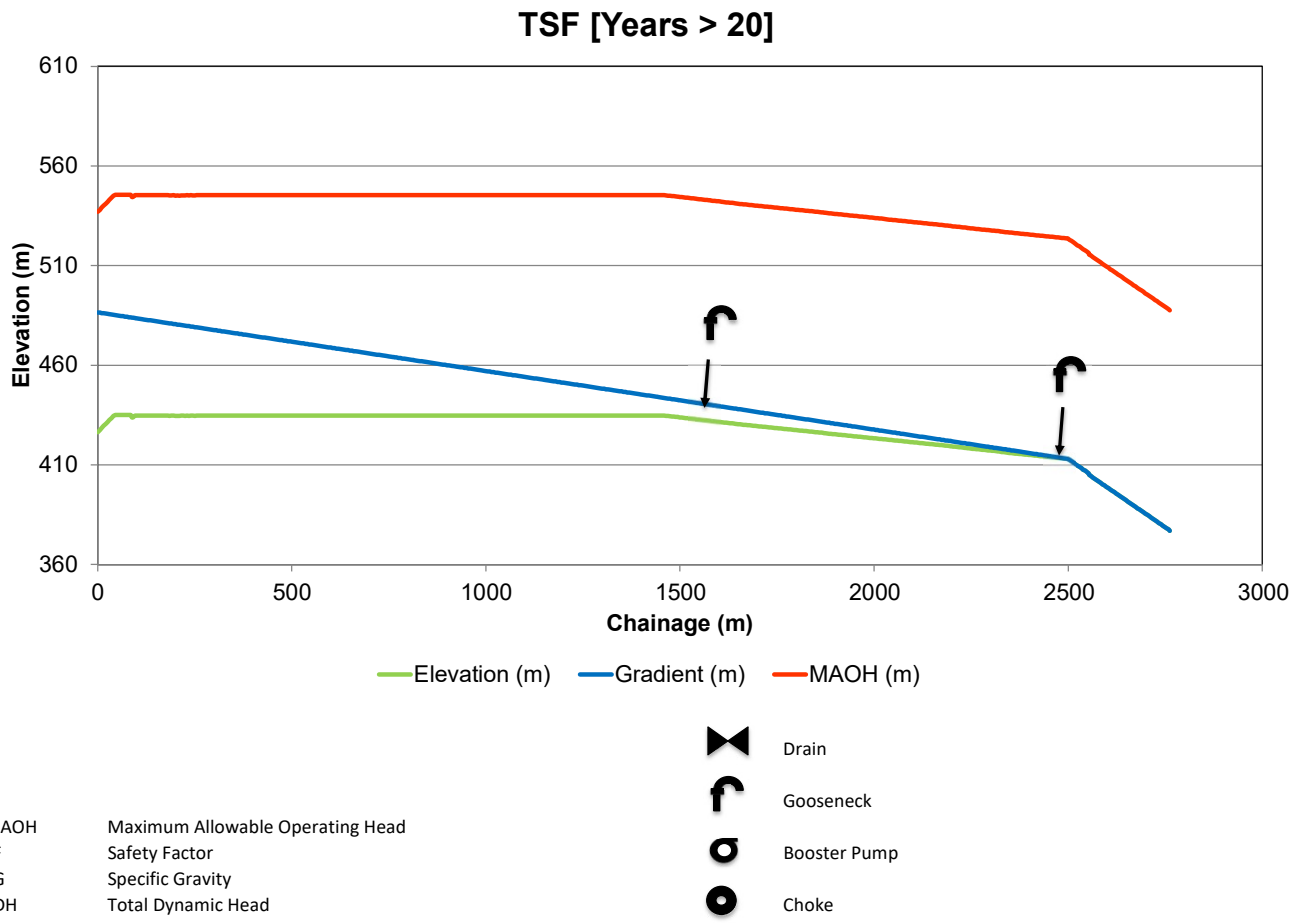
Head Derating Ratio	0.98
Efficiency derating Ratio	0.98
Head Safety Factor	0
Pump Efficiency	0.6
Power Safety Factor	0.15

Pump Configuration

Number of stages	1
Parallel lines	1
Total pumps	1

Pipe loss model: Colebrook with 10%SF

Power per pump	348.9	kw
	467.5	hp
Power per pump w/ SF	401.2	kw
	537.6	hp
Pump selection	700	hp



MAOH	Maximum Allowable Operating Head
SF	Safety Factor
SG	Specific Gravity
TDH	Total Dynamic Head

APPENDIX B

Drawings

1 LINE SYMBOLS

- PRIMARY
- SECONDARY
- EXISTING
- ELECTRICAL
- FLEXIBLE
- MECHANICAL LINKAGE
- PNEUMATIC
- CAPILLARY
- HYDRAULIC
- SOFTWARE
- WIRELESS SIGNAL
- MATERIAL FLOW
- OPEN FLOW
- MATCH FLAG ON SAME SHEET (3)
- ####-XX-#### AA — OFF-PAGE CONNECTOR
- AAAAA BBBBB — SPECIFICATION CHANGE
- ABOVE BELOW — SEGMENT BREAK
- (IA) INSTRUMENT AIR SUPPLY
- (PA) PLANT AIR SUPPLY
- (FW) FRESH WATER SUPPLY
- (ES) ELECTRICAL SUPPLY
- (EP) EMERGENCY POWER
- (HS) HYDRAULIC SUPPLY
- (TP 01) TIE POINT
- INTERLOCK

2 AUXILIARY SYMBOLS

- MANUAL ACTUATOR
- PISTON ACTUATOR
- PISTON ACTUATOR (W/ POSITIONER)
- ROTARY PISTON ACTUATOR
- ROTARY PISTON ACTUATOR (W/ POSITIONER)
- DIAPHRAGM ACTUATOR
- DIAPHRAGM ACTUATOR (W/ POSITIONER)
- PRESSURE BALANCED DIAPHRAGM ACTUATOR
- ELECTRO-HYDRAULIC ACTUATOR
- SOLENOID ACTUATOR
- ROTARY MOTOR OPERATED ACTUATOR
- SAFETY VALVE ACTUATOR
- PRESSURE REDUCING REGULATOR ACTUATOR WITH INTERNAL TAP
- PRESSURE REDUCING REGULATOR ACTUATOR WITH EXTERNAL TAP
- WIRELESS TRANSMITTER
- BALL VALVE
- BUTTERFLY VALVE
- DIAPHRAGM VALVE
- GATE VALVE OR UNDEFINED
- GLOBE VALVE
- KNIFE GATE VALVE
- PINCH VALVE
- PLUG VALVE
- NEEDLE VALVE
- CHECK VALVE (BALL)
- CHECK VALVE (SWING)
- ANGLE VALVE
- 3-WAY VALVE
- 4-WAY VALVE
- SINGLE ELEMENT SENSING PROBE
- DUAL ELEMENT SENSING PROBE
- INTEGRAL ORIFICE PLATE
- STANDARD PITOT TUBE
- AVERAGING PITOT TUBE
- TURBINE OR PROPELLER FLOWMETER
- VORTEX SHEDDING FLOWMETER
- POSITIVE DISPLACEMENT FLOWMETER
- (M) MAGNETIC FLOWMETER
- CORIOLLIS FLOWMETER
- SONIC OR ULTRASONIC FLOWMETER
- DENSITY METER
- DISPLACER INTERNALLY MOUNTED IN VESSEL
- BALL FLOAT
- RADIATION OR SONIC LEVEL SENSOR
- RADAR LEVEL SENSOR
- MEASURING ELEMENT AND STILLING WELL
- FLOAT WITH GUIDE WIRES
- WEIGHTOMETER
- VARIABLE AREA FLOWMETER
- MONITORED BEARING
- HEATER
- INLINE MIXER
- MOTOR
- VSD — VARIABLE SPEED DRIVE
- DOL — DIRECT ON LINE STARTER
- SS — SOFT STARTER
- FDR — FEEDER
- CCTV — CAMERA
- 2"-PP — INSULATION
- 1"-PPET — ELECTRICAL HEAT TRACING
- ORIFICE PLATE
- ORIFICE PLATE WITH QUICK-CHANGE FITTING
- OPEN CHANNEL WEIR PLATE
- OPEN CHANNEL FLUME
- PRESSURE SAFETY ELEMENT
- VENTURI TUBE
- Y-STRAINER
- DIAPHRAGM SEAL
- SLIDE GATE
- LUBRICATOR
- FILTER
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- CB — CATCH BASIN
- AT — AIR TRAP
- ST — STEAM TRAP
- RT — RESIN TRAP
- DT — DRAIN TRAP
- DR. — DRAIN
- GW — GUIDED WAVE RADAR
- A/S — AIR SUPPLY
- FLANGE SET
- SPADE/LINE BLIND
- UNION
- ORIFICE UNION
- FLANGED CONICAL SCREEN
- FLANGED FLAT SCREEN
- BLIND FLANGE
- HOSE CONNECTION
- PIPE CAP - THREADED
- PIPE CAP - WELDED
- PLUG
- PIPE BREAK
- INSULATION
- FLAME ARRESTOR
- DEMISTER
- CENTRIFUGAL PUMP
- SUBMERSIBLE PUMP
- AGITATOR
- VERTICAL TURBINE PUMP

3 PIPE LINE DESIGNATION

100 - WPR - ####

- 100 — LINE SIZE (IN)
- WPR — SERVICE CODE
- #### — SEQUENCE NUMBER

SERVICE CODES:

PROCESS:		UTILITIES:	
RFL	FLOCCULANT	WCW	CONTACT WATER
PST	PASTE	WMN	MINE WATER
SLR	SLURRY	WGS	GLAND WATER
STA	SLURRY TAILINGS	WGH	HP GLAND WATER
SUP	SUMPAGE	AMN	MINE AIR
CMT	CEMENT	AIN	INSTRUMENT AIR
ALP	AIR LOW PRESSURE (PROCESS EXHAUST)	APL	PLANT AIR
		BFL	BIOFUEL
ADM	ADMIXTURES	OIL	HYDRAULIC/ENGINE OIL/COOLANT

INSULATION CODES:

HC	HEAT CONSERVATION	PP	PERSONNEL PROTECTION

4 VALVE TAG NUMBERING

TYPE
SIZE (IN) — 100-K NO
NORMALLY OPEN / NORMALLY CLOSED

TYPE CODES:

K	KNIFE GATE
C	CHECK
B	BALL
F	BUTTERFLY

5 MISCELLANEOUS PIPING SYMBOLS

PIPING LETTER NOTATIONS:

A/G	ABOVE GROUND
LO	LOCK OPEN
LC	LOCK CLOSED
CSO	CAR SEAL (OPEN)
CSC	CAR SEAL (CLOSED)
CO	CLEAN-OUT
FL	FLUSH
DR	DRAIN
QD	QUICK DISCONNECT
SC	SAMPLE CONNECTION
TSO	TIGHT SHUT-OFF
U/G	UNDERGROUND
O/F	OVERFLOW

6 EQUIPMENT TAG NUMBERING

XXXX-XXXXX-######

- XXXX — AREA/LEVEL
- XXXXX — ATTACHED EQUIP. NUMBER
- ###### — EQUIP. NUMBER

7 MOTOR TAG NUMBERING

XXXX-ELSXX-MTR##

- XXXX — AREA NUMBER
- ELSXX — SEQUENCE NUMBER
- MTR## — SUFFIX (IF REQUIRED)

8 GENERAL CONTROL SYMBOLS

TABLE 2
INSTRUMENT DEVICE & FUNCTION SYMBOLS (PER ISA STANDARDS)

	SHARED DISPLAY A: PRIMARY CHOICE OR BASIC PROCESS CONTROL SYSTEM	SHARED DISPLAY B: ALTERNATE CHOICE OR SAFETY INSTRUMENTED SYSTEM	C: COMPUTER SYSTEMS AND SOFTWARE	D: DISCRETE	LOCATION & ACCESSIBILITY
1	◯	◇	⬡	◯	• LOCATED IN FIELD. • NOT PANEL, CABINET OR CONSOLE MOUNTED. • VISIBLE AT FIELD LOCATION. • NORMALLY OPERATOR ACCESSIBLE.
2	◯	◇	⬡	◯	• LOCATED IN OR IN FRONT OF CENTRAL OR MAIN PANEL OR CONSOLE. • VISIBLE ON FRONT PANEL OR ON VIDEO DISPLAY. • NORMALLY OPERATOR ACCESSIBLE AT PANEL OR CONSOLE.
3	◯	◇	⬡	◯	• LOCATED IN REAR OF CENTRAL OR MAIN PANEL. • LOCATED IN CABINET BEHIND PANEL. • NOT VISIBLE ON FRONT OF PANEL OR ON VIDEO DISPLAY. • NOT NORMALLY OPERATOR ACCESSIBLE AT PANEL OR CONSOLE.
4	◯	◇	⬡	◯	• LOCATED IN OR ON FRONT OF SECONDARY OR LOCAL PANEL OR CONSOLE. • VISIBLE ON FRONT PANEL OR ON VIDEO DISPLAY. • NORMALLY OPERATOR ACCESSIBLE AT PANEL OR CONSOLE.
5	◯	◇	⬡	◯	• LOCATED IN REAR OF SECONDARY OR LOCAL PANEL. • LOCATED IN FIELD PANEL. • NOT VISIBLE ON FRONT OF PANEL OR ON VIDEO DISPLAY. • NOT NORMALLY OPERATOR ACCESSIBLE AT PANEL OR CONSOLE.

9 INSTRUMENT TAG NUMBERING

EACH INSTRUMENT IS IDENTIFIED BY A COMBINATION OF LETTERS AND NUMBERS. THE LETTERS ARE SELECTED FROM TABLE 1 TO CLASSIFY THE INSTRUMENT FUNCTION. THE LETTERS ARE FOLLOWED BY A LOOP NUMBER.

THE LOOP IDENTIFICATION NUMBER WILL BE COMMON TO ALL INSTRUMENTS WITHIN THAT LOOP. A LETTER SUFFIX IS ADDED TO DIFFERENTIATE BETWEEN INSTRUMENTS BEARING THE SAME LETTER PREFIX WITHIN ANY GIVEN LOOP.

- FA XX — LETTER ID (SEE TABLE 1)
- VENDOR SUPPLIED FUNCTION — HH, H, L, LL
- SUFFIX
- LOOP NUMBER

TABLE 1
LETTER IDENTIFICATION (PER ISA STANDARDS)

	FIRST LETTER: MEASURED OR INITITATING VARIABLE	FIRST LETTER: VARIABLE MODIFIER	SUCCEEDING LETTERS: READOUT OR PASSIVE FUNCTION	SUCCEEDING LETTERS: OUTPUT OR ACTIVE FUNCTION	SUCCEEDING LETTERS: FUNCTION MODIFIER
A	ANALYSIS		ALARM		
B	BURNER FLAME				
C	CONDUCTIVITY			CONTROL	CLOSE
D	DENSITY OR SPECIFIC GRAVITY	DIFFEREN-TIAL			DEVIATION
E	VOLTAGE		SENSOR, PRIMARY ELEMENT		
F	FLOW, FLOW RATE	RATIO			
G	GAUGING		GLASS, GAUGE, VIEWING DEVICE		
H	HAND OPERATED				HIGH
I	CURRENT		INDICATE		
J	POWER		SCAN		
K	TIME	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE				MIDDLE OR INTERMEDIATE
N	METAL DETECTION				
O	TORQUE		ORIFICE (RESTRICTION)		
P	PRESSURE OR VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE OR TOTALIZE	INTEGRATE OR TOTALIZE		
R	RADIOACTIVITY		RECORD		RUN
S	SPEED OR FREQUENCY	SAFETY		SWITCH	STOP
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION		
V	VIBRATION			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL OR PROBE		
X	ON/OFF	X-AXIS	UNCLASSIFIED		
Y	MOTOR CONTROL / MISC.	Y-AXIS		AUX. DEVICES	
Z	POSITION	Z-AXIS	DRIVE, ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT		

10 NOTES

1. GREYED AREAS OF PIPEWORK, EQUIPMENT, AND VALVES ARE EXISTING OR FUTURE DEVELOPMENTS.

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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CONSULTANT: WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
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TITLE
PIPING & INSTRUMENTATION DIAGRAM LEGEND SHEET

PROJECT NO. 22575540 | REV. A | DRAWING PPL-001-001

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

0 — 25 mm

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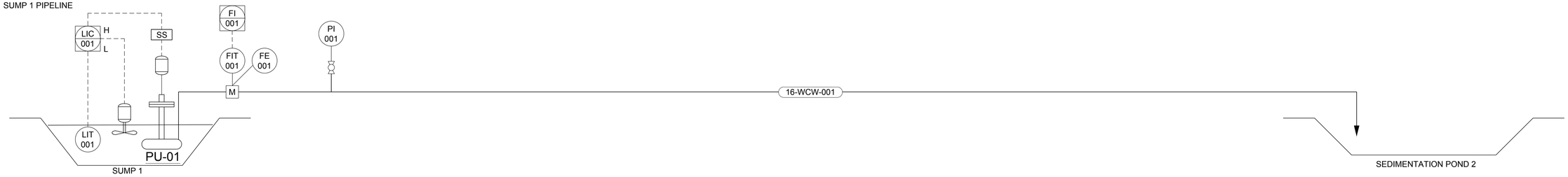
PU-01
SUBMERSIBLE
PUMP #1

PU-02
SUBMERSIBLE
PUMP #2

PU-03
SUBMERSIBLE
PUMP #3

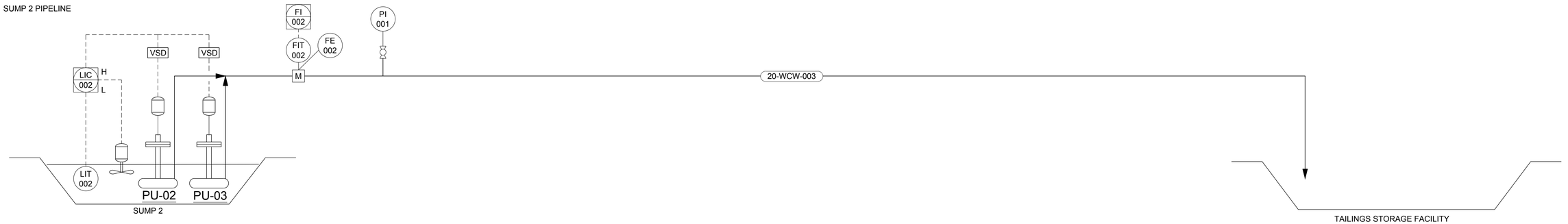
PU-04
CENTRIFUGAL
PUMP #1

SUMP 1 PIPELINE



SUMP 1B PIPELINE (FUTURE)

SUMP 2 PIPELINE



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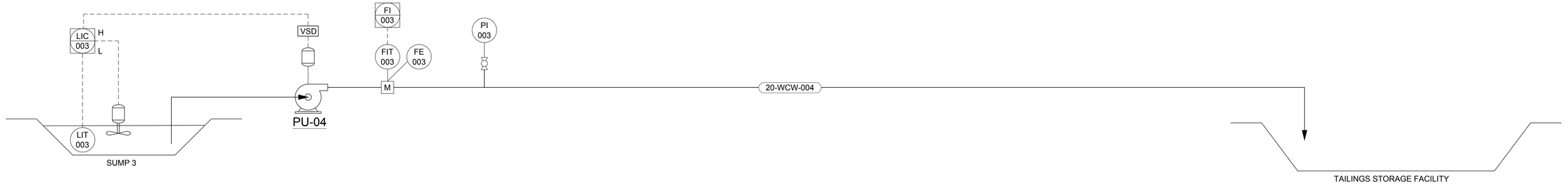

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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TROILUS

CONSULTANT
WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT
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SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE
PIPING & INSTRUMENTATION DIAGRAM
SUMP 1, SUMP 1B, SUMP 2, SUMP 3

PROJECT NO. 22575540
REV. A
DRAWING PPL-001-002

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25 mm
0

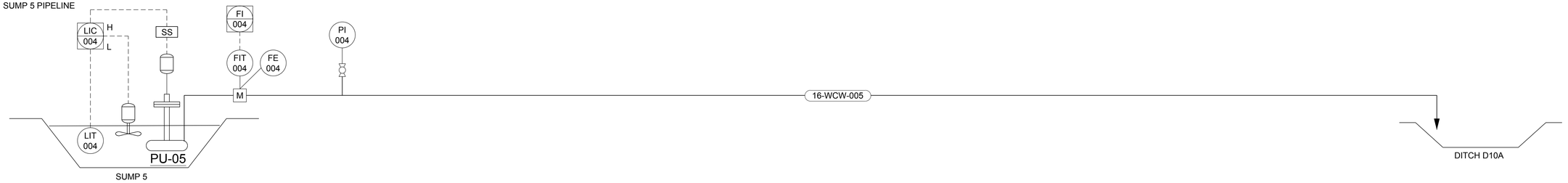
PU-05
SUBMERSIBLE
PUMP #4

PU-06
SUBMERSIBLE
PUMP #5

PU-07
SUBMERSIBLE
PUMP #6

PU-08
SUBMERSIBLE
PUMP #7

SUMP 5 PIPELINE



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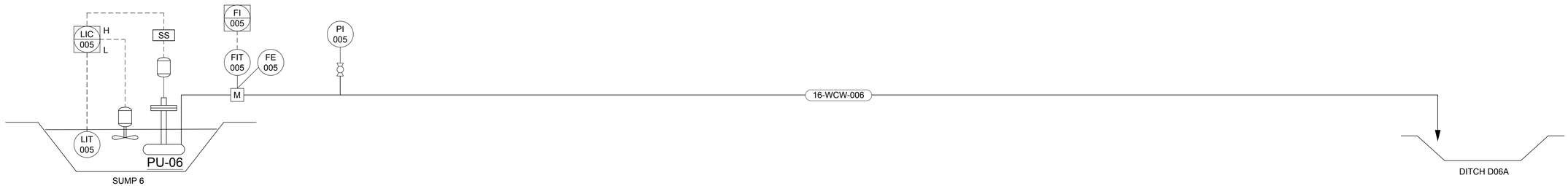

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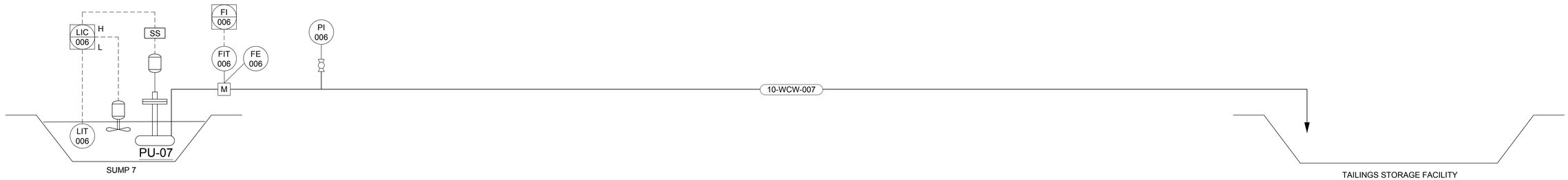

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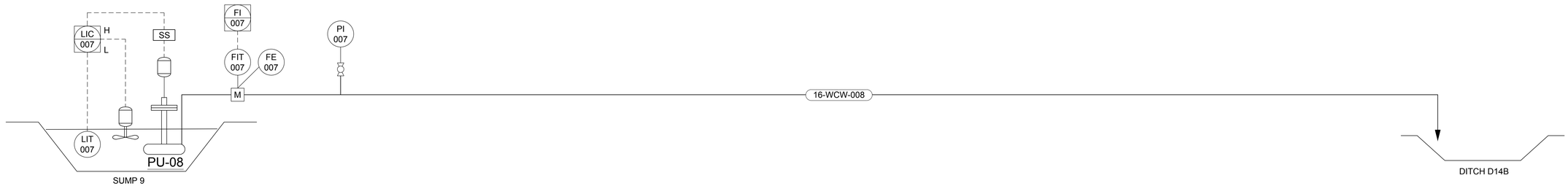

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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CLIENT

TROILUS

CONSULTANT

WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
www.golder.com

PROJECT
TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE
PIPING & INSTRUMENTATION DIAGRAM
SUMP 5, SUMP 6, SUMP 7, SUMP 9

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-001-003

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

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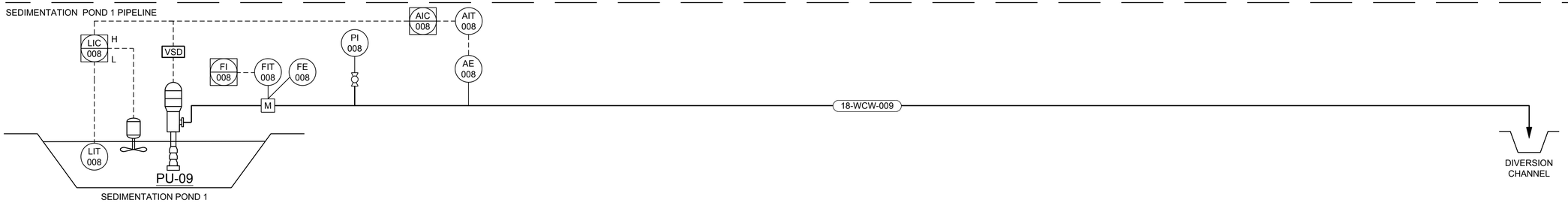
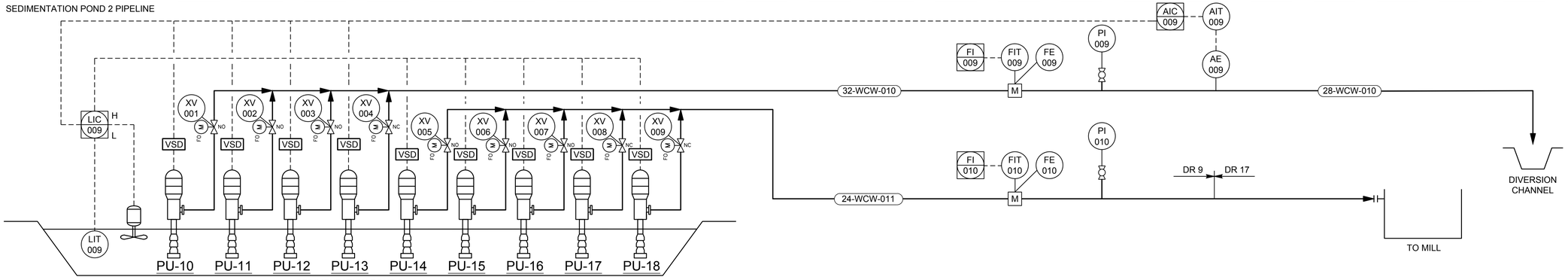
PU-09 VERTICAL TURBINE PUMP #1
PU-10 VERTICAL TURBINE PUMP #2
PU-11 VERTICAL TURBINE PUMP #3
PU-12 VERTICAL TURBINE PUMP #4
PU-13 VERTICAL TURBINE PUMP #5
PU-14 VERTICAL TURBINE PUMP #6
PU-15 VERTICAL TURBINE PUMP #7
PU-16 VERTICAL TURBINE PUMP #8
PU-17 VERTICAL TURBINE PUMP #9
PU-18 VERTICAL TURBINE PUMP #10
PU-19 VERTICAL TURBINE PUMP #11
PU-20 VERTICAL TURBINE PUMP #12
PU-21 VERTICAL TURBINE PUMP #13
PU-22 VERTICAL TURBINE PUMP #14

SEDIMENTATION POND 1 PIPELINE



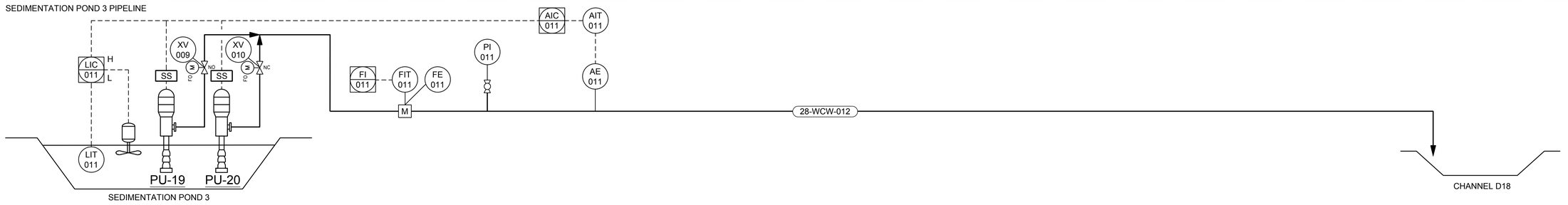
SEDIMENTATION POND 1

SEDIMENTATION POND 2 PIPELINE



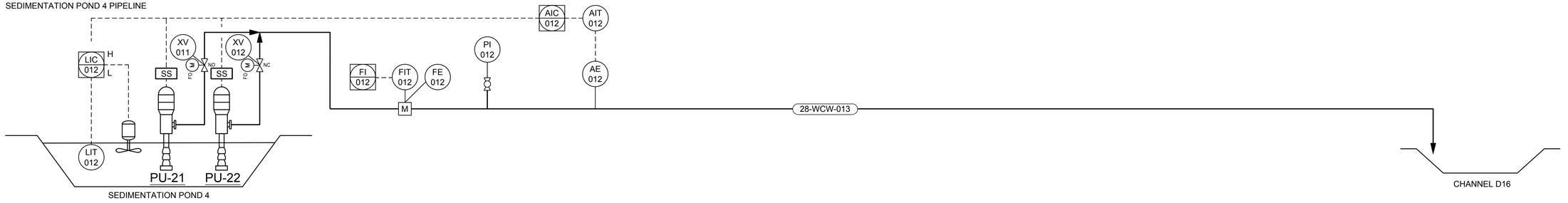
SEDIMENTATION POND 2

SEDIMENTATION POND 3 PIPELINE



SEDIMENTATION POND 3

SEDIMENTATION POND 4 PIPELINE



SEDIMENTATION POND 4

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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CONSULTANT
WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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TITLE
PIPING & INSTRUMENTATION DIAGRAM
SEDIMENTATION POND 1, SEDIMENTATION POND 2,
SEDIMENTATION POND 3, SEDIMENTATION POND 4

PROJECT NO. 22575540
REV. A
DRAWING PPL-001-004

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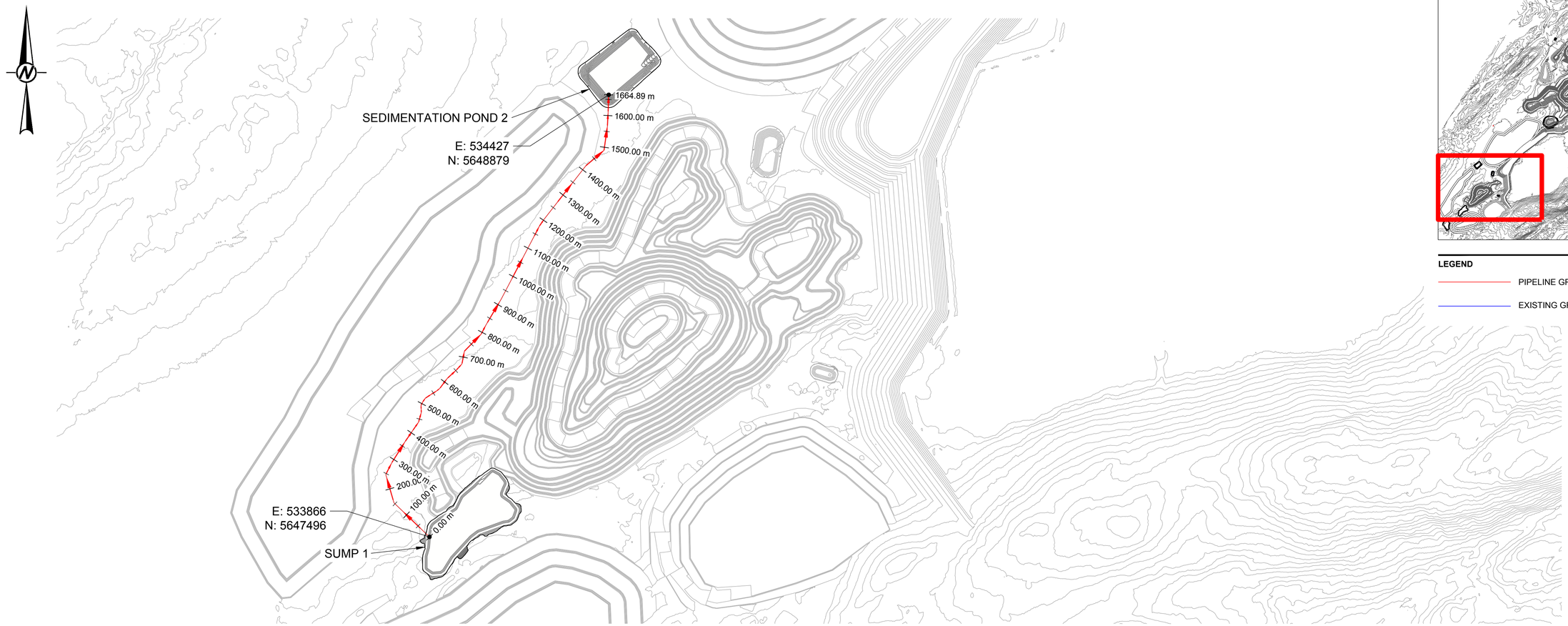

SUMP 1 PIPELINE PLAN VIEW

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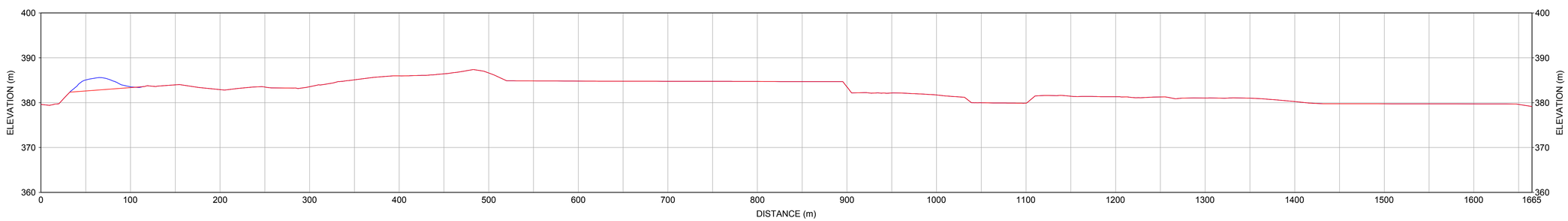

SUMP 1 PIPELINE PROFILE

1: 2,500 m

LEGEND

PIPELINE GRADE

EXISTING GRADE

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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TITLE

PIPELINE PLAN AND PROFILE
SUMP 1

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-001

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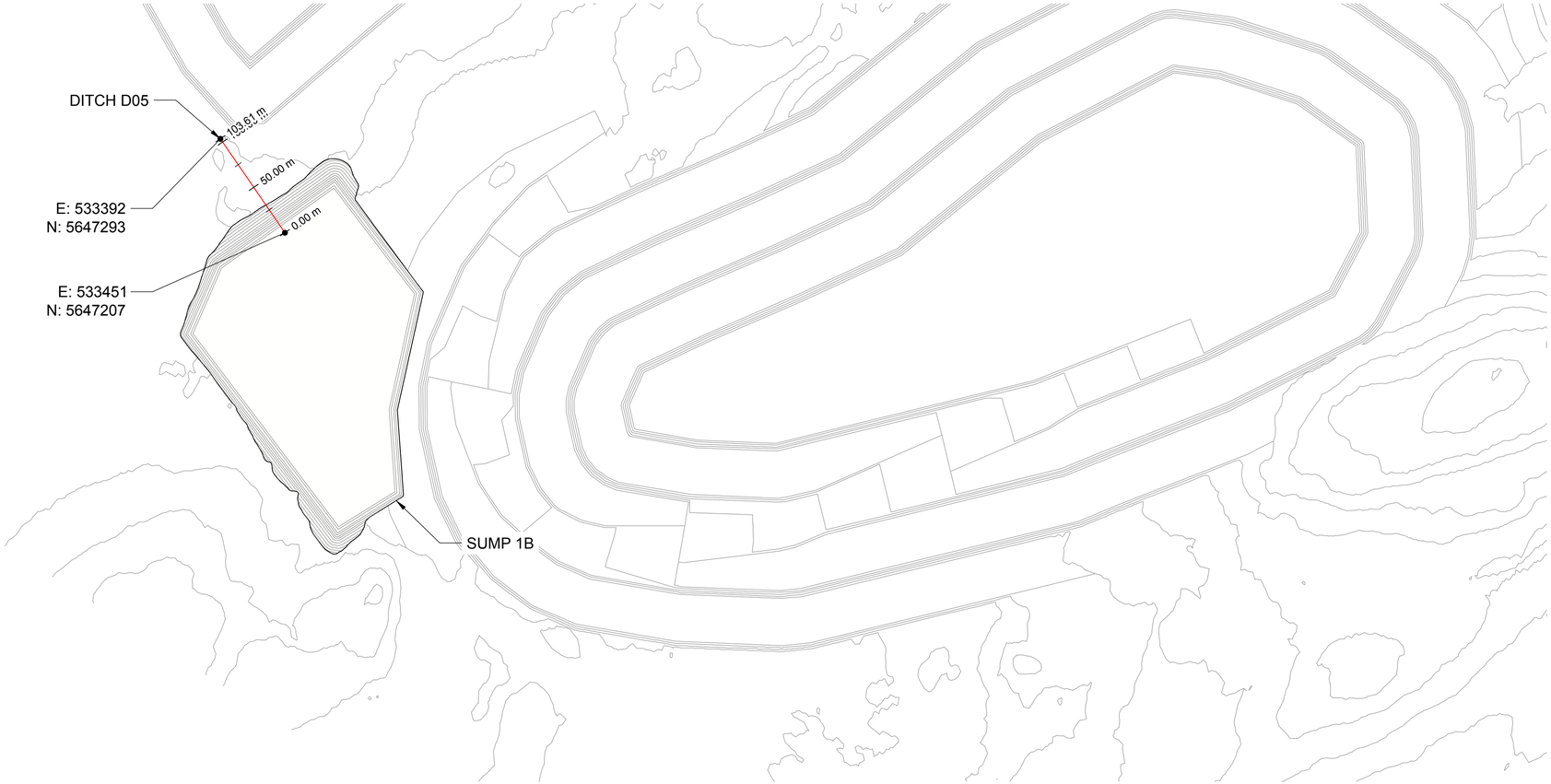

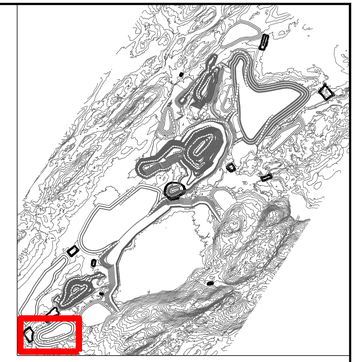

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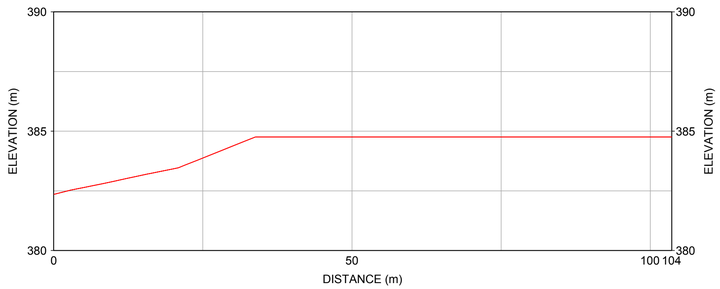

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REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-02-09	ISSUED FOR REVIEW	MV	OA	MV	AF

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CONSULTANT
WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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TITLE
PIPELINE PLAN AND PROFILE
SUMP 1B

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22575540	A	PPL-002-002

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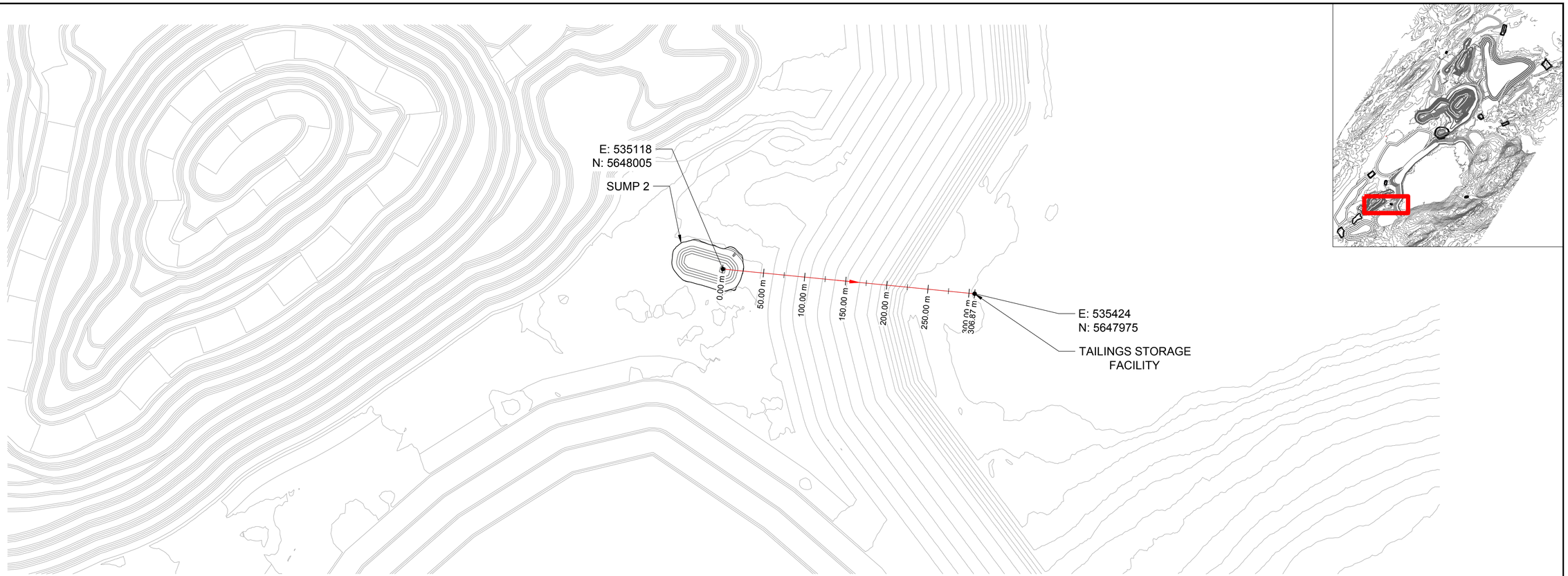

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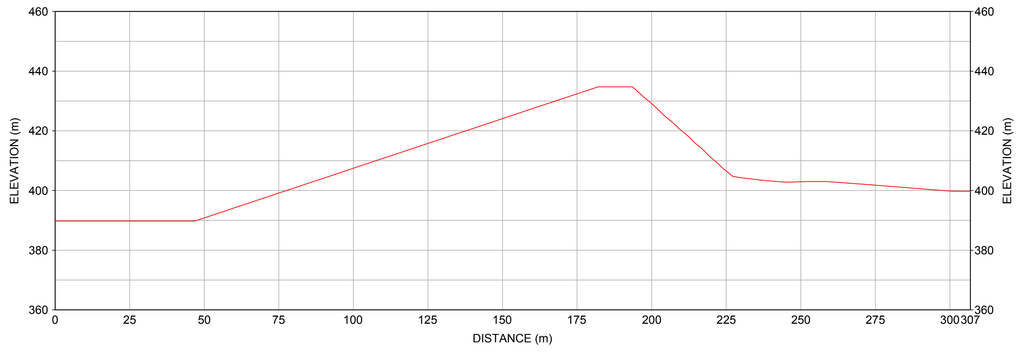

SUMP 2 PIPELINE PROFILE

1: 1,000 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT

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TITLE

PIPELINE PLAN AND PROFILE
SUMP 2

PROJECT NO.	REV.	DRAWING
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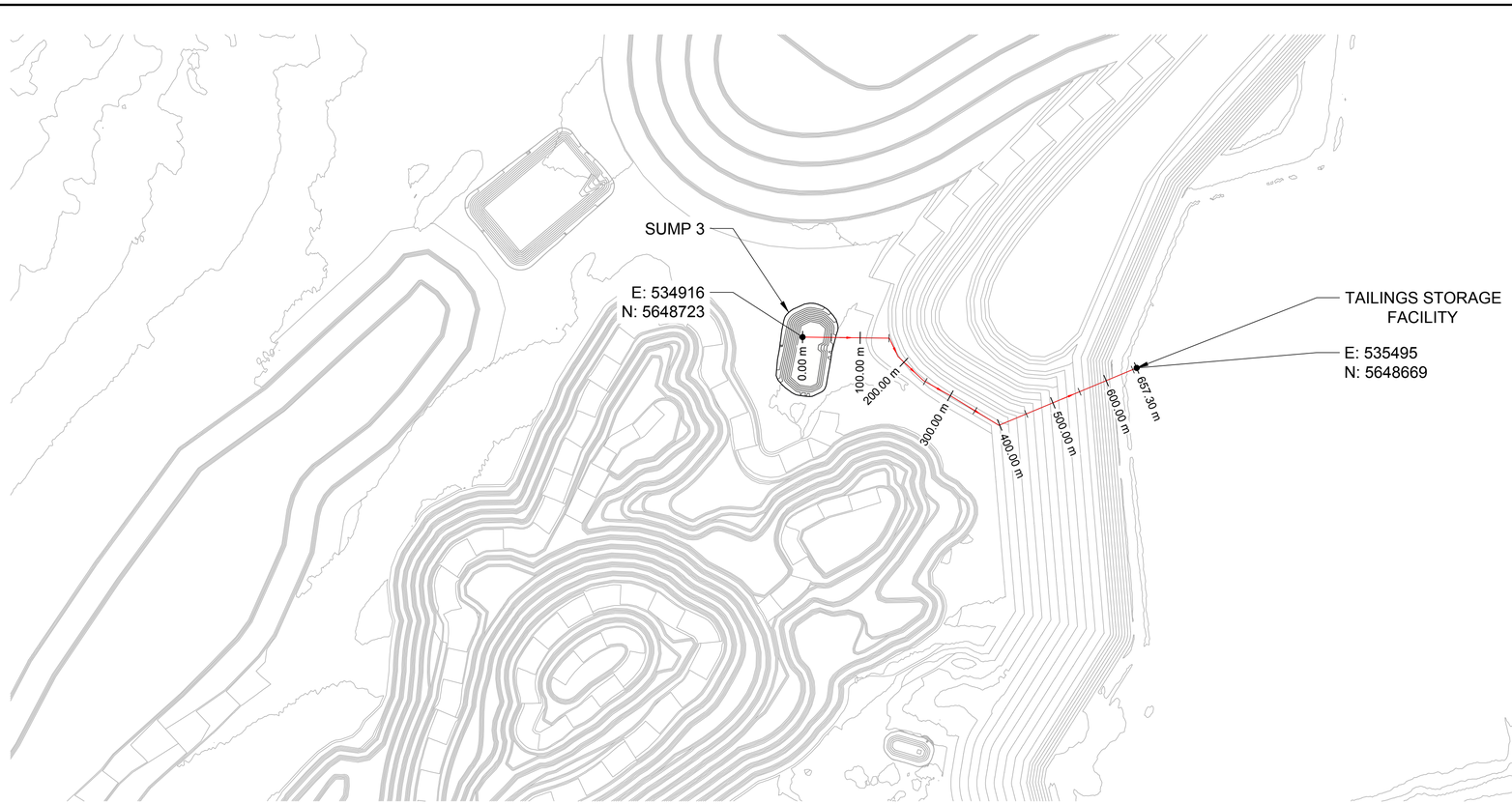

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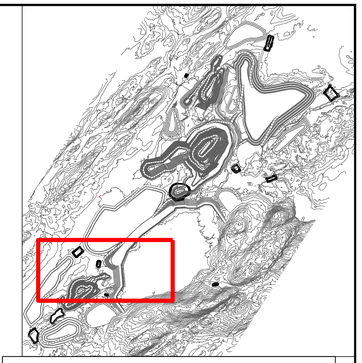

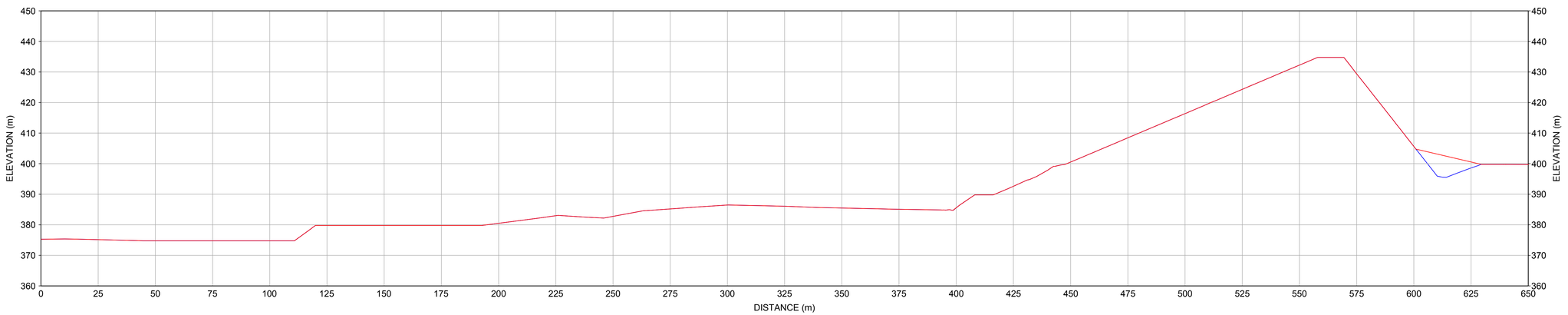

SUMP 3 PIPELINE PROFILE
1: 1,000 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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CONSULTANT
WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
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FEASIBILITY STUDY

TITLE
PIPELINE PLAN AND PROFILE
SUMP 3

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-004

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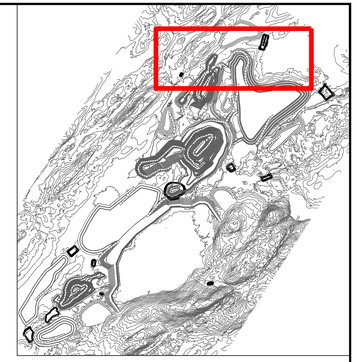
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm



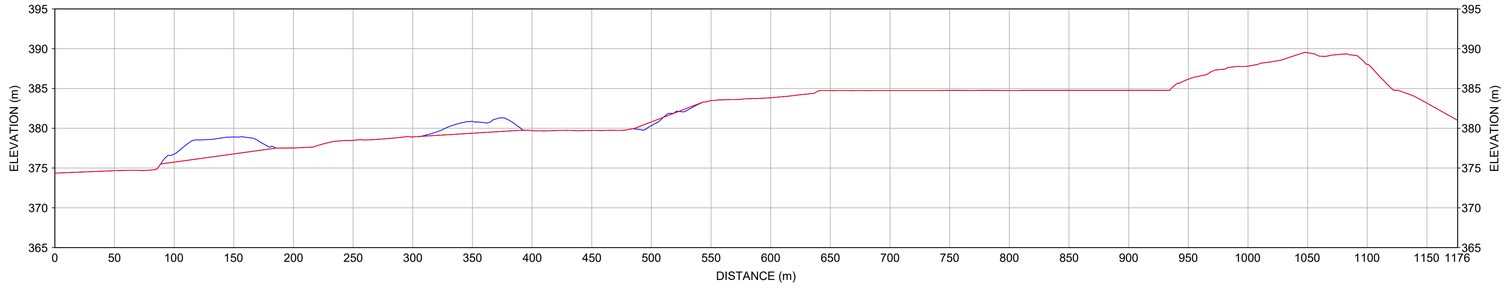
LEGEND

PIPELINE GRADE

EXISTING GRADE

SUMP 5 PIPELINE PLAN VIEW

1: 5,000 m



SUMP 5 PIPELINE PROFILE

1: 2,500 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

CLIENT

TROILUS

CONSULTANT

WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
www.golder.com

PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

PIPELINE PLAN AND PROFILE
SUMP 5

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-005

Path: \\golder.gds\gal\mississauga\postel\2023\22575540 Troilus\AUTOCAD\P - Piping (M)\ | File Name: Sump5 - Profile.dwg

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

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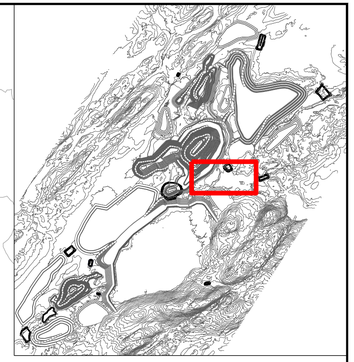


LEGEND

PIPELINE GRADE

EXISTING GRADE

0.00 m

100.00 m

200.00 m

300.00 m

400.00 m

459.20 m

E: 537994
N: 5650787

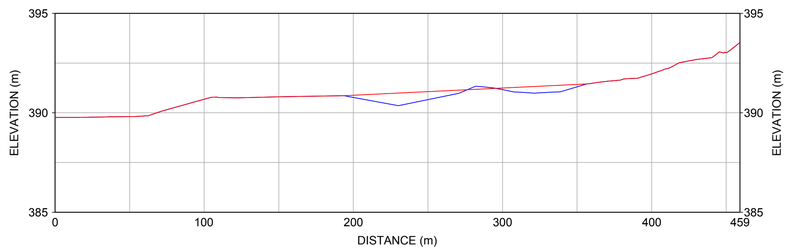
SUMP 6

DITCH D06A

E: 537735
N: 5650410

SUMP 6 PIPELINE PLAN VIEW

1: 2,500 m



SUMP 6 PIPELINE PROFILE

1: 2,000 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

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WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

PIPELINE PLAN AND PROFILE
SUMP 6

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-006

Path: \\golder.gds\gal\mississauga\waste\2023\22575540 Troilus\AUTOCAD\P - Piping (M\). | File Name: Sump6 - Profile.dwg

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

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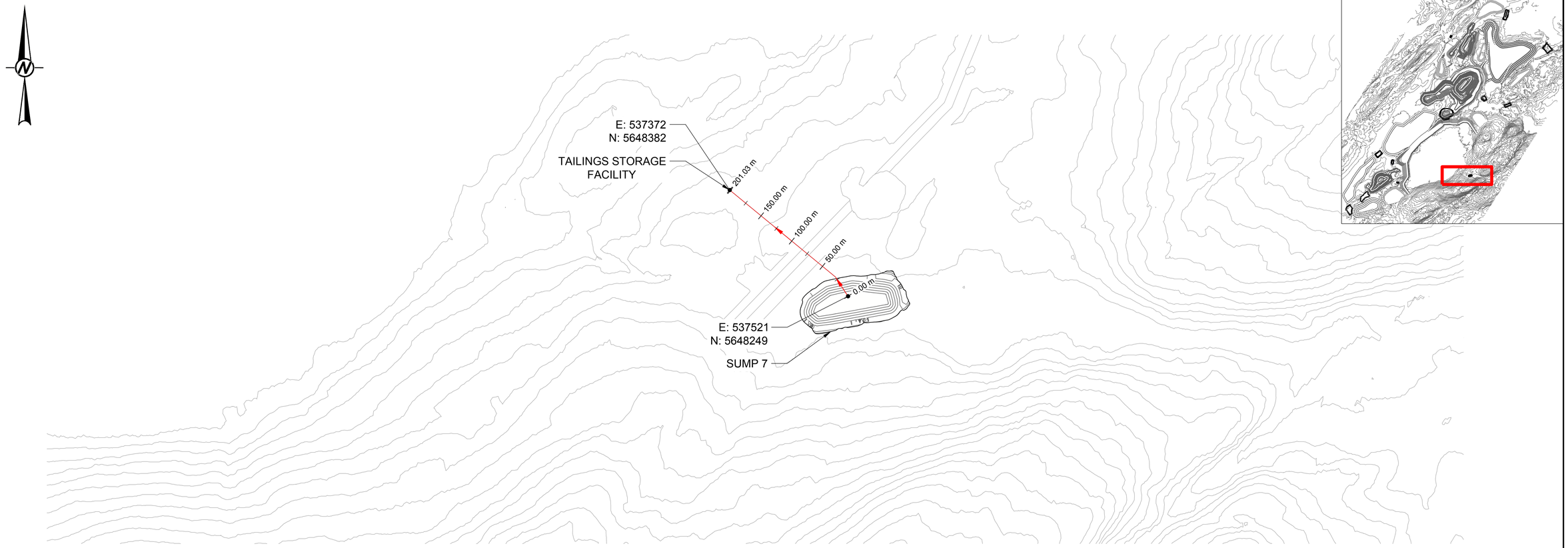
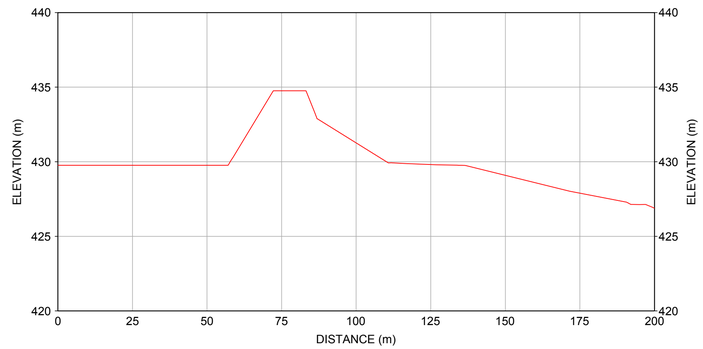


SUMP 7 PIPELINE PLAN VIEW
1: 2,500 m



SUMP 7 PIPELINE PROFILE
1: 1,000 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

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WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT
TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE
PIPELINE PLAN AND PROFILE
SUMP 7

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-007

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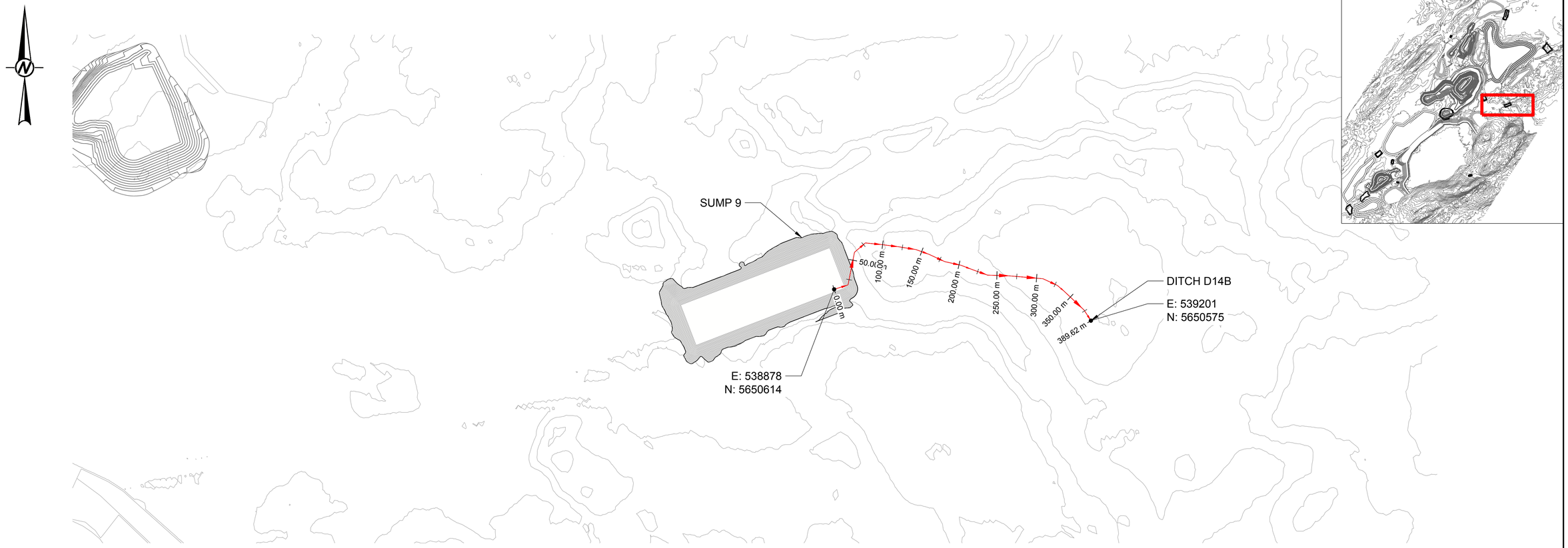
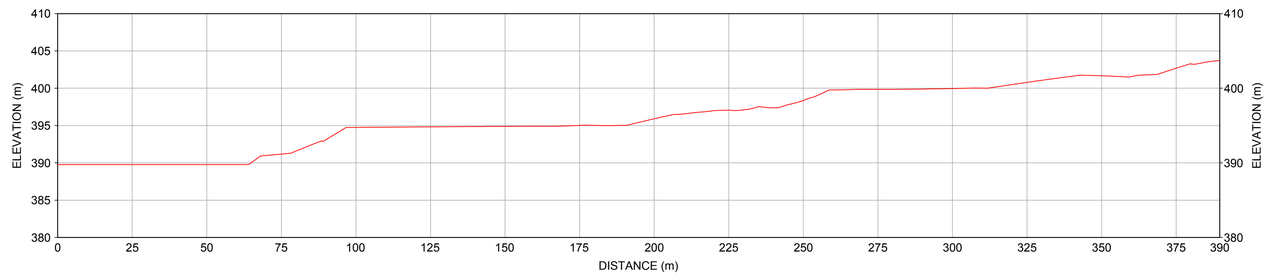


SUMP 9 PIPELINE PLAN VIEW

1: 2,500 m



SUMP 9 PIPELINE PROFILE

1: 1,000 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

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WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

PIPELINE PLAN AND PROFILE
SUMP 9

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-008

Path: \\golder.gds\gal\mississauga\jobs\e\2023\22575540 Troilus\AUTOCAD\P - Piping (M)\ | File Name: Sump9 - Profile.dwg

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

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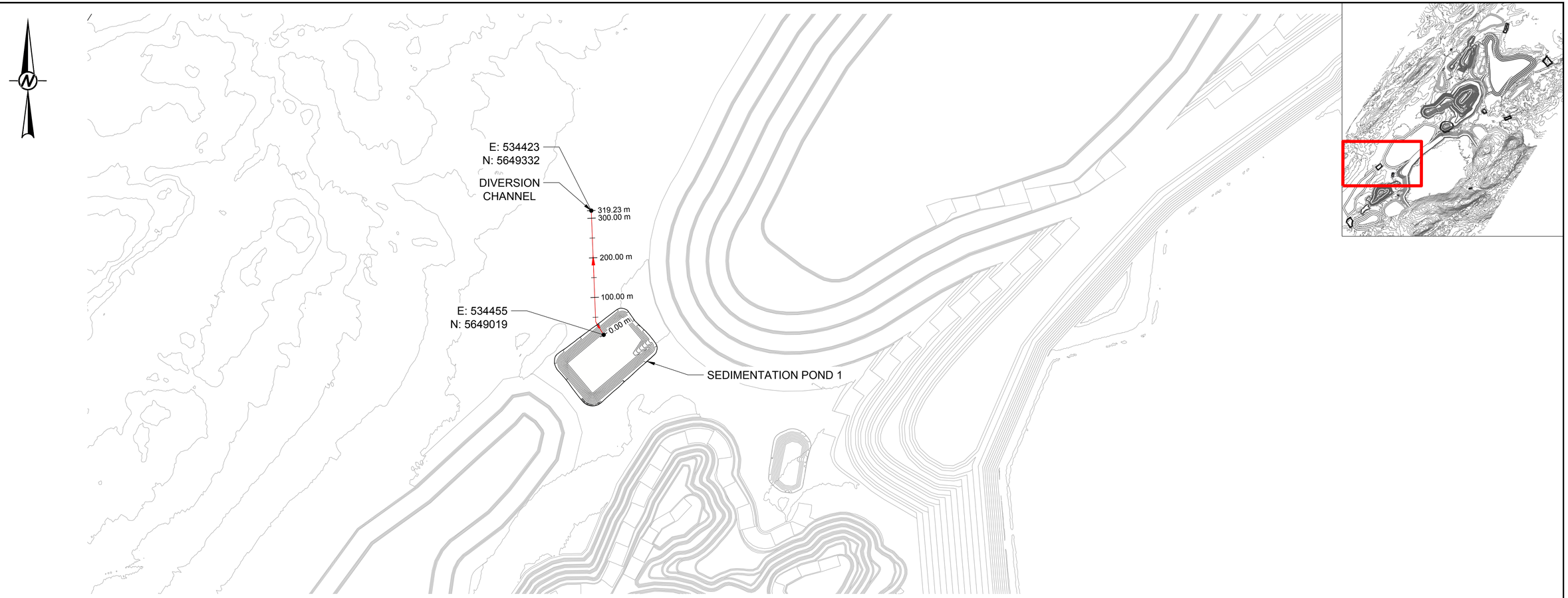
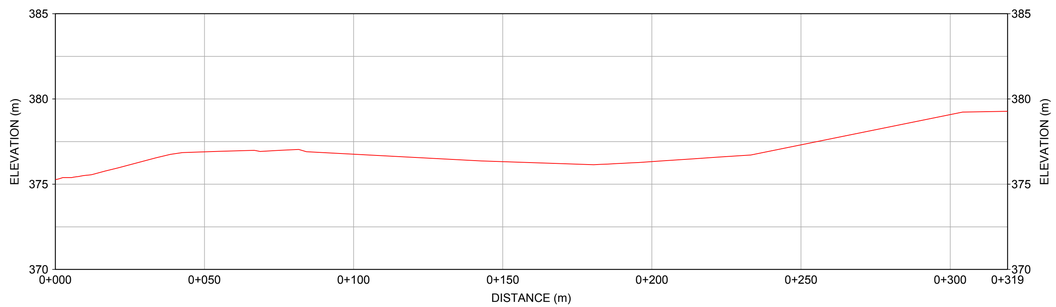


SEDIMENTATION POND 1 PIPELINE PLAN VIEW

1: 5,000 m



SEDIMENTATION POND 1 PIPELINE PROFILE

1: 1,000 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

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MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

PIPELINE PLAN AND PROFILE
SEDIMENTATION POND 1

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-009

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

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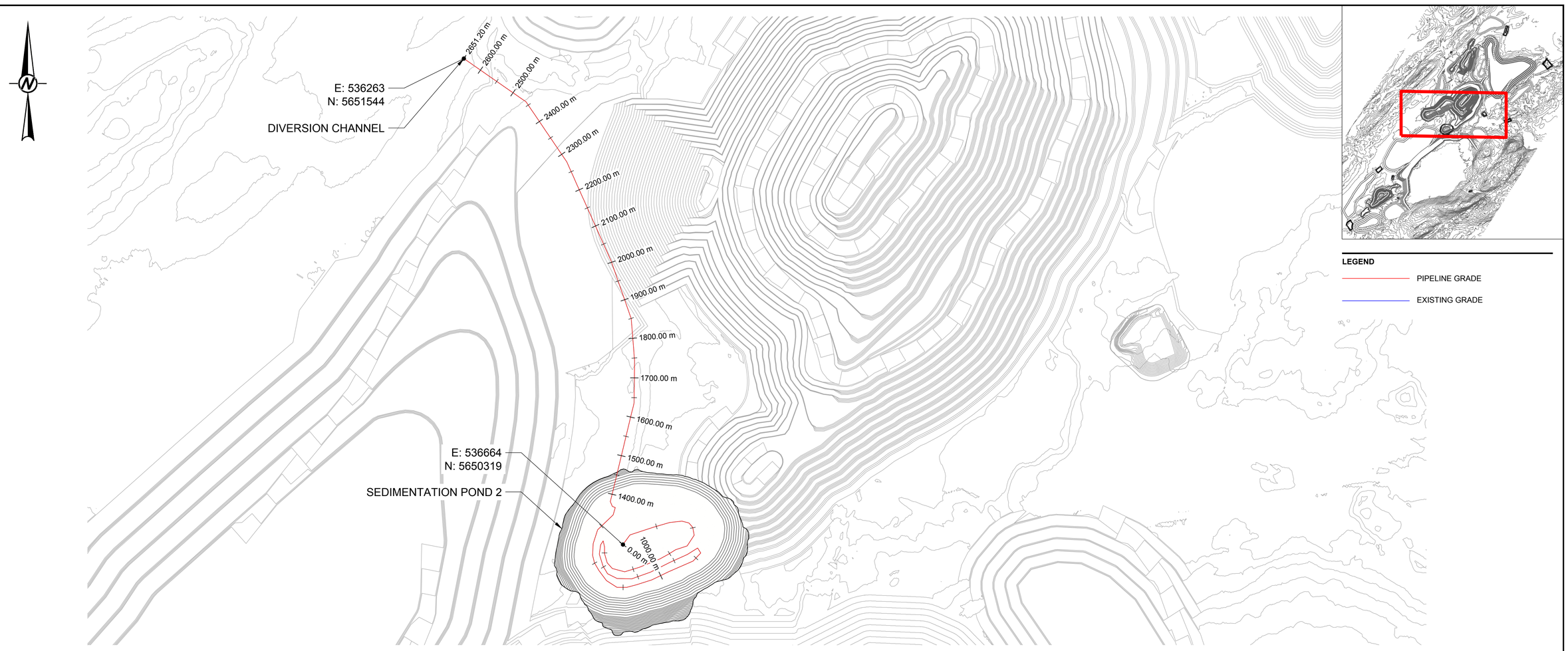
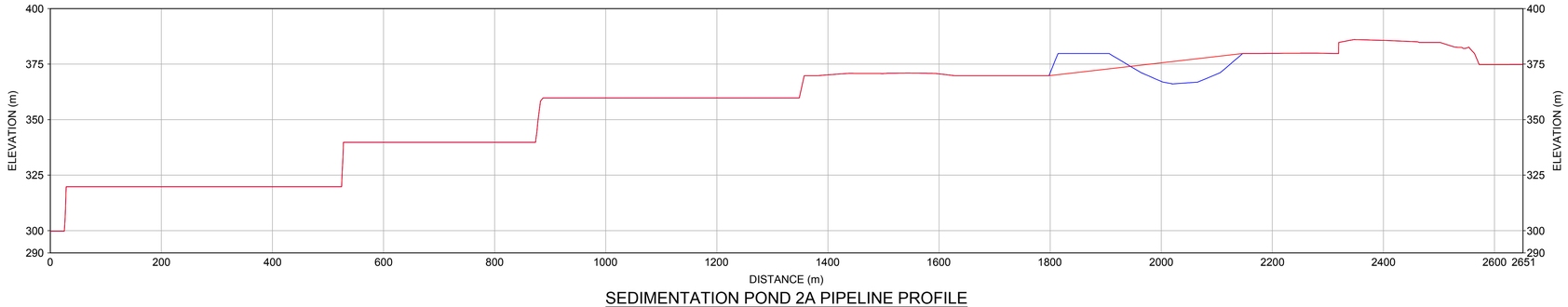


SEDIMENTATION POND 2A PIPELINE PLAN VIEW

1: 5,000 m



SEDIMENTATION POND 2A PIPELINE PROFILE

1: 5,000 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

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1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

PIPELINE PLAN AND PROFILE
SEDIMENTATION POND 2A

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-010

Path: \\golder.gds\gal\mississauga\spatial\2023\22575540 Troilus\AUTOCAD\P - Piping (M)\ | File Name: SP2A - Profile.dwg

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

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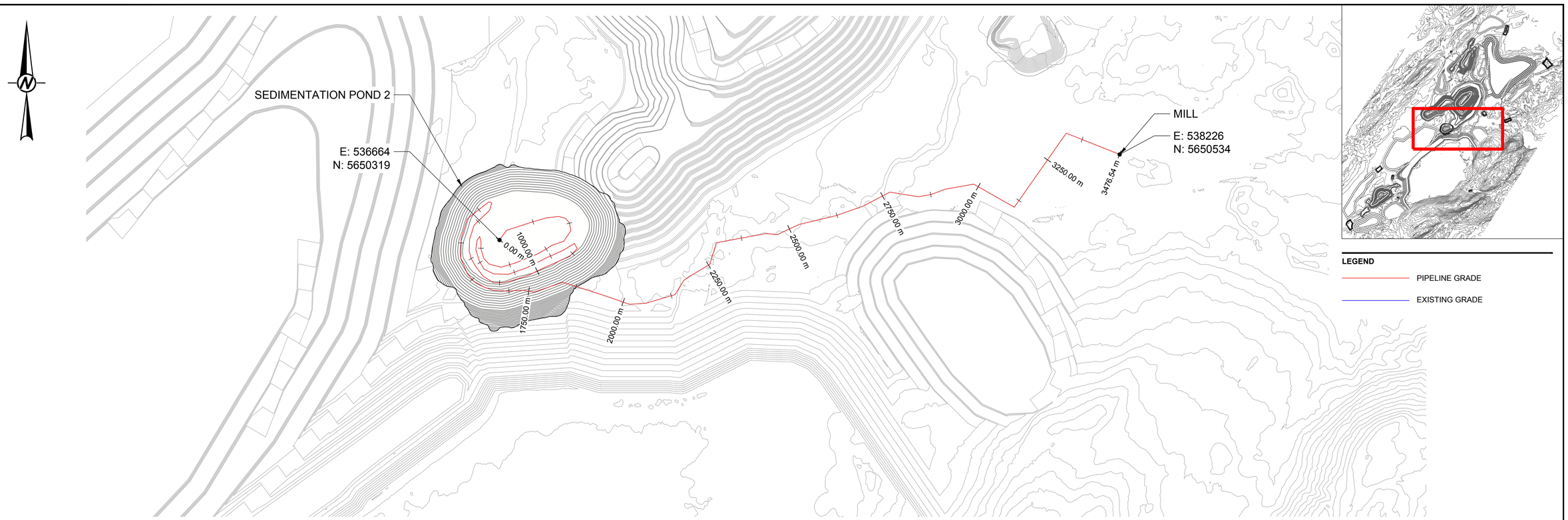
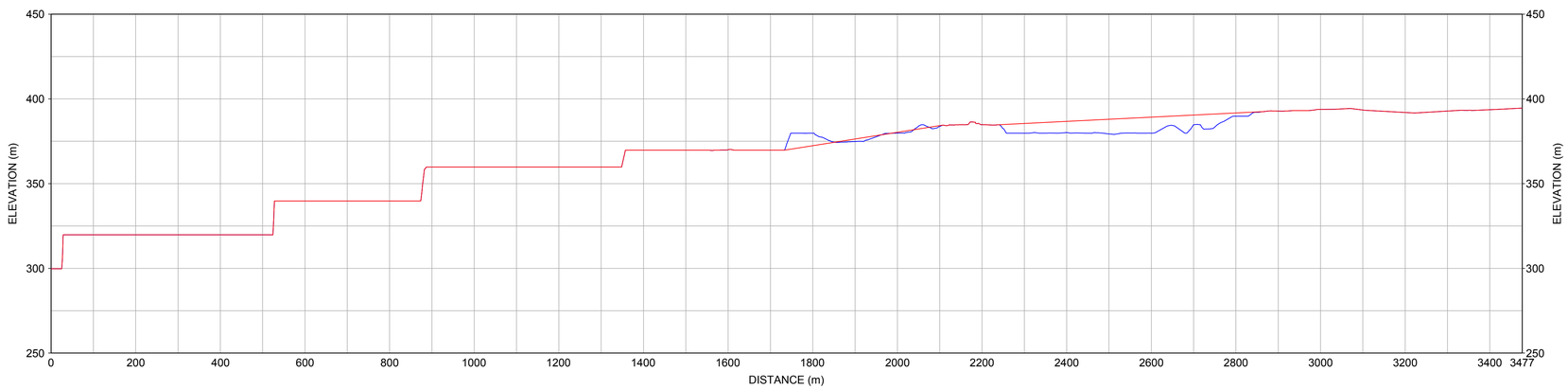


SEDIMENTATION POND 2B PIPELINE PLAN VIEW

1: 5,000 m



SEDIMENTATION POND 2B PIPELINE PROFILE

1: 7,500 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

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WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

PIPELINE PLAN AND PROFILE
SEDIMENTATION POND 2B

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-011

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

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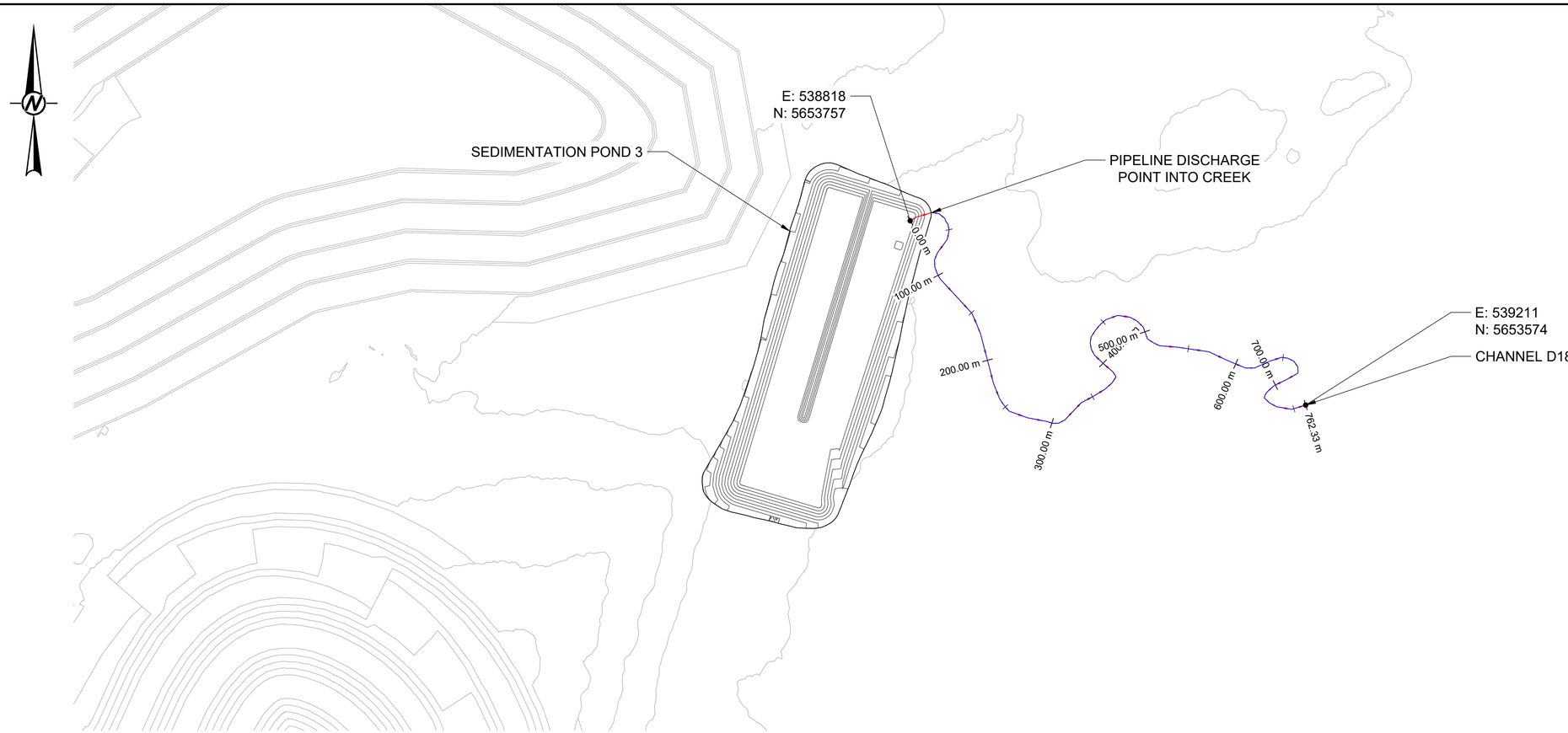


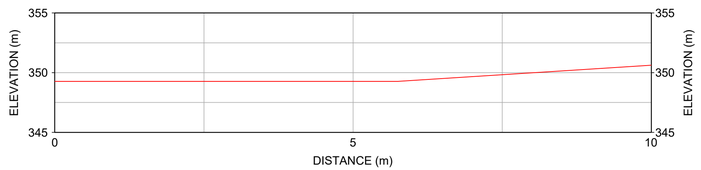
LEGEND

PIPELINE GRADE

CREEK

SEDIMENTATION POND 3 PIPELINE PLAN VIEW

1: 2,500 m



SEDIMENTATION POND 3 PIPELINE PROFILE

1: 50 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

CLIENT

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CONSULTANT

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1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

PIPELINE PLAN AND PROFILE
SEDIMENTATION POND 3

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-012

Path: \\golder.gtdsgal\mississauga\jobs\e\2023\22575540 Troilus\AUTOCAD\P - Piping (M)\ | File Name: SP3 - Profile.dwg

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25 mm
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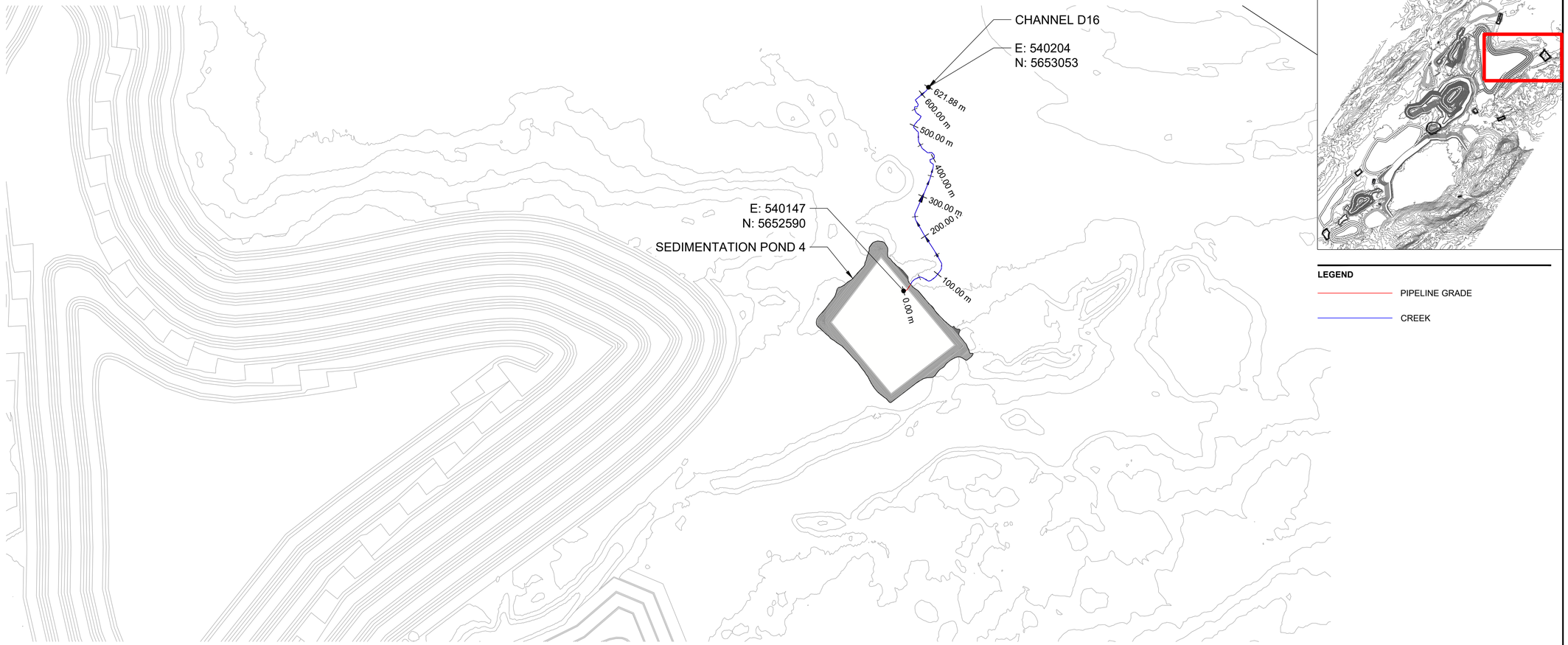
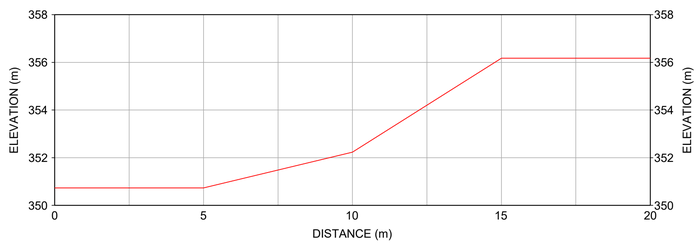


SEDIMENTATION POND 4 PIPELINE PLAN VIEW

1: 5,000 m



SEDIMENTATION POND 4 PIPELINE PROFILE

1: 100 m

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

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MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
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PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

PIPELINE PLAN AND PROFILE
SEDIMENTATION POND 4

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-002-013

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

0 25 mm

Path: \\golder.gds\ga\Mississauga\saste\2023\22575540 Troilus\AUTOCAD\P - Piping (M\) | File Name: SP4 - Profile.dwg

LEGEND

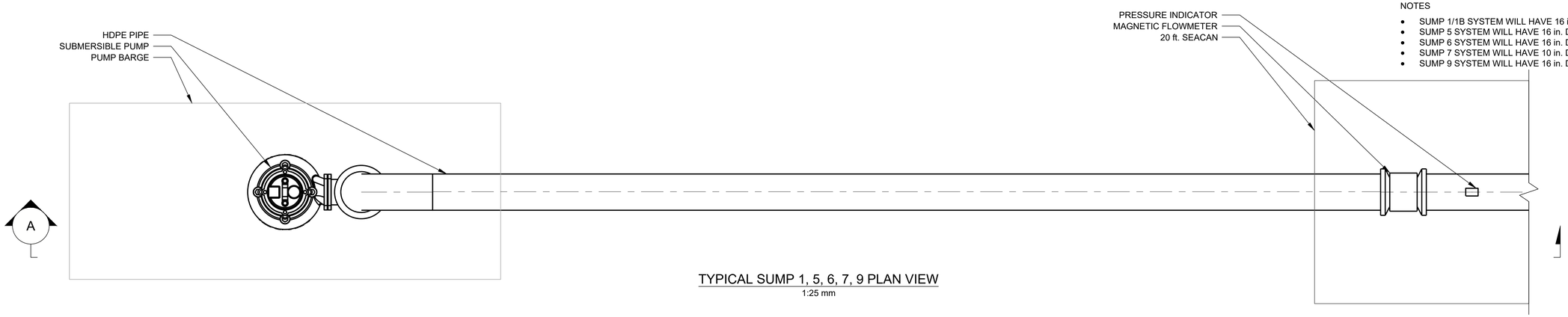
ROCK

CENTERLINE

WATER LINE

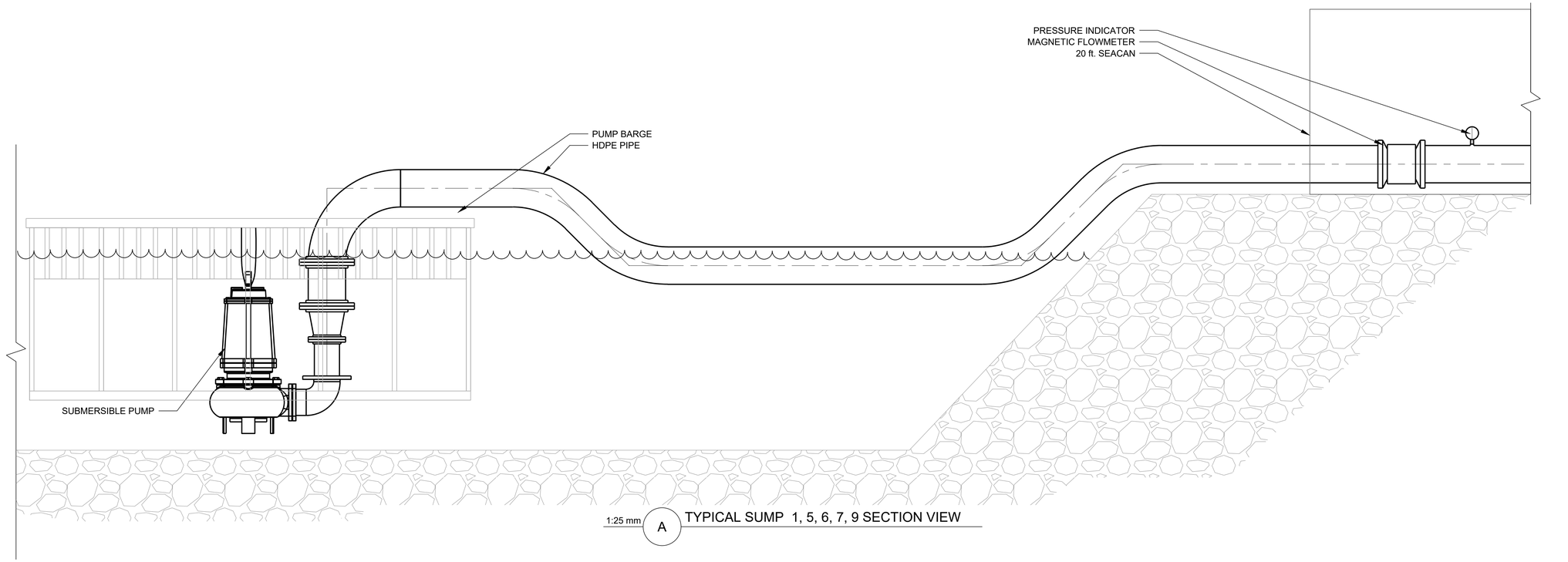
NOTES

- SUMP 1/1B SYSTEM WILL HAVE 16 in. DR 17 HDPE PIPING.
- SUMP 5 SYSTEM WILL HAVE 16 in. DR 17 HDPE PIPING.
- SUMP 6 SYSTEM WILL HAVE 16 in. DR 17 HDPE PIPING.
- SUMP 7 SYSTEM WILL HAVE 10 in. DR 11 HDPE PIPING.
- SUMP 9 SYSTEM WILL HAVE 16 in. DR 17 HDPE PIPING.



TYPICAL SUMP 1, 5, 6, 7, 9 PLAN VIEW

1:25 mm



1:25 mm A TYPICAL SUMP 1, 5, 6, 7, 9 SECTION VIEW

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

CLIENT

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CANADA, H3H 1P9
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PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

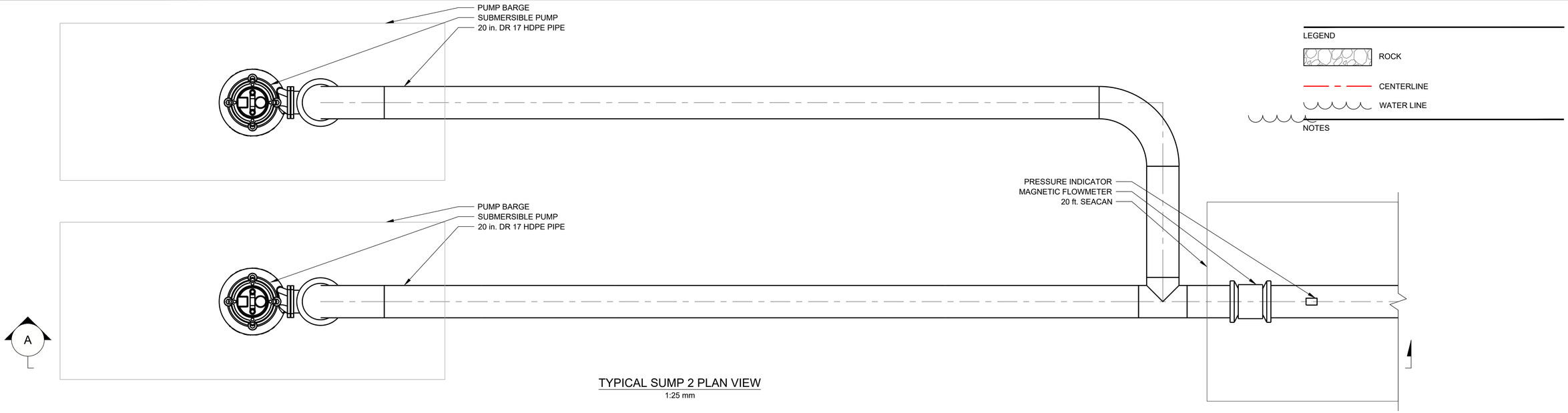
MECHANICAL LAYOUT
TYPICAL FOR SUMP 1, SUMP 5, SUMP 6, SUMP 7, SUMP 9

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-003-001

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

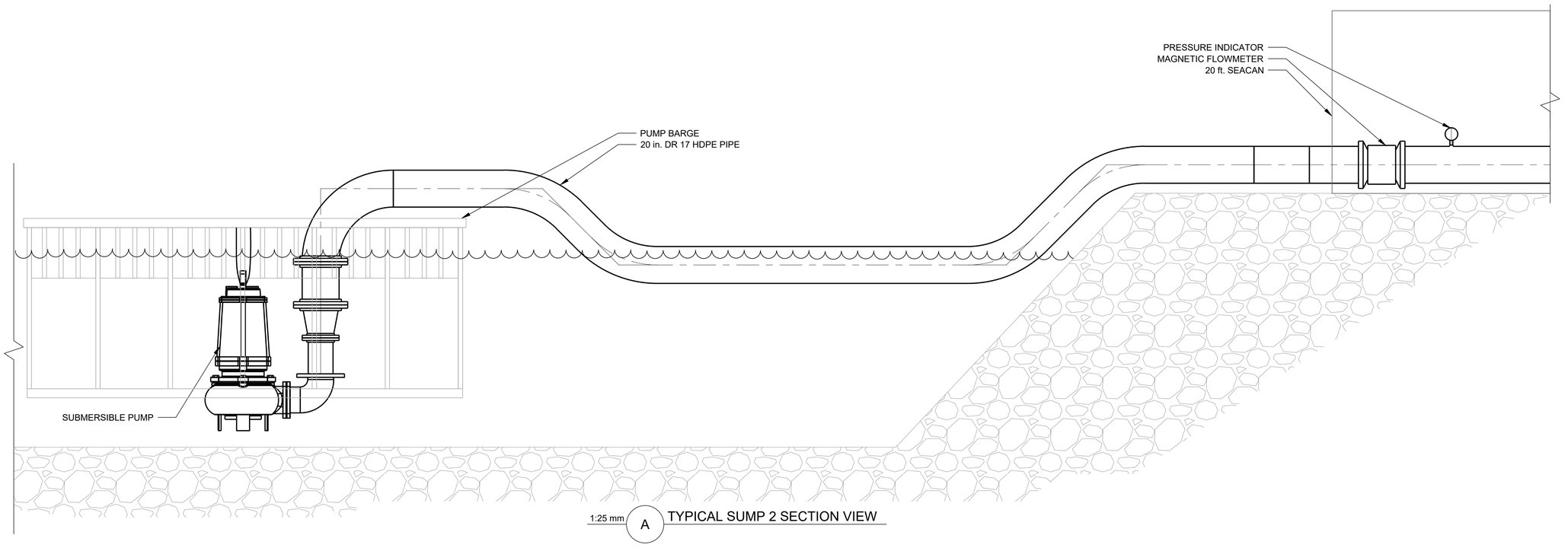
0 25 mm

Path: \\golder.gds\complexdata\office\Ontario\PID\20123\22575540 Troilus\PLANT 3D\22575540 Troilus\Orthos\DWGs\General Arrangement\ | File Name: G-01.dwg



TYPICAL SUMP 2 PLAN VIEW

1:25 mm



1:25 mm A TYPICAL SUMP 2 SECTION VIEW

LEGEND

ROCK

CENTERLINE

WATER LINE

NOTES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

CLIENT

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CONSULTANT

WSP
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MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

MECHANICAL LAYOUT
SUMP 2

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-003-002

Path: \\golder.gds\complexdata\office\Ontario\PID\20123\22575540 Troilus\PLANT 3D\22575540 Troilus\Orthos\DWGs\General Arrangement\ | File Name: G-02.dwg

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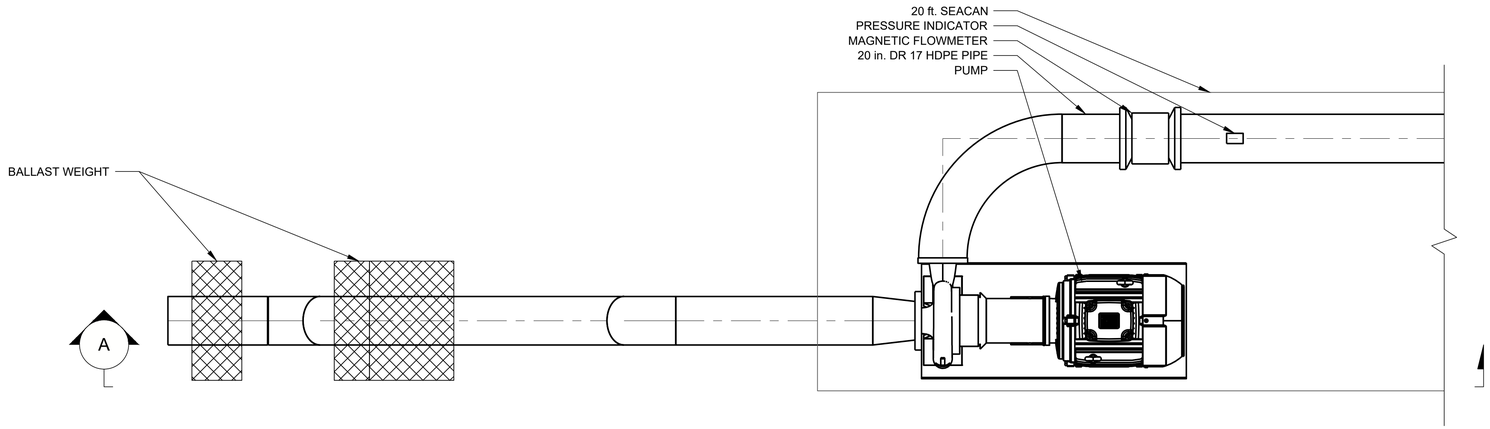
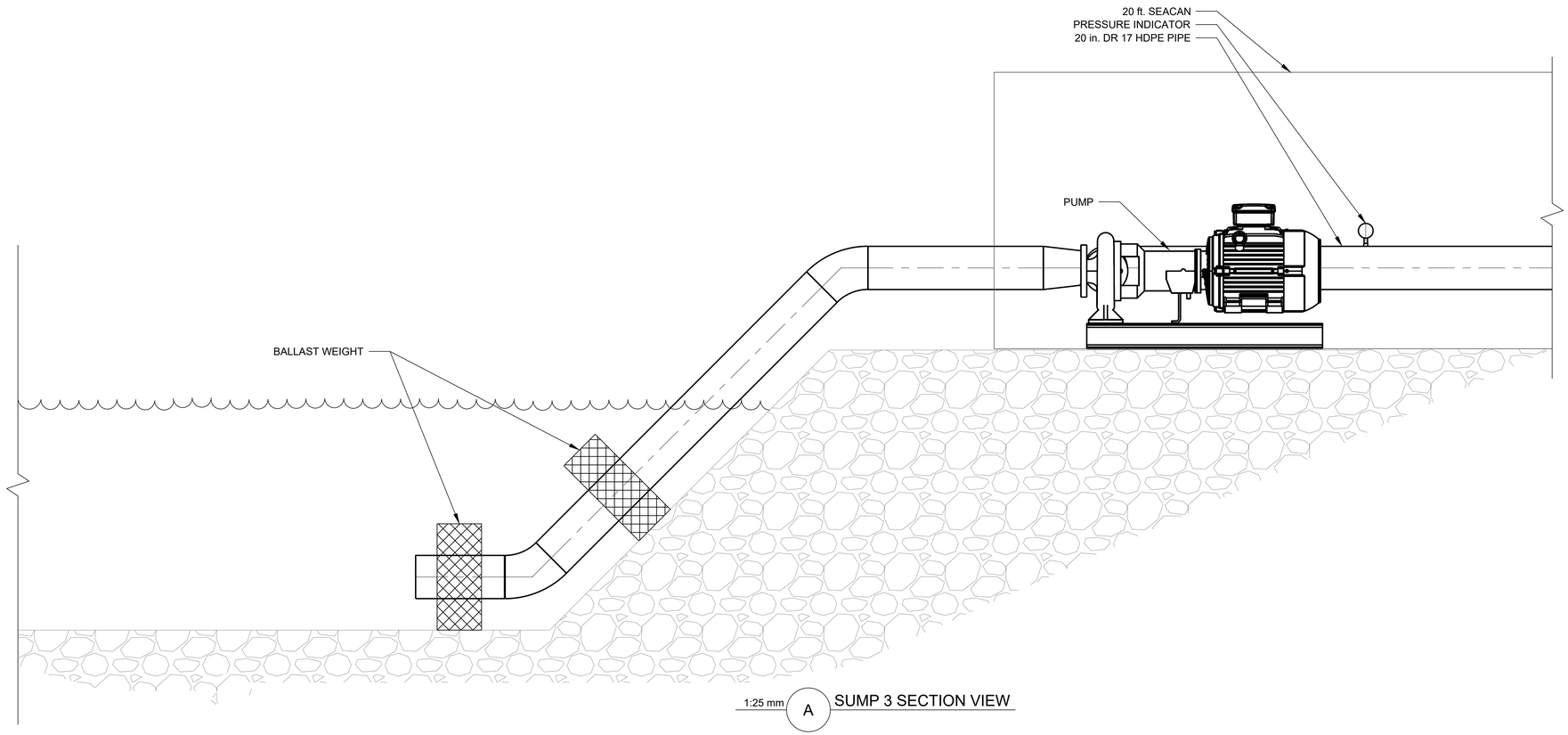


SUMP 3 PLAN VIEW
1:25 mm



1:25 mm A SUMP 3 SECTION VIEW

LEGEND

ROCK

CENTERLINE

WATER LINE

NOTES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

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CANADA, H3H 1P9
[+1] (514) 340 0046
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PROJECT
TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE
MECHANICAL LAYOUT
SUMP 3

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-003-003

Path: \\golder.gds\complexdata\office\Ontario\PID\2023\22575540 Troilus\PLANT 3D\22575540 Troilus\Orthos\DWGs\General Arrangement\ | File Name: G-03.dwg

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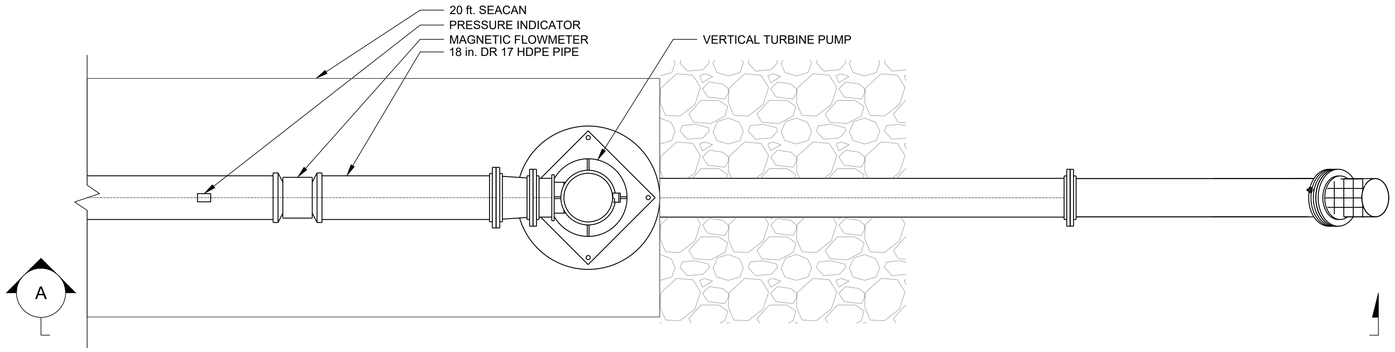
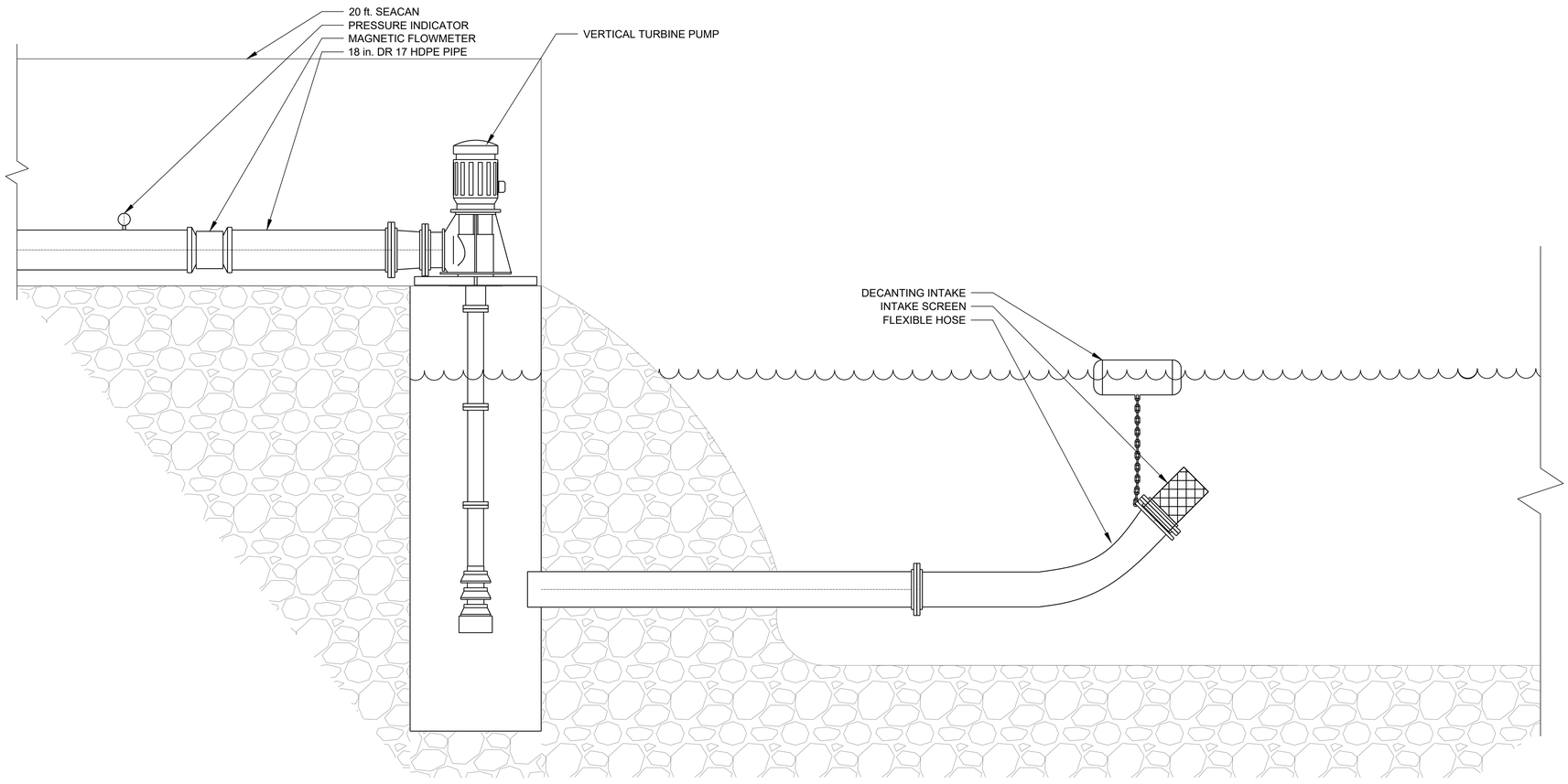


TYPICAL SEDIMENTATION POND 1 PLAN VIEW

1:35 mm



1:35 mm A TYPICAL SEDIMENTATION POND 1 SECTION VIEW

LEGEND

ROCK

CENTERLINE

WATER LINE

NOTES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

CLIENT

TROILUS

CONSULTANT

WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
www.golder.com

PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

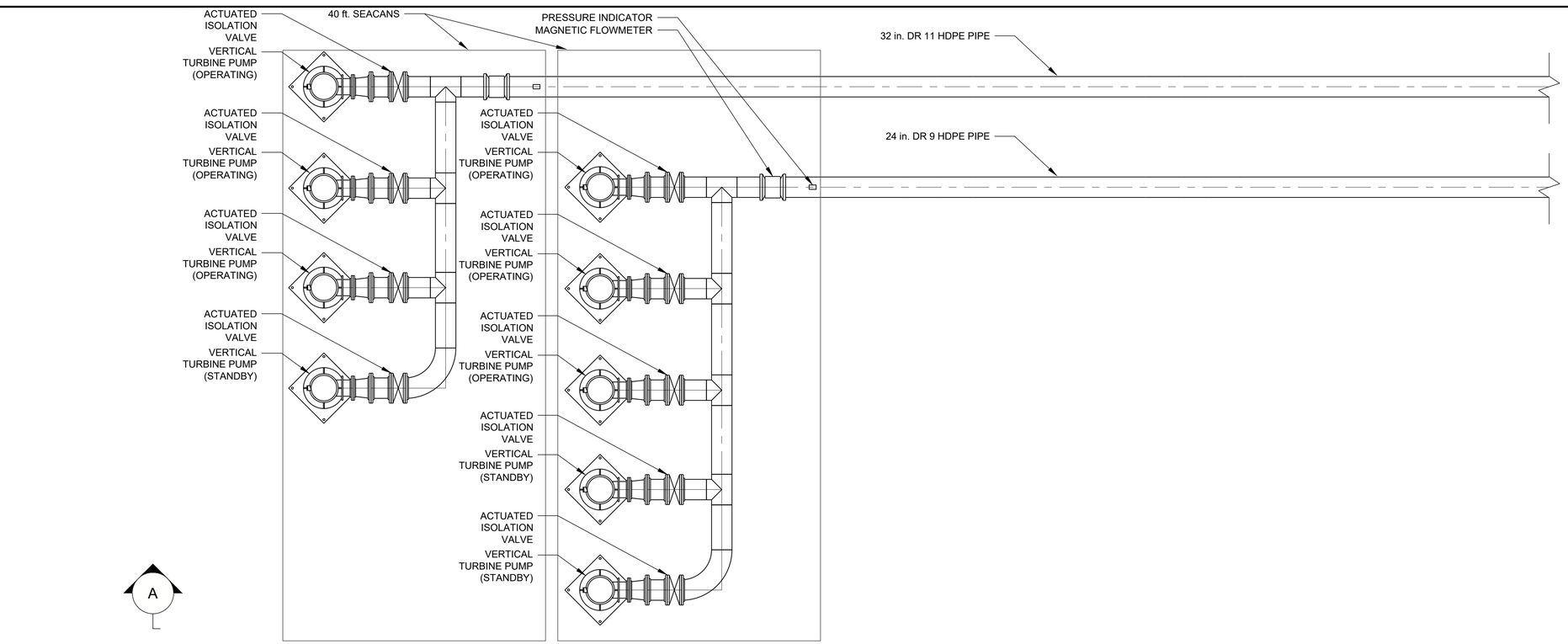
MECHANICAL LAYOUT
SEDIMENTATION POND 1

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-003-004

Path: \\golder.gds\complexdata\office\Ontario\PID\20232275540 Troilus\PLANT 3D\22575540 Troilus\Orthos\DWGs\General Arrangement\ | File Name: G-04.dwg

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

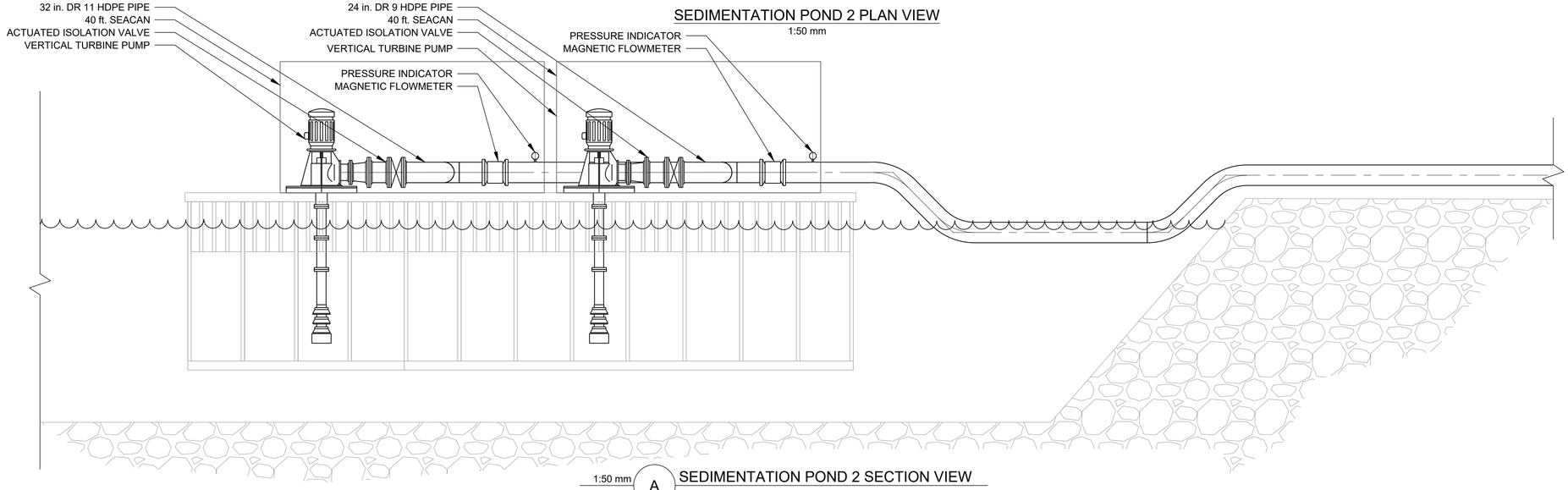
0 25 mm



A

SEDIMENTATION POND 2 PLAN VIEW

1:50 mm



1:50 mm A SEDIMENTATION POND 2 SECTION VIEW

LEGEND

ROCK

CENTERLINE

WATER LINE

NOTES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

CLIENT

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CONSULTANT

WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
www.golder.com

PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

MECHANICAL LAYOUT
SEDIMENTATION POND 2

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-003-005

Path: \\golder.gds\complexdata\office\Ontario\PID\20232\22575540 Troilus\PLANT 3D\22575540 Troilus\Ortthos\DWGs\General Arrangement\ | File Name: G-05.dwg

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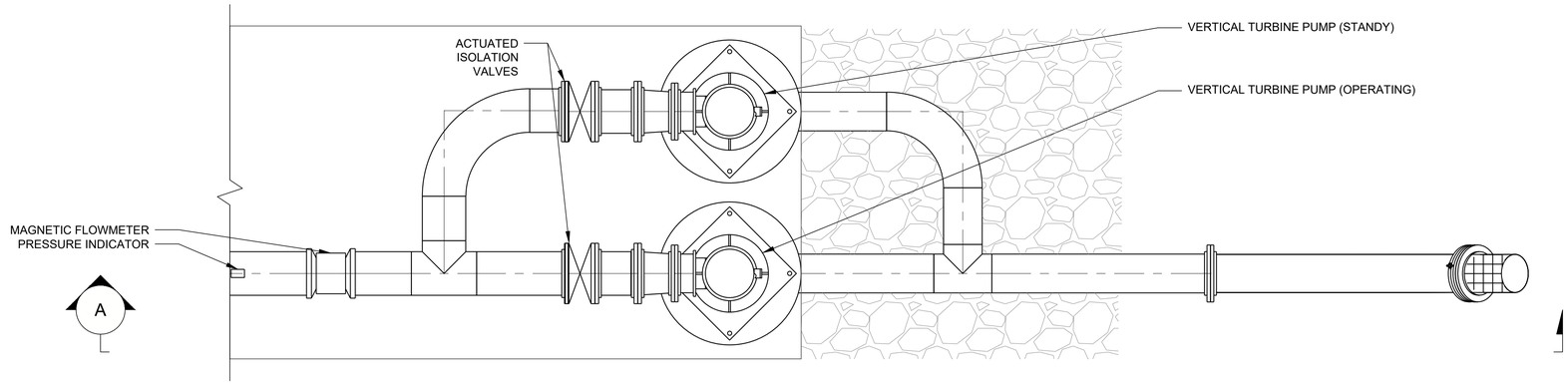
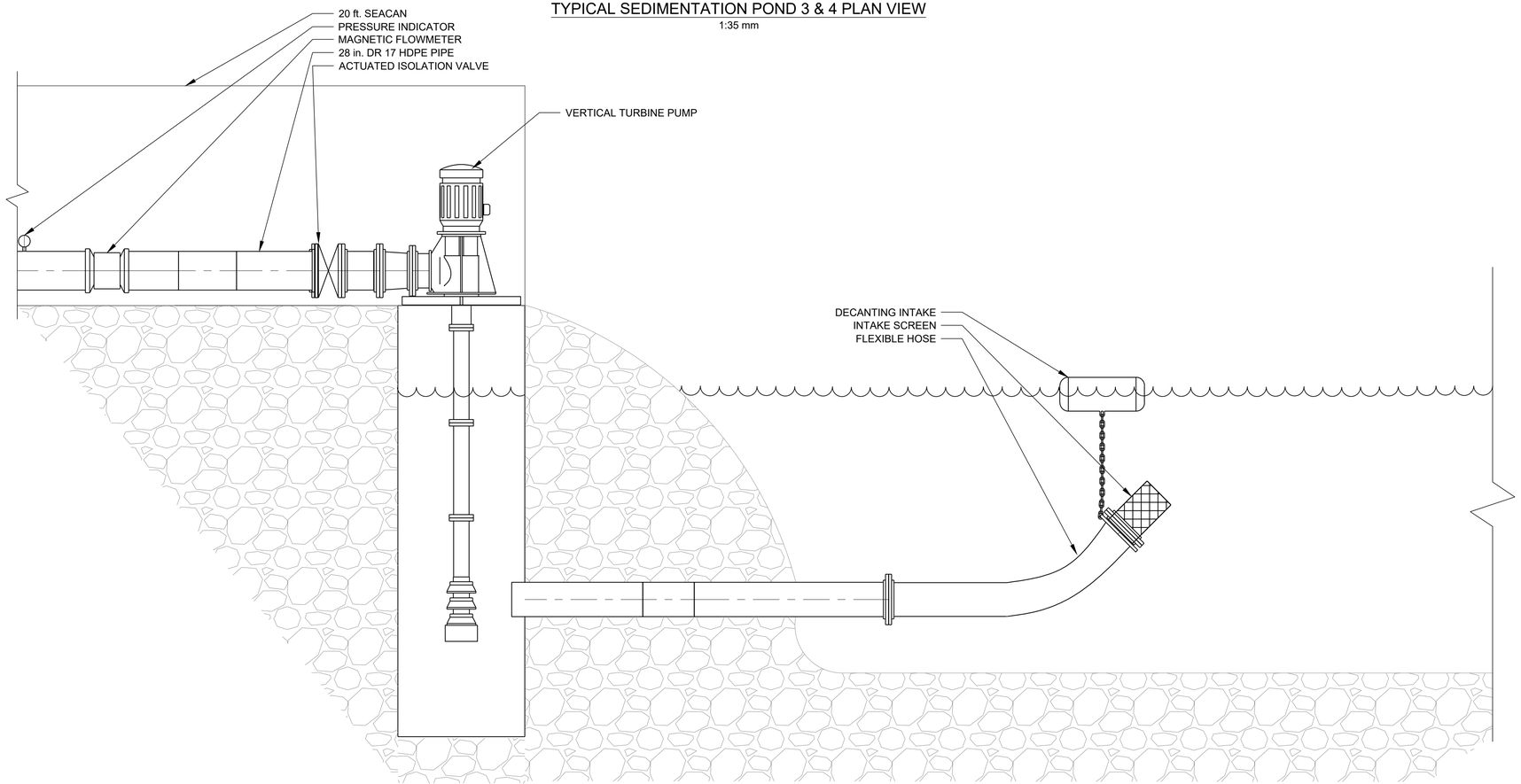


TYPICAL SEDIMENTATION POND 3 & 4 PLAN VIEW

1:35 mm



1:35 mm A TYPICAL SEDIMENTATION POND 3 & 4 SECTION VIEW

LEGEND

ROCK

CENTERLINE

WATER LINE

NOTES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-03-08	ISSUED FOR REVIEW	MV	OA	AF	PP

SEAL

CLIENT

TROILUS

CONSULTANT

WSP
1600 BOULEVARD RENÉ-LÉVESQUE WEST
MONTRÉAL, QUÉBEC
CANADA, H3H 1P9
[+1] (514) 340 0046
www.golder.com

PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

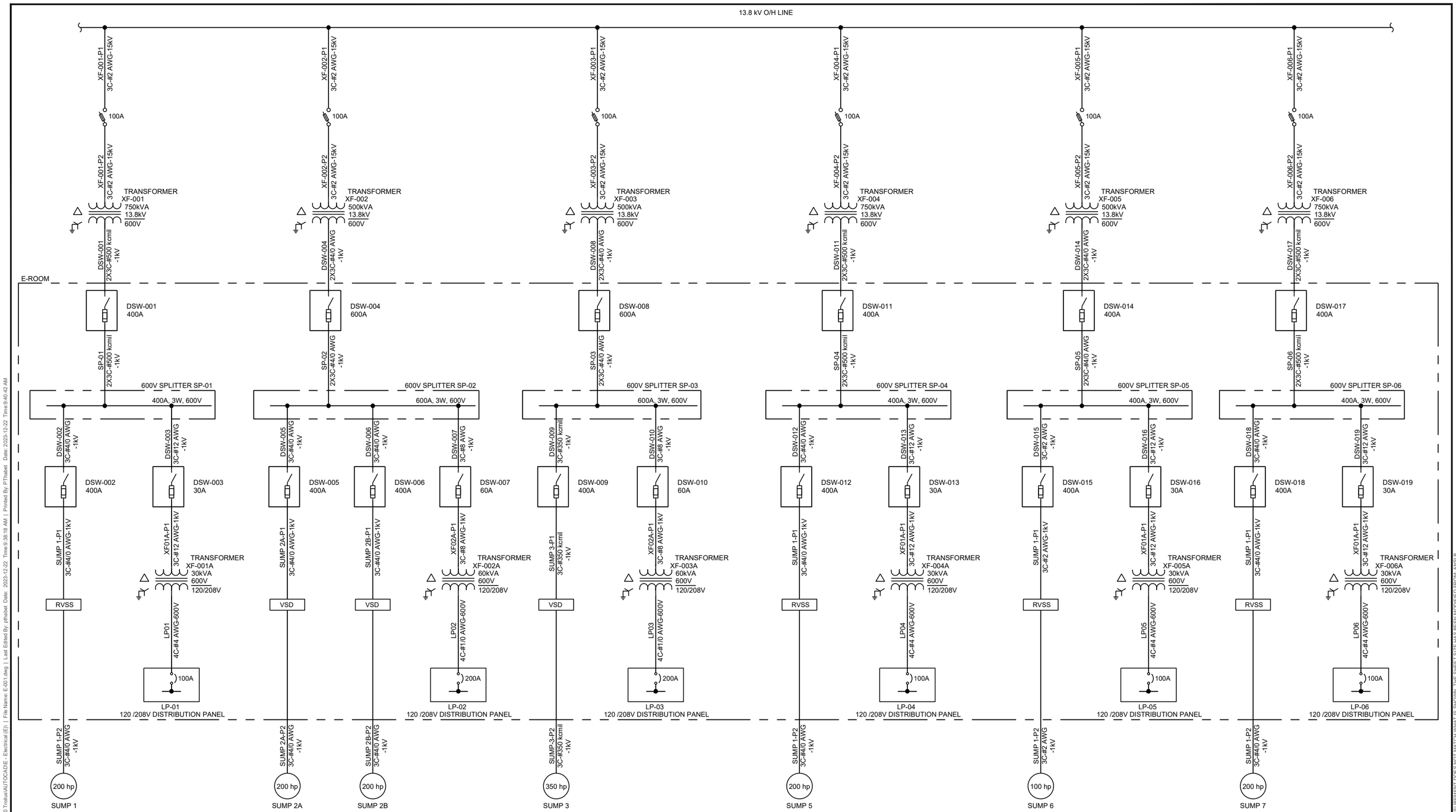
TITLE

MECHANICAL LAYOUT
TYPICAL FOR SEDIMENTATION POND 3 & SEDIMENTATION POND 4

PROJECT NO.	REV.	DRAWING
22575540	A	PPL-003-006

Path: \\golder.gds\complexdata\office\Ontario\PID\22/23\22575540 Troilus\PLANT 3D\22575540 Troilus\Ortho\DWG\a\General Arrangement\ | File Name: G-06.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
0 25 mm



REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2023-12-22	ISSUED FOR REVIEW	PT	PT	PLE	VR

CLIENT
TROILUS

CONSULTANT
GOLDER ASSOCIATES LTD
33 MACKENZIE ST.
SUITE 100, SUDBURY, ONTARIO
CANADA, P3C 4Y1
[+1] (705) 524 6861
www.golder.com

PROJECT
TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

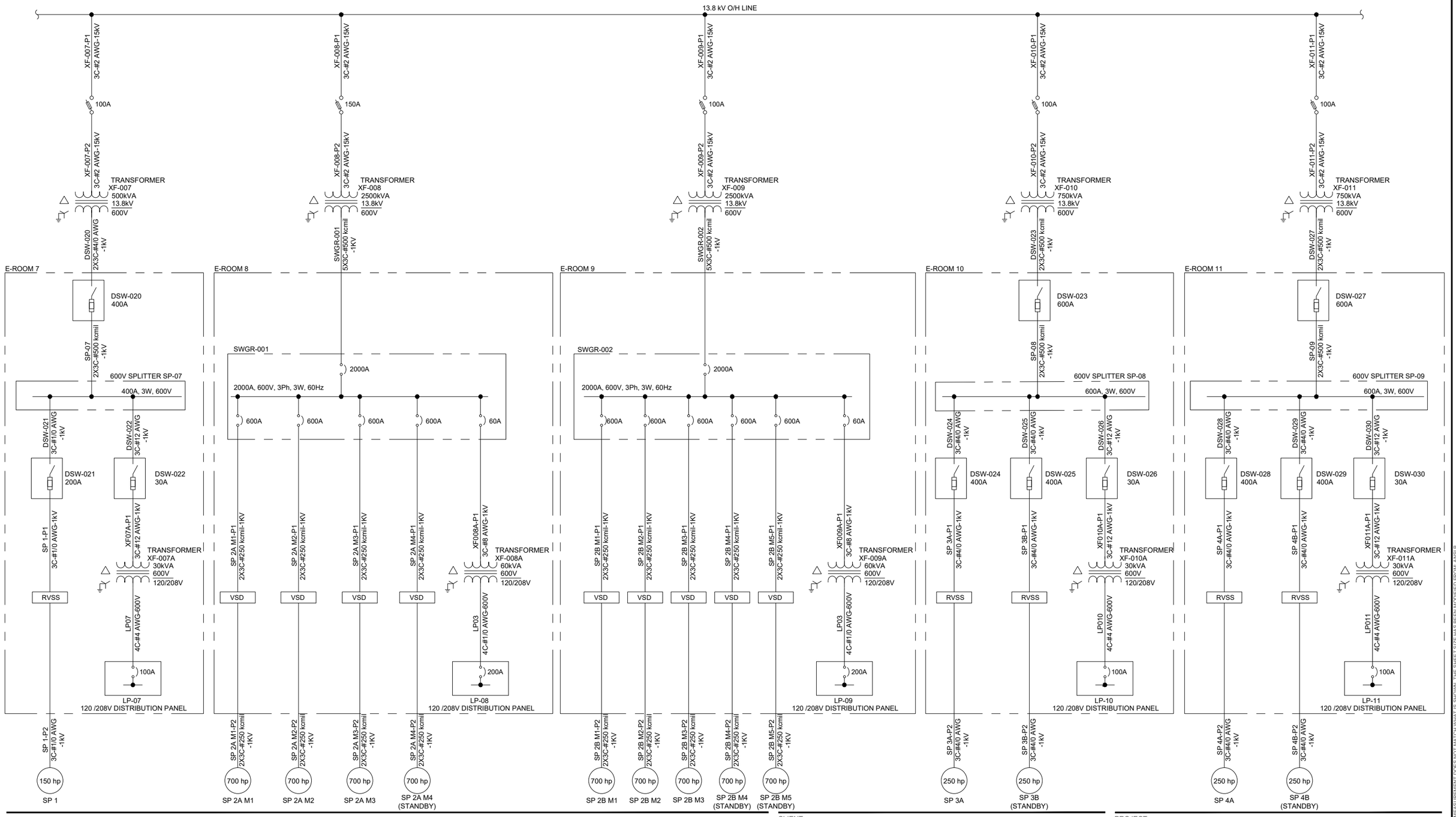
TITLE
SUMP PUMPS
SINGLE LINE DIAGRAM

PROJECT NO. 22575540
REV. A
DRAWING E-001

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

25 mm

Path: \\golder.gds\gal\mississauga\Paste\20232257\5540 Troilus\AUTOCAD\E - Electrical (EI) | File Name: E-001.dwg | Last Edited By: pthabet Date: 2023-12-22 Time:9:38:18 AM | Printed By: PThabet Date: 2023-12-22 Time:9:40:42 AM



REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2023-12-22	ISSUED FOR REVIEW	PT	PT	PLE	PLE

CLIENT

TROILUS

CONSULTANT

wsp

GOLDER ASSOCIATES LTD
33 MACKENZIE ST.
SUITE 100, SUDBURY, ONTARIO
CANADA, P3C 4Y1
[+1] (705) 524 6861
www.golder.com

PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

SEDIMENTATION POND PUMPING
SINGLE LINE DIAGRAM

PROJECT NO. 22575540

REV. A

DRAWING PPL-004-002

Path: \\golder.gds\gal\Mississauga\Paste\2023\22575540 Troilus\AUTOCAD\E - Electrical (E)\ | File Name: E-002.dwg | Last Edited By: pthabet Date: 2024-03-01 Time:3:25:16 PM | Printed By: PThabet Date: 2024-03-01 Time:3:25:27 PM

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

0 25 mm

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2023-12-22	ISSUED FOR REVIEW	PT	PT	PLE	PLE

CLIENT

TROILUS

CONSULTANT

GOLDER ASSOCIATES LTD
33 MACKENZIE ST.
SUITE 100, SUDBURY, ONTARIO
CANADA, P3C 4Y1
[+1] (705) 524 6861
www.golder.com

PROJECT

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY

TITLE

SEDIMENTATION POND PUMPING
SINGLE LINE DIAGRAM

PROJECT NO.	REV.	DRAWING
1234567	A	PPL-004-003

Path: \\golder.gds\gal\Mississauga\Paste\20232257\5540 Troilus\AUTOCAD\E - Electrical (E)\ | File Name: E-003.dwg | Last Edited By: pthabet Date: 2024-02-14 Time:11:05:50 AM | Printed By: PThabet Date: 2024-02-14 Time:11:08:21 AM

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

0 25 mm

APPENDIX C

Expenditures

Total Capex by Annum[1]			Opex by Annum[1,2]		
Year	Capital Cost ($CAD)	EPCM ($CAD)[3]	Spares	Kwh	Man-Hours[4]
-3	$ 1 443 564.00	$ 74 417.87	$ -	-	0
-2	$ 13 415 410.00	$ 609 110.76	$ 204 241.30	3 617 769.63	657
-1	$ 4 647 746.00	$ 234 238.64	$ 252 388.59	3 946 771.30	800
1	$ 13 813 475.00	$ 618 138.15	$ 460 212.10	5 061 813.60	1182
2	$ 1 829 576.00	$ 207 210.26	$ 494 747.14	5 061 813.60	1344
3	$ -	$ -	$ 494 747.14	5 061 813.60	1344
4	$ 1 350 170.00	$ 73 237.43	$ 494 747.14	5 061 813.60	1344
5	$ -	$ -	$ 505 840.43	5 590 481.38	1411
6	$ -	$ -	$ 505 840.43	5 590 481.38	1411
7	$ -	$ -	$ 505 840.43	5 590 481.38	1411
8	$ 697 199.00	$ 19 993.51	$ 514 879.82	5 767 773.04	1431
9	$ -	$ -	$ 514 879.82	5 767 773.04	1431
10	$ -	$ -	$ 514 879.82	5 767 773.04	1431

Summary of Systems																			
System	Year of Construction	First Year of Operation	Pump Type	Duty	Standby	Pump location	E-house location	Total flowrate (m3/h)	length (m) (tdh m)	Motor size (hp) / pump	Voltage	Drive	Selected Tx	OPEX - Spares	OPEX - Hours	OPEX kWh	CAPEX	EPCM	Capex changes Feasibility vs Pre-Feasibility
Sump 1	1	1	Submersible	1		Barge	Shore	900	1615 [29]	200	600	RVSS	750	21 503	90	141 833	1 357 588	94 816	
Sump 2	-1	-1	Submersible	2		Barge	Shore	1080	290 [52]	200	600	RVSS	500	18 833	39	129 232	1 213 853	35 793	Not included in PFS
Sump 3	-1	-1	Self Priming	1		Shore	Shore	1080	585 [69]	350	600	RVSS	500	11 876	44	143 037	855 468	53 929	
Sump 5	-1	-1	Submersible	1		Barge	Shore	720	1140 [31]	200	600	RVSS	750	17 438	60	56 733	1 142 575	70 428	PFS used existing pump
Sump 6	-2	-2	Submersible	1		Barge	Shore	720	515 [18]	100	600	RVSS	500	10 147	37	101 430	764 007	38 684	
Sump 7	8	8	Submersible	1		Barge	Shore	720	205 [26]	200	600	RVSS	750	9 039	20	177 292	697 199	19 994	Not included in PFS
Sump 9	-2	-2	Submersible	1		Barge	Shore	1080	395 [29]	250	600	RVSS	750	11 772	30	189 644	838 031	32 764	Not included in PFS or Rev A.
SP 1	-1	1	Vertical Turbine	1		Shore	Shore	1440	300 [13]	150	600	RVSS	500	10 688	105	858 718	1 435 850	74 089	
SP 2A	-2	-2	Vertical Turbine	3	1	Barge	Barge	3600	2700 [113]	700	4160	VSD	2500	169 193	555	3 055 360	11 813 372	537 662	In PFS named SP2_2 Flowrate was 3200 m3/h and line length was 1625.
SP 2B	1	1	Vertical Turbine	3	2	Barge	Barge	1703	3530 [134]	700	4160	VSD	1500	175 633	187	114 491	12 455 887	523 322	In PFS named SP2_1 Flowrate was 360 m3/h and discharged to TSF and used an existing pump. In FS the line length is longer and discharges to the mill
SP 3	4	5	Lo-Lift	1	1	Shore	Shore	3600	10 [3]	250	600	RVSS	750	11 093	67	528 668	1 350 170	73 237	
SP 4	-3	-2	Lo-Lift	1	1	Shore	Shore	3600	20 [8]	250	600	RVSS	750	13 129	35	271 336	1 443 564	74 418	Not included in PFS
TSF to Water Treatment Plant	2	2	N/A	N/A	N/A	N/A	N/A	1200	3190 [75]	N/A	N/A	N/A	N/A	31 418	161	0	1 664 068	188 506	Not included in PFS
Water Treatment Plant Overflow	2	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3 117	1	0	165 508	18 704	Not included in PFS
All Systems	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	514 880	1 431	5 767 773	37 197 140	1 836 347	associated with mitigating the solids discharge from the sedimentation ponds

1. Currency Specification: All financial figures presented herein are denominated in 2023 dollars, ensuring alignment with the current fiscal context.
2. Operational Expenditure Scope for TSF to Water Treatment Plant and Water Treatment Plant Overflow Systems: Within the evaluation of operational costs, it is pertinent to note that, for the TSF and Overflow systems, only operational expenditures related to piping have been considered. It is essential to underscore that pump-related expenses are expressly excluded from
3. EPCM - Engineering Procurement and Construction Management (remote design clarification and support)
4. Man-Hours Clarification: The recorded man-hours explicitly represent direct working hours and do not encompass mobility hours.

Assumptions
Assumed power is brought to the e-houses
Assuming culverts and crossings not included
Assuming access to pipeline is available (snow removed from roads)
Maintenance hours' assumes no mobile/driving time
TSF to Water Treatment Plant Pipeline requires an alignment change near year 21. This change is not currently accounted for in the Expenditures.

Project Number:	2257554004	**Troilus Gold Corporation**	**Sign-Offs**	**Initials**	**Date**
Project Type:	Feasibility Study	**Troilus Project**	**Designed by:**	M. Valkenburg	28-févr-24
Date:	28-févr-24	**Site-Wide WMP - Pumping Systems**	**Checked by:**	A. Fontaine Ing.	28-févr-24
Revision:	E	**CAPEX (-20%+30%)**	**Approved by:**	P. Primeau, Ing.	28-févr-24

General Information:

Mineral(s): Gold / Copper

Data Sources

Provided by Vlad Rojanschi

Previous Studies	PS
WSP:	WSP
Firm Price	F
Budget Quotes	B
Historical Data	H
Factored	Z
Allowances	A

Disclaimer

Expenditures do not encompass the costs associated with earthworks required for the excavation and leveling of the pipeline corridor to ensure optimal drainage. Additionally, they exclude expenses related to earthworks and protective measures for the pipeline at road crossings.

OPTION #1

DESCRIPTION

Equipment		Quantity	Unit	Material		Labour			WBS Cost (CAD)	Source	Remarks
				U. Cost (CAD)	T. Cost (CAD)	Hours/Unit	Labour Rate ($/hr)	Total Labour ($WBS)			
Major Equipment					**$ 9 499 019**			**$ 699 000**	**$ 10 198 019**		
					$ -		$ 150	$ -	$ -		
Sump 1	Main pump (GSZ-150-4)	1	ea	$ 135 789	$ 135 789	120	$ 150	$ 18 000	$ 153 789	B	
	Barge (Defender 5800), incl.pipe fittings	1	ea	$ 91 000	$ 91 000	40	$ 150	$ 6 000	$ 97 000	B	
	Air-o-lator	2	ea	$ 3 750	$ 7 500	10	$ 150	$ 3 000	$ 10 500	B	
Sump 2	Main pump (GSZ-150-4)	2	ea	$ 135 789	$ 271 578	120	$ 150	$ 36 000	$ 307 578	B	
	Barge (Defender 5800), incl.pipe fittings	2	ea	$ 91 000	$ 182 000	40	$ 150	$ 12 000	$ 194 000	B	
	Air-o-lator	2	ea	$ 3 750	$ 7 500	10	$ 150	$ 3 000	$ 10 500	B	
Sump 3	Main pump (Cornell 10RB), incl. skid	1	ea	$ 127 610	$ 127 610	120	$ 150	$ 18 000	$ 145 610	B	
	Raft	1	ea	$ 2 000	$ 2 000	40	$ 150	$ 6 000	$ 8 000	B	
	Air-o-lator	2	ea	$ 3 750	$ 7 500	10	$ 150	$ 3 000	$ 10 500	B	
Sump 5	Main pump (GSZ-150-4)	1	ea	$ 135 789	$ 135 789	120	$ 150	$ 18 000	$ 153 789	B	
	Barge (Defender 5800), incl.pipe fittings	1	ea	$ 91 000	$ 91 000	40	$ 150	$ 6 000	$ 97 000	B	
	Air-o-lator	2	ea	$ 3 750	$ 7 500	10	$ 150	$ 3 000	$ 10 500	B	
Sump 6	Main pump (GSZ-75-4L)	1	ea	$ 67 226	$ 67 226	120	$ 150	$ 18 000	$ 85 226	B	
	Barge (Defender 5800), incl.pipe fittings	1	ea	$ 91 000	$ 91 000	40	$ 150	$ 6 000	$ 97 000	B	
	Air-o-lator	2	ea	$ 3 750	$ 7 500	10	$ 150	$ 3 000	$ 10 500	B	
Sump 7	Main pump (GSZ-150-4)	1	ea	$ 135 789	$ 135 789	120	$ 150	$ 18 000	$ 153 789	B	
	Barge (Defender 5800), incl.pipe fittings	1	ea	$ 91 000	$ 91 000	40	$ 150	$ 6 000	$ 97 000	B	
	Air-o-lator	2	ea	$ 3 750	$ 7 500	10	$ 150	$ 3 000	$ 10 500	B	
Sump 9	Main pump (GSZ-150-4)	1	ea	$ 156 157	$ 156 157	120	$ 150	$ 18 000	$ 174 157	Z	
	Barge (Defender 5800), incl.pipe fittings	1	ea	$ 91 000	$ 91 000	40	$ 150	$ 6 000	$ 97 000	Z	
	Air-o-lator	2	ea	$ 3 750	$ 7 500	10	$ 150	$ 3 000	$ 10 500	Z	
SP 1	Main pump (VTT 6000, 1 st.), incl. pipe fittings	1	ea	$ 236 590	$ 236 590	120	$ 150	$ 18 000	$ 254 590	B	
SP 2A	Main pump (VTT 6000, 5 st.), incl. pipe fittings	3	ea	$ 312 237	$ 936 711	200	$ 150	$ 90 000	$ 1 026 711	B	
	Spare pump (VTT 6000, 5 st.), incl. pipe fittings	1	ea	$ 312 237	$ 312 237	200	$ 150	$ 30 000	$ 342 237	B	
	Barge	1	ea	$ 2 000 000	$ 2 000 000	400	$ 150	$ 60 000	$ 2 060 000	B	
	Air-o-lator	2	ea	$ 3 750	$ 7 500	10	$ 150	$ 3 000	$ 10 500	B	
SP 2B	Main pump (VTT 6000, 5 st.), incl. pipe fittings	3	ea	$ 312 237	$ 936 711	200	$ 150	$ 90 000	$ 1 026 711	B	
	Spare pump (VTT 6000, 5 st.), incl. pipe fittings	2	ea	$ 312 237	$ 624 474	200	$ 150	$ 60 000	$ 684 474	B	
	Barge	1	ea	$ 2 000 000	$ 2 000 000	400	$ 150	$ 60 000	$ 2 060 000	B	
	Air-o-lator	2	ea	$ 3 750	$ 7 500	10	$ 150	$ 3 000	$ 10 500	B	
SP 3	Main pump (Lolift 24-LL20P)	1	ea	$ 163 630	$ 163 630	120	$ 150	$ 18 000	$ 181 630	B	
	Spare pump (Lolift 24-LL20P)	1	ea	$ 163 630	$ 163 630	120	$ 150	$ 18 000	$ 181 630	B	
SP 4	Main pump (Lolift 24-20LLMFH)	1	ea	$ 194 299	$ 194 299	120	$ 150	$ 18 000	$ 212 299	B	
	Spare pump (Lolift 24-20LLMFH)	1	ea	$ 194 299	$ 194 299	120	$ 150	$ 18 000	$ 212 299	B	
Civil/Structural					**$ 1 167 100**			**$ 76 500**	**$ 1 243 600**		
Sump 1	Barge shoring (Defender 5800)	1	ea	$ 3 000	$ 3 000	50	$ 150	$ 7 500	$ 10 500	Z	
	Barge anchoring pad (Defender 5800)	3	ea	$ 3 000	$ 9 000	0	$ 150	$ -	$ 9 000	Z	Labor cost included in material cost
	E-house Pad	1	ea	$ 3 600	$ 3 600	0	$ 150	$ -	$ 3 600	Z	Labor cost included in material cost
Sump 2	Barge shoring (Defender 5800)	1	ea	$ 3 000	$ 3 000	50	$ 150	$ 7 500	$ 10 500	Z	
	Barge anchoring pad (Defender 5800)	3	ea	$ 3 000	$ 9 000	0	$ 150	$ -	$ 9 000	Z	Labor cost included in material cost
	E-house Pad	1	ea	$ 3 600	$ 3 600	0	$ 150	$ -	$ 3 600	Z	Labor cost included in material cost
Sump 3	Barge shoring	1	ea	$ 3 000	$ 3 000	50	$ 150	$ 7 500	$ 10 500	Z	
	Barge anchoring pad	3	ea	$ 3 000	$ 9 000	0	$ 150	$ -	$ 9 000	Z	Labor cost included in material cost
	E-house Pad	1	ea	$ 3 600	$ 3 600	0	$ 150	$ -	$ 3 600	Z	Labor cost included in material cost
Sump 5	Barge shoring (Defender 5800)	1	ea	$ 3 000	$ 3 000	50	$ 150	$ 7 500	$ 10 500	Z	
	Barge anchoring pad (Defender 5800)	3	ea	$ 3 000	$ 9 000	0	$ 150	$ -	$ 9 000	Z	Labor cost included in material cost
	E-house Pad	1	ea	$ 3 600	$ 3 600	0	$ 150	$ -	$ 3 600	Z	Labor cost included in material cost
Sump 6	Barge shoring (Defender 5800)	1	ea	$ 3 000	$ 3 000	50	$ 150	$ 7 500	$ 10 500	Z	
	Barge anchoring pad (Defender 5800)	3	ea	$ 3 000	$ 9 000	0	$ 150	$ -	$ 9 000	Z	Labor cost included in material cost
	E-house Pad	1	ea	$ 3 600	$ 3 600	0	$ 150	$ -	$ 3 600	Z	Labor cost included in material cost
Sump 7	Barge shoring (Defender 5800)	1	ea	$ 3 000	$ 3 000	50	$ 150	$ 7 500	$ 10 500	Z	
	Barge anchoring pad (Defender 5800)	3	ea	$ 3 000	$ 9 000	0	$ 150	$ -	$ 9 000	Z	Labor cost included in material cost
	E-house Pad	1	ea	$ 3 600	$ 3 600	0	$ 150	$ -	$ 3 600	Z	Labor cost included in material cost
Sump 9	Barge shoring (Defender 5800)	1	ea	$ 3 000	$ 3 000	50	$ 150	$ 7 500	$ 10 500	Z	
	Barge anchoring pad (Defender 5800)	3	ea	$ 3 000	$ 9 000	0	$ 150	$ -	$ 9 000	Z	Labor cost included in material cost
	E-house Pad	1	ea	$ 3 600	$ 3 600	0	$ 150	$ -	$ 3 600	Z	Labor cost included in material cost
SP 1	Floating Intake	3	ea	$ 67 000	$ 201 000	10	$ 150	$ 4 500	$ 205 500	Z	
	Intake Structure CSP	5	m		$ -		$ 150	$ -	$ -		Cost to be determined by client
	Intake Structure Inlet Pipe	18	m		$ -		$ 150	$ -	$ -		Cost to be determined by client
	Waste Rock	1800	m^3		$ -		$ 150	$ -	$ -		Cost to be determined by client
	E-house Pad	1	ea	$ 7 200	$ 7 200	0	$ 150	$ -	$ 7 200	Z	Labor cost included in material cost
SP 2	Raft shoring	1	ea	$ 9 000	$ 9 000	50	$ 150	$ 7 500	$ 16 500	Z	
	Raft anchoring pad	3	ea	$ 4 500	$ 13 500	0	$ 150	$ -	$ 13 500	Z	Labor cost included in material cost
	E-house Pad	4	ea	$ 7 200	$ 28 800	0	$ 150	$ -	$ 28 800	Z	Labor cost included in material cost
SP 3	Floating Intake	4	ea	$ 98 000	$ 392 000	10	$ 150	$ 6 000	$ 398 000	Z	
	Intake Structure CSP	5	m		$ -		$ 150	$ -	$ -		Cost to be determined by client
	Intake Structure Inlet Pipe	24	m		$ -		$ 150	$ -	$ -		Cost to be determined by client
	Waste Rock	1800	m^3		$ -		$ 150	$ -	$ -		Cost to be determined by client
	E-house Pad	1	ea	$ 7 200	$ 7 200	0	$ 150	$ -	$ 7 200	Z	Labor cost included in material cost
SP 4	Floating Intake	4	ea	$ 98 000	$ 392 000	10	$ 150	$ 6 000	$ 398 000	Z	
	Intake Structure CSP	5	m		$ -		$ 150	$ -	$ -		Cost to be determined by client
	Intake Structure Inlet Pipe	24	m		$ -		$ 150	$ -	$ -		Cost to be determined by client
	Waste Rock	1800	m^3		$ -		$ 150	$ -	$ -		Cost to be determined by client
	E-house Pad	1	ea	$ 7 200	$ 7 200	0	$ 150	$ -	$ 7 200	Z	Labor cost included in material cost
Piping					**$ 4 629 208**			**$ 3 728 362**	**$ 8 357 569**		
Sump 1	HDPE DR17, 16"	1615	m	$ 128	$ 207 332	1.08	$ 150	$ 262 211	$ 469 544	H	
	Flanges and backing rings	44	ea	$ 150	$ 6 600		$ 150	$ -	$ 6 600	H	
	Construction waste	242	m	$ 128	$ 31 100	1.08	$ 150	$ 39 332	$ 70 432	H	
Sump 2	HDPE DR17, 20"	293	m	$ 201	$ 58 777	1.38	$ 150	$ 60 546	$ 119 323	H	
	Flanges and backing rings	8	ea	$ 200	$ 1 600		$ 150	$ -	$ 1 600	H	
	Construction waste	44	m	$ 201	$ 8 817	1.38	$ 150	$ 9 082	$ 17 898	H	
Sump 3	HDPE DR17, 20"	587	m	$ 201	$ 117 755	1.38	$ 150	$ 121 298	$ 239 053	H	
	Flanges and backing rings	16	ea	$ 200	$ 3 200		$ 150	$ -	$ 3 200	H	
	Construction waste	88	m	$ 201	$ 17 663	1.38	$ 150	$ 18 195	$ 35 858	H	
Sump 5	HDPE DR17, 16"	1135	m	$ 128	$ 145 710	1.08	$ 150	$ 184 279	$ 329 989	H	
	Flanges and backing rings	30	ea	$ 150	$ 4 500		$ 150	$ -	$ 4 500	H	
	Construction waste	170	m	$ 128	$ 21 857	1.08	$ 150	$ 27 642	$ 49 498	H	
Sump 6	HDPE DR17, 16"	516	m	$ 128	$ 66 244	1.08	$ 150	$ 83 778	$ 150 021	H	
	Flanges and backing rings	14	ea	$ 150	$ 2 100		$ 150	$ -	$ 2 100	H	
	Construction waste	77	m	$ 128	$ 9 937	1.08	$ 150	$ 12 567	$ 22 503	H	
Sump 7	HDPE DR11, 10"	207	m	$ 86	$ 17 870	0.75	$ 150	$ 23 424	$ 41 294	H	
	Flanges and backing rings	6	ea	$ 90	$ 540		$ 150	$ -	$ 540	H	
	Construction waste	31	m	$ 86	$ 2 681	0.75	$ 150	$ 3 514	$ 6 194	H	
Sump 9	HDPE DR17, 16"	393	m	$ 128	$ 50 453	1.08	$ 150	$ 63 807	$ 114 261	H	
	Flanges and backing rings	10	ea	$ 150	$ 1 500		$ 150	$ -	$ 1 500	H	
	Construction waste	59	m	$ 128	$ 7 568	1.08	$ 150	$ 9 571	$ 17 139	H	
SP 1	HDPE DR17, 18"	300	m	$ 162	$ 48 747	1.25	$ 150	$ 56 088	$ 104 835	H	
	Flanges and backing rings	8	ea	$ 180	$ 1 440		$ 150	$ -	$ 1 440	H	
	Construction waste	45	m	$ 162	$ 7 312	1.25	$ 150	$ 8 413	$ 15 725	H	
SP 2 to Env, A1	HDPE DR11, 32"	944	m	$ 769	$ 726 304	2.46	$ 150	$ 348 336	$ 1 074 640	H	
	Flanges and backing rings	26	ea	$ 300	$ 7 800		$ 150	$ -	$ 7 800	H	
	Construction waste	142	m	$ 769	$ 108 946	2.46	$ 150	$ 52 250	$ 161 196	H	
SP 2 to Env, A2	HDPE DR17, 28"	1769	m	$ 395	$ 698 066	1.90	$ 150	$ 504 802	$ 1 202 867	H	
	Flanges and backing rings	48	ea	$ 280	$ 13 440		$ 150	$ -	$ 13 440	H	
	Construction waste	265	m	$ 395	$ 104 710	1.90	$ 150	$ 75 720	$ 180 430	H	
SP 2 to Mill, B1	HDPE DR9, 24"	956	m	$ 513	$ 490 734	1.94	$ 150	$ 277 508	$ 768 242	H	
	Flanges and backing rings	26	ea	$ 270	$ 7 020		$ 150	$ -	$ 7 020	H	
	Construction waste	143	m	$ 513	$ 73 610	1.94	$ 150	$ 41 626	$ 115 236	H	
SP 2 to Mill, B2	HDPE DR17, 24"	2574	m	$ 289	$ 743 483	1.64	$ 150	$ 633 204	$ 1 376 687	H	
	Flanges and backing rings	68	ea	$ 200	$ 13 600		$ 150	$ -	$ 13 600	H	
	Construction waste	386	m	$ 289	$ 111 522	1.64	$ 150	$ 94 981	$ 206 503	H	
SP 3	HDPE DR17, 28"	10	m	$ 395	$ 3 946	1.90	$ 150	$ 2 854	$ 6 800	H	
	Flanges and backing rings	0	ea	$ 280	$ -		$ 150	$ -	$ -	H	
	Construction waste	2	m	$ 395	$ 592	1.90	$ 150	$ 428	$ 1 020	H	
SP 4	HDPE DR17, 28"	20	m	$ 395	$ 7 892	1.90	$ 150	$ 5 707	$ 13 599	H	
	Flanges and backing rings	0	ea	$ 280	$ -		$ 150	$ -	$ -	H	
	Construction waste	3	m	$ 395	$ 1 184	1.90	$ 150	$ 856	$ 2 040	H	
TSF to Water Treatment	HDPE DR13.5, 16"	3190	m	$ 159	$ 506 837	1.18	$ 150	$ 565 013	$ 1 071 850	H	
Plant	Flanges and backing rings	86	ea	$ 280	$ 24 080		$ 150	$ -	$ 24 080	H	
	Construction waste	479	m	$ 159	$ 76 026	1.18	$ 150	$ 84 752	$ 160 778	H	
Water Treatment Plant	HDPE DR17, 24"	200	m	$ 289	$ 57 769	1.64	$ 150	$ 49 200	$ 106 969	H	
Overflow	Flanges and backing rings	6	ea	$ 280	$ 1 680		$ 150	$ -	$ 1 680	H	
	Construction waste	30	m	$ 289	$ 8 665	1.64	$ 150	$ 7 380	$ 16 045	H	

OPTION #1 DESCRIPTION											
Equipment		Quantity	Unit	Material		Labour			WBS Cost (CAD)	Source	Remarks
				U. Cost (CAD)	T. Cost (CAD)	Hours/Unit	Labour Rate ($/hr)	Total Labour ($/WBS)			
Electrical & Instrumentation					**$ 7 859 374**			**$ 64 050**	**$ 7 923 424**		
Sump 1	E-house (20' sea-can)	1	ea	$ 80 513	$ 80 513	16	$ 150	$ 2 400	$ 82 913	B	
	Cabling	1	lot	$ 10 168	$ 10 168	8	$ 150	$ 1 200	$ 11 368	Z	based on a combination of power, control, and instrumentation cabling distances on a maximum distance of 200 meters between barge and E-house
	Transformer, 750kVA, 13.8kV/600V	1	ea	$ 53 933	$ 53 933	8	$ 150	$ 1 200	$ 55 133	H	
	Soft Start, Control panel/PLC, instrumentation, flow	1	lot	$ 37 577	$ 37 577	2	$ 150	$ 300	$ 37 877	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
Sump 2	E-house (20' sea-can)	1	ea	$ 80 513	$ 80 513	16	$ 150	$ 2 400	$ 82 913	B	
	Cabling	1	lot	$ 16 072	$ 16 072	8	$ 150	$ 1 200	$ 17 272	Z	based on a combination of power, control, and instrumentation cabling distances on a maximum distance of 200 meters between barge and E-house
	Transformer, 500kVA, 13.8kV/600V	1	ea	$ 52 957	$ 52 957	8	$ 150	$ 1 200	$ 54 157	H	
	Soft Start, Control panel/PLC, instrumentation, flow	2	lot	$ 37 577	$ 75 154	2	$ 150	$ 600	$ 75 754	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
Sump 3	E-house (20' sea-can)	1	ea	$ 80 513	$ 80 513	16	$ 150	$ 2 400	$ 82 913	B	
	Cabling	1	lot		$ -		$ 150	$ -	$ -	Z	Since pumps and electrical equipment are installed in same structure, all cabling is in E-House quote
	Transformer, 500kVA, 13.8kV/600V	1	ea	$ 52 957	$ 52 957	8	$ 150	$ 1 200	$ 54 157	H	
	Soft Start, Control panel/PLC, instrumentation, flow	1	lot	$ 37 577	$ 37 577	2	$ 150	$ 300	$ 37 877	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
Sump 5	E-house (20' sea-can)	1	ea	$ 80 513	$ 80 513	16	$ 150	$ 2 400	$ 82 913	B	
	Cabling	1	lot	$ 10 168	$ 10 168	8	$ 150	$ 1 200	$ 11 368	Z	based on a combination of power, control, and instrumentation cabling distances on a maximum distance of 200 meters between barge and E-house
	Transformer, 750kVA, 13.8kV/600V	1	ea	$ 53 933	$ 53 933	8	$ 150	$ 1 200	$ 55 133	H	
	Soft Start, Control panel/PLC, instrumentation, flow	1	lot	$ 37 577	$ 37 577	2	$ 150	$ 300	$ 37 877	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
Sump 6	E-house (20' sea-can)	1	ea	$ 80 513	$ 80 513	16	$ 150	$ 2 400	$ 82 913	B	
	Cabling	1	lot	$ 9 512	$ 9 512	8	$ 150	$ 1 200	$ 10 712	Z	based on a combination of power, control, and instrumentation cabling distances on a maximum distance of 200 meters between barge and E-house
	Transformer, 500kVA, 13.8kV/600V	1	ea	$ 52 957	$ 52 957	7	$ 150	$ 1 050	$ 54 007	H	
	Soft Start, Control panel/PLC, instrumentation, flow	1	lot	$ 32 577	$ 32 577	2	$ 150	$ 300	$ 32 877	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
Sump 7	E-house (20' sea-can)	1	ea	$ 80 513	$ 80 513	16	$ 150	$ 2 400	$ 82 913	B	
	Cabling	1	lot	$ 9 512	$ 9 512	8	$ 150	$ 1 200	$ 10 712	Z	based on a combination of power, control, and instrumentation cabling distances on a maximum distance of 200 meters between barge and E-house
	Transformer, 750kVA, 13.8kV/600V	1	ea	$ 53 933	$ 53 933	7	$ 150	$ 1 050	$ 54 983	H	
	Soft Start, Control panel/PLC, instrumentation, flow	1	lot	$ 37 577	$ 37 577	2	$ 150	$ 300	$ 37 877	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
Sump 9	E-house (20' sea-can)	1	ea	$ 80 513	$ 80 513	16	$ 150	$ 2 400	$ 82 913	Z	
	Cabling	1	lot	$ 10 168	$ 10 168	8	$ 150	$ 1 200	$ 11 368	Z	based on a combination of power, control, and instrumentation cabling distances on a maximum distance of 200 meters between barge and E-house
	Transformer, 750kVA, 13.8kV/600V	1	ea	$ 53 933	$ 53 933	8	$ 150	$ 1 200	$ 55 133	H	
	Soft Start, Control panel/PLC, instrumentation, flow	1	lot	$ 37 577	$ 37 577	2	$ 150	$ 300	$ 37 877	Z	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
SP 1	E-house (20' sea-can)	1	ea	$ 362 821	$ 362 821	16	$ 150	$ 2 400	$ 365 221	B	
	Cabling	1	lot		$ -		$ 150	$ -	$ -	Z	Since pumps and electrical equipment are installed in same structure, all cabling is in E-House quote
	Transformer, 500kVA, 13.8kV/600V	1	ea	$ 52 957	$ 52 957	7	$ 150	$ 1 050	$ 54 007	H	
	TSS Sensor	1	ea	$ 13 437	$ 13 437	3	$ 150	$ 450	$ 13 887	B	
	Soft Start, Control panel/PLC, instrumentation, flow	1	lot	$ 44 264	$ 44 264	2	$ 150	$ 300	$ 44 564	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
SP 2A	E-house (40' sea-can)	2	ea	$ 451 824	$ 903 648	16	$ 150	$ 4 800	$ 908 448	B	
	Cabling	1	lot		$ -		$ 150	$ -	$ -	Z	Since pumps and electrical equipment are installed in same structure, all cabling is in E-House quote
	Transformer, 2500kVA, 13.8kV/600V	1	ea	$ 280 000	$ 280 000	12	$ 150	$ 1 800	$ 281 800	H	
	TSS Sensor	1	ea	$ 13 437	$ 13 437	3	$ 150	$ 450	$ 13 887	B	
	VFD, Control panel/PLC, instrumentation, flowmete	4	lot	$ 362 597	$ 1 450 388	2	$ 150	$ 1 200	$ 1 451 588	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
SP 2B	E-house (40' sea-can)	2	ea	$ 451 824	$ 903 648	16	$ 150	$ 4 800	$ 908 448	B	
	Cabling	1	lot		$ -		$ 150	$ -	$ -	Z	Since pumps and electrical equipment are installed in same structure, all cabling is in E-House quote
	Transformer, 2500kVA, 13.8kV/600V	1	ea	$ 280 000	$ 280 000	11	$ 150	$ 1 650	$ 281 650	H	
	VFD, Control panel/PLC, instrumentation, flowmete	5	lot	$ 362 597	$ 1 812 985	2	$ 150	$ 1 500	$ 1 814 485	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
SP 3	E-house (20' sea-can)	1	ea	$ 80 513	$ 80 513	16	$ 150	$ 2 400	$ 82 913	B	
	Cabling	1	lot		$ -		$ 150	$ -	$ -	Z	Since pumps and electrical equipment are installed in same structure, all cabling is in E-House quote
	Transformer, 750kVA, 13.8kV/600V	1	ea	$ 53 933	$ 53 933	7	$ 150	$ 1 050	$ 54 983	H	
	TSS Sensor	1	ea	$ 13 437	$ 13 437	3	$ 150	$ 450	$ 13 887	B	
	Soft Start, Control panel/PLC, instrumentation, flow	2	lot	$ 36 654	$ 73 307	2	$ 150	$ 600	$ 73 907	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
SP 4	E-house (20' sea-can)	1	ea	$ 80 513	$ 80 513	16	$ 150	$ 2 400	$ 82 913	B	
	Cabling	1	lot		$ -		$ 150	$ -	$ -	Z	Since pumps and electrical equipment are installed in same structure, all cabling is in E-House quote
	Transformer, 750kVA, 13.8kV/600V	1	ea	$ 53 933	$ 53 933	8	$ 150	$ 1 200	$ 55 133	H	
	TSS Sensor	1	ea	$ 13 437	$ 13 437	3	$ 150	$ 450	$ 13 887	B	
	Soft Start, Control panel/PLC, instrumentation, flow	2	lot	$ 36 654	$ 73 307	2	$ 150	$ 600	$ 73 907	B	Panel containing a simple I/O card & controller (if needed), Ethernet switch and programming. Excludes the communication lines/wifi back to mine HMI.
Total Pipelines and Pumping Direct Costs					**$ 23 154 701**			**$ 4 567 912**	**$ 27 722 613**		
Indirects Cost Allowances									**$ 11 310 868**		
Project Indirects - EPCM		Pipe	15%	Civil	15%	Electrical	5%		$ 1 836 347		% of Direct Costs
Project Indirects - Freight		5%							$ 1 157 736		% of Material Costs
Contingency		20%							$ 5 544 523		% of Total Pipelines and Pumping Direct Costs
Construction Indirects - Commissioning and Vendor Representatives		4%							$ 1 108 905		% of Total Pipelines and Pumping Direct Costs
Construction Indirects - Mobilization and Demobilization		6%							$ 1 663 357		% of Total Pipelines and Pumping Direct Costs
TOTAL PIPELINES AND PUMPING CAPITAL COSTS									**$ 39 033 481**		

OPERATING COSTS PER ANNUM						
Description	Quantity	Unit	Unit Cost	Total Cost (CAD)	Source	Remarks
Consumables				**$ -**		
Power	5 767 773	kWh	$ -	$ -	Z	Electricity rate to be supplied by client
Parts & Supplies	1	Lot	$ 305 941	$ -	Z	3% of Direct Mechanical Equipment including installation
Pipe	1	Lot	$ 208 939	$ -	Z	2.5% of Direct Pipeline Cost including installation
Operators				**$ -**		
Electrical Maintenance	50	Man-hours	$ -	$ -	Z	Individual hours reflect average system requirements per
Pump Maintenance	1000	Man-hours	$ -	$ -	Z	Individual hours reflect average system requirements per year. Does not include mobility hours or overhead.
Pipeline leak Inspection	30	Man-hours	$ -	$ -	Z	Individual hours reflect average system requirements per year. Does not include mobility hours or overhead. System positional costs are accounted for in the Surface water management plan - Operations and Maintenance document.
Instrument Maintenance	50	Man-hours	$ -	$ -	Z	Individual hours reflect average system requirements per year. Does not include mobility hours or overhead.
Pipeline re-routing/repairs	700	Man-hours	$ -	$ -	Z	On crowded sites, some pipeline rerouting and repairs require adjusting.
TOTAL ANNUAL OPERATING COSTS				**$ -**		

APPENDIX D

Technical Documents

Appendix D1: Electrical load list

	GENERAL SPECIFICATION **Piping, Valves and Fittings** **HDPE Pipe DR 9**	TROILUS

PIPING, VALVES AND FITTINGS

SERVICE: Water
CODE: WCW

Maximum Temperature °C	**Pressure kPag**
27	1720
32	1550
43	1380
54	1200
60 (Note 1)	1030

Size mm	**Sch./ Rating**	**Material**	**End Connection**	**Description**	**ASTM**	**Note**
Pipe						
DN 400-800	DR17	HDPE	Fusion Weld (FW)	High density polyethylene pipe PE 4710 (unless noted otherwise).	ASTM D3350	
Fittings						
DN 400-800	DR17	HDPE	FW	Butt fusion fittings Fabricated fittings or equivalent	ASTM D3261 ASTM D3350	
Bends						
DN 400-800	DR17	HDPE	FW	Sweep continuous runs of flexible pipe without kinking (see Note 4), or fabricated fittings (minimum 3 x diam. radius elbow)	ASTM D3350	
Flanges						
DN 400-800	To suit Pipe & fittings			Stub ends on polyethylene pipe comes with ductile iron backing ring.	DN <500, 600 ASME B16.5 DN 550, 660-800 ASME B16.47 ASTM D3350	
Gaskets						
3 thk	150#	Rub	FF	Garlock	ANSI B16.21	
1.5 thk	150#	NBR	RF	Garlock	ANSI B16.21	
Instrument Connections						
50 mm Flanged Conn. (unless otherwise noted).						
Branch Connections						
Per Manufactorers Limits.						

GENERAL SPECIFICATION
Piping, Valves and Fittings
HDPE Pipe DR 9

PIPING, VALVES AND FITTINGS

SERVICE: Water
CODE: WCW

Size mm	Sch./ Rating	Material	End Connection	Description	ASTM	Note
Valves						
Ball Valve						
DN 25-75	150#	SS	Thd	Full bore		

NOTES

(1) Pressure/temperature design limits based on "S-5 (2018) HDPEapp V 2.0 Calculator." Plastics Pipe Institute, hdpeapp.com/#/pipe.

(2) HDPE pipe roping limits based on PPI Chapter 7 Table 4.

DR Number	Minimum Allowable Bending Radius (Rmin)
32.5	> 40 OD
26	> 34 OD
17, 21	> 27 OD
13.5, 11	> 25 OD
9, 7.3, 7	> 20 OD
Fitting or flange present in bend	> 100 OD

GENERAL SPECIFICATION
Piping, Valves and Fittings
HDPE Pipe DR 11

PIPING, VALVES AND FITTINGS

SERVICE: Water
CODE: WCW

Maximum Temperature °C	**Pressure kPag**
27	1380
32	1240
43	1100
54	970
60 (Note 1)	830

Size mm	**Sch./ Rating**	**Material**	**End Connection**	**Description**	**ASTM**	**Note**
Pipe						
DN 400-800	DR17	HDPE	Fusion Weld (FW)	High density polyethylene pipe PE 4710 (unless noted otherwise).	ASTM D3350	
Fittings						
DN 400-800	DR17	HDPE	FW	Butt fusion fittings Fabricated fittings or equivalent	ASTM D3261 ASTM D3350	
Bends						
DN 400-800	DR17	HDPE	FW	Sweep continuous runs of flexible pipe without kinking (see Note 4), or fabricated fittings (minimum 3 x diam. radius elbow)	ASTM D3350	
Flanges						
DN 400-800	To suit Pipe & fittings			Stub ends on polyethylene pipe comes with ductile iron backing ring.	DN <500, 600 ASME B16.5 DN 550, 660-800 ASME B16.47 ASTM D3350	
Gaskets						
3 thk	150#	Rub	FF	Garlock	ANSI B16.21	
1.5 thk	150#	NBR	RF	Garlock	ANSI B16.21	
Instrument Connections						
50 mm Flanged Conn. (unless otherwise noted).						
Branch Connections						
Per Manufactorers Limits.						

GENERAL SPECIFICATION
Piping, Valves and Fittings
HDPE Pipe DR 11

TROILUS

PIPING, VALVES AND FITTINGS

SERVICE: Water
CODE: WCW

Size mm	Sch./ Rating	Material	End Connection	Description	ASTM	Note
Valves						
Ball Valve						
DN 25-75	150#	SS	Thd	Full bore		

NOTES

(1) Pressure/temperature design limits based on "S-5 (2018) HDPEapp V 2.0 Calculator." Plastics Pipe Institute, hdpeapp.com/#/pipe.

(2) HDPE pipe roping limits based on PPI Chapter 7 Table 4.

DR Number	Minimum Allowable Bending Radius (Rmin)
32.5	> 40 OD
26	> 34 OD
17, 21	> 27 OD
13.5, 11	> 25 OD
9, 7.3, 7	> 20 OD
Fitting or flange present in bend	> 100 OD

GENERAL SPECIFICATION
Piping, Valves and Fittings
HDPE Pipe DR 13.5

PIPING, VALVES AND FITTINGS

SERVICE: Water
CODE: WCW

Maximum Temperature °C	Pressure kPag
27	1100
32	990
43	880
54	770
60 (Note 1)	660

Size mm	Sch./ Rating	Material	End Connection	Description	ASTM	Note
Pipe						
DN 400-800	DR17	HDPE	Fusion Weld (FW)	High density polyethylene pipe PE 4710 (unless noted otherwise).	ASTM D3350	
Fittings						
DN 400-800	DR17	HDPE	FW	Butt fusion fittings Fabricated fittings or equivalent	ASTM D3261 ASTM D3350	
Bends						
DN 400-800	DR17	HDPE	FW	Sweep continuous runs of flexible pipe without kinking (see Note 4), or fabricated fittings (minimum 3 x diam. radius elbow)	ASTM D3350	
Flanges						
DN 400-800	To suit Pipe & fittings			Stub ends on polyethylene pipe comes with ductile iron backing ring.	DN <500, 600 ASME B16.5 DN 550, 660-800 ASME B16.47 ASTM D3350	
Gaskets						
3 thk	150#	Rub	FF	Garlock	ANSI B16.21	
1.5 thk	150#	NBR	RF	Garlock	ANSI B16.21	
Instrument Connections						
50 mm Flanged Conn. (unless otherwise noted).						
Branch Connections						
Per Manufactorers Limits.						

wsp	**GENERAL SPECIFICATION** **Piping, Valves and Fittings** **HDPE Pipe DR 13.5**	TROILUS

PIPING, VALVES AND FITTINGS

SERVICE: Water
CODE: WCW

Size mm	Sch./ Rating	Material	End Connection	Description	ASTM	Note
Valves						
Ball Valve						
DN 25-75	150#	SS	Thd	Full bore		

NOTES

(1) Pressure/temperature design limits based on "S-5 (2018) HDPEapp V 2.0 Calculator." Plastics Pipe Institute, hdpeapp.com/#/pipe.

(2) HDPE pipe roping limits based on PPI Chapter 7 Table 4.

DR Number	Minimum Allowable Bending Radius (Rmin)
32.5	> 40 OD
26	> 34 OD
17, 21	> 27 OD
13.5, 11	> 25 OD
9, 7.3, 7	> 20 OD
Fitting or flange present in bend	> 100 OD

GENERAL SPECIFICATION
Piping, Valves and Fittings
HDPE Pipe DR 17

PIPING, VALVES AND FITTINGS

SERVICE: Water
CODE: WCW

Maximum Temperature °C	Pressure kPag
27	860
32	780
43	690
54	600
60 (Note 1)	520

Size mm	Sch./ Rating	Material	End Connection	Description	ASTM	Note
Pipe						
DN 400-800	DR17	HDPE	Fusion Weld (FW)	High density polyethylene pipe PE 4710 (unless noted otherwise).	ASTM D3350	
Fittings						
DN 400-800	DR17	HDPE	FW	Butt fusion fittings Fabricated fittings or equivalent	ASTM D3261 ASTM D3350	
Bends						
DN 400-800	DR17	HDPE	FW	Sweep continuous runs of flexible pipe without kinking (see Note 4), or fabricated fittings (minimum 3 x diam. radius elbow)	ASTM D3350	
Flanges						
DN 400-800	To suit Pipe & fittings			Stub ends on polyethylene pipe comes with ductile iron backing ring.	DN <500, 600 ASME B16.5 DN 550, 660-800 ASME B16.47 ASTM D3350	
Gaskets						
3 thk	150#	Rub	FF	Garlock	ANSI B16.21	
1.5 thk	150#	NBR	RF	Garlock	ANSI B16.21	
Instrument Connections						
50 mm Flanged Conn. (unless otherwise noted).						
Branch Connections						
Per Manufactorers Limits.						

wsp	**GENERAL SPECIFICATION** **Piping, Valves and Fittings** **HDPE Pipe DR 17**	TROILUS

PIPING, VALVES AND FITTINGS

SERVICE: Water
CODE: WCW

Size mm	Sch./ Rating	Material	End Connection	Description	ASTM	Note
Valves						
Ball Valve						
DN 25-75	150#	SS	Thd	Full bore		

NOTES

(1) Pressure/temperature design limits based on "S-5 (2018) HDPEapp V 2.0 Calculator." Plastics Pipe Institute, hdpeapp.com/#/pipe.

(2) HDPE pipe roping limits based on PPI Chapter 7 Table 4.

DR Number	Minimum Allowable Bending Radius (Rmin)
32.5	> 40 OD
26	> 34 OD
17, 21	> 27 OD
13.5, 11	> 25 OD
9, 7.3, 7	> 20 OD
Fitting or flange present in bend	> 100 OD

TROILUS WATER MANGEMENT SYSTEM
INSTRUMENT LIST

WSP PROJECT:					
REV	REV DATE	DES	PREP	CHK	REV / APP
0	2024-03-21	SC	SC		
ISSUED FOR 90% DESIGN REVIEW					

WSP DOCUMENT No.:
TROILUS DOCUMENT No.:

INDEX REVISION No.: 0 — INSTRUMENT LIST —

INSTRUMENT TAG		INSTRUMENT SERVICE AND TYPE	CAL. RANGE : DISPLAY RANGE	SUPPLY BY	DETAIL DRAWING	NOTES
REV. NO.	REV. DATE	MANUFACTURER AND MODEL	LINE NO. / EQUIP NO.	LOOP DRAWING	LOCATION PLAN	
LOOP NO. 001-F		SUMP 1 DISCHARGE FLOW		PID No.: PPL-001-002		
FE-001		MAGNETIC FLOWTUBE	0-900 m³/h : 0-900 m³/h			
			SUMP 1			
FIT-001		REMOTE MAGNETIC FLOW TRANSMITTER	0-900 m³/h : 0-900 m³/h			
			SUMP 1			
LOOP NO. 001-L		SUMP 1 LEVEL		PID No.: PPL-001-002		
LIT-001		SUBMERSIBLE LEVEL TRANSMITTER	0-4.40 m : 0-100 %			
			SUMP 1			
LOOP NO. 001-P		SUMP 1 DISCHARGE PRESSURE		PID No.: PPL-001-002		
PI-001		PRESSURE GAUGE	0-1000 kPa : 0-1000 kPa			
			PU-01			
LOOP NO. 001-X		PU-10 DISCHARGE FLOW		PID No.: PPL-001-004		
XV-001		PU-10 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFEG				
			PU10			
LOOP NO. 002-F		SUMP 2 DISCHARGE FLOW		PID No.: PPL-001-002		
FE-002		MAGNETIC FLOWTUBE	0-1100 m³/h : 0-1100 m³/h			
			SUMP 2			
FIT-002		REMOTE MAGNETIC FLOW TRANSMITTER	0-1100 m³/h : 0-1100 m³/h			
			SUMP 2			
LOOP NO. 002-L		SUMP 2 LEVEL		PID No.: PPL-001-002		
LIT-002		SUBMERSIBLE LEVEL TRANSMITTER	0-3.50 m : 0-100 %			
			SUMP 2			

INDEX REVISION No.: 0 INSTRUMENT LIST

INSTRUMENT TAG		INSTRUMENT SERVICE AND TYPE	CAL. RANGE : DISPLAY RANGE	SUPPLY BY	DETAIL DRAWING	NOTES
REV. NO.	REV. DATE	MANUFACTURER AND MODEL	LINE NO. / EQUIP NO.	LOOP DRAWING	LOCATION PLAN	
LOOP NO. 002-P		SUMP 2 DISCHARGE PRESSURE			PID No.: PPL-001-002	
PI-002		PRESSURE GAUGE	0-1000 kPa : 0-1000 kPa			
			PU-02 / PU-03			
LOOP NO. 002-X		PU-11 DISCHARGE FLOW			PID No.: PPL-001-004	
XV-002		PU-11 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
			PU11			
LOOP NO. 003-F		SUMP 3 DISCHARGE FLOW			PID No.: PPL-001-002	
FE-003		MAGNETIC FLOWTUBE	0-1100 m³/h : 0-1100 m³/h			
			SUMP 3			
FIT-003		REMOTE MAGNETIC FLOW TRANSMITTER	0-1100 m³/h : 0-1100 m³/h			
			SUMP 3			
LOOP NO. 003-L		SUMP 3 LEVEL			PID No.: PPL-001-002	
LIT-003		SUBMERSIBLE LEVEL TRANSMITTER	0-2.99 m : 0-100 %			
			SUMP 3			
LOOP NO. 003-P		SUMP 3 DISCHARGE PRESSURE			PID No.: PPL-001-002	
PI-003		PRESSURE GAUGE	0-1000 kPa : 0-1000 kPa			
			PU-04			
LOOP NO. 003-X		PU-12 DISCHARGE FLOW			PID No.: PPL-001-004	
XV-003		PU-12 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
			PU12			
LOOP NO. 004-F		SUMP 5 DISCHARGE FLOW			PID No.: PPL-001-003	
FE-004		MAGNETIC FLOWTUBE	0-750 m³/h : 0-750 m³/h			
			SUMP 5			
FIT-004		REMOTE MAGNETIC FLOW TRANSMITTER	0-750 m³/h : 0-750 m³/h			
			SUMP 5			
LOOP NO. 004-L		SUMP 5 LEVEL			PID No.: PPL-001-003	
LIT-004		SUBMERSIBLE LEVEL TRANSMITTER	0-2.96 m : 0-100 %			
			SUMP 5			

INDEX REVISION No.: 0 INSTRUMENT LIST

INSTRUMENT TAG		INSTRUMENT SERVICE AND TYPE	CAL. RANGE : DISPLAY RANGE	SUPPLY BY	DETAIL DRAWING	NOTES
REV. NO.	REV. DATE	MANUFACTURER AND MODEL	LINE NO. / EQUIP NO.	LOOP DRAWING	LOCATION PLAN	
LOOP NO. 004-P		SUMP 5 DISCHARGE PRESSURE			PID No.: PPL-001-003	
PI-004		PRESSURE GAUGE	0-500 kPa : 0-500 kPa			
			PU-05			
LOOP NO. 004-X		PU-13 DISCHARGE FLOW			PID No.: PPL-001-004	
XV-004		PU-13 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
			PU13			
LOOP NO. 005-F		SUMP 6 DISCHARGE FLOW			PID No.: PPL-001-003	
FE-005		MAGNETIC FLOWTUBE	0-750 m³/h : 0-750 m³/h			
			SUMP 6			
FIT-005		REMOTE MAGNETIC FLOW TRANSMITTER	0-750 m³/h : 0-750 m³/h			
			SUMP 6			
LOOP NO. 005-L		SUMP 6 LEVEL			PID No.: PPL-001-003	
LIT-005		SUBMERSIBLE LEVEL TRANSMITTER	0-2.50 m : 0-100 %			
			SUMP 6			
LOOP NO. 005-P		SUMP 6 DISCHARGE PRESSURE			PID No.: PPL-001-003	
PI-005		PRESSURE GAUGE	0-500 kPa : 0-500 kPa			
			PU-06			
LOOP NO. 005-X		PU-14 DISCHARGE FLOW			PID No.: PPL-001-004	
XV-005		PU-14 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
			PU14			
LOOP NO. 006-F		SUMP 7 DISCHARGE FLOW			PID No.: PPL-001-003	
FE-006		MAGNETIC FLOWTUBE	0-750 m³/h : 0-750 m³/h			
			SUMP 7			
FIT-006		REMOTE MAGNETIC FLOW TRANSMITTER	0-750 m³/h : 0-750 m³/h			
			SUMP 7			
LOOP NO. 006-L		SUMP 7 LEVEL			PID No.: PPL-001-003	
LIT-006		SUBMERSIBLE LEVEL TRANSMITTER	0-4.16 m : 0-100 %			
			SUMP 7			

INDEX REVISION No.: 0 INSTRUMENT LIST

INSTRUMENT TAG	REV. NO.	REV. DATE	INSTRUMENT SERVICE AND TYPE / MANUFACTURER AND MODEL	CAL. RANGE : DISPLAY RANGE / LINE NO. / EQUIP NO.	SUPPLY BY / LOOP DRAWING	DETAIL DRAWING / LOCATION PLAN	NOTES
LOOP NO. 006-P			**SUMP 7 DISCHARGE PRESSURE**			**PID No.: PPL-001-003**	
PI-006			PRESSURE GAUGE	0-500 kPa : 0-500 kPa			
				PU-07			
LOOP NO. 006-X			**PU-15 DISCHARGE FLOW**			**PID No.: PPL-001-004**	
XV-006			PU-15 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
				PU15			
LOOP NO. 007-F			**SUMP 9 DISCHARGE FLOW**			**PID No.: PPL-001-003**	
FE-007			MAGNETIC FLOWTUBE	0-1100 m³/h : 0-1100 m³/h			
				SUMP 9			
FIT-007			REMOTE MAGNETIC FLOW TRANSMITTER	0-1100 m³/h : 0-1100 m³/h			
				SUMP 9			
LOOP NO. 007-L			**SUMP 9 LEVEL**			**PID No.: PPL-001-003**	
LIT-007			SUBMERSIBLE LEVEL TRANSMITTER	0-3.00 m : 0-100 %			
				SUMP 9			
LOOP NO. 007-P			**SUMP 9 DISCHARGE PRESSURE**			**PID No.: PPL-001-003**	
PI-007			PRESSURE GAUGE	0-500 kPa : 0-500 kPa			
				PU-08			
LOOP NO. 007-X			**PU-16 DISCHARGE FLOW**			**PID No.: PPL-001-004**	
XV-007			PU-16 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
				PU16			
LOOP NO. 008-A			**SEDIMENTATION POND 1 DISCHARGE TURBIDITY**			**PID No.: PPL-001-004**	
AE-008			TURBIDITY SENSOR				
AIT-008			TURBIDITY TRANSMITTER	0 50 mg/L : 0 50 mg/L			
LOOP NO. 008-F			**SEDIMENTATION POND 1 DISCHARGE FLOW**			**PID No.: PPL-001-004**	
FE-008			MAGNETIC FLOWTUBE	0-1500 m³/h : 0-1500 m³/h			
				SP1			

INDEX REVISION No.: 0 INSTRUMENT LIST

INSTRUMENT TAG		INSTRUMENT SERVICE AND TYPE	CAL. RANGE : DISPLAY RANGE	SUPPLY BY	DETAIL DRAWING	NOTES
REV. NO.	REV. DATE	MANUFACTURER AND MODEL	LINE NO. / EQUIP NO.	LOOP DRAWING	LOCATION PLAN	
FIT-008		REMOTE MAGNETIC FLOW TRANSMITTER	0-1500 m³/h : 0-1500 m³/h			
			SP1			
LOOP NO. 008-L		SEDIMENTATION POND 1		PID No.: PPL-001-004		
LIT-008		SUBMERSIBLE LEVEL TRANSMITTER	0-3.00 m : 0-100 %			
			SP1			
LOOP NO. 008-P		SEDIMENTATION POND 1 DISCHARGE PRESSURE		PID No.: PPL-001-004		
PI-008		PRESSURE GAUGE	0-500 kPa : 0-500 kPa			
			PU-09			
LOOP NO. 008-X		PU-17 DISCHARGE FLOW		PID No.: PPL-001-004		
XV-008		PU-17 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
			PU17			
LOOP NO. 009-A		SEDIMENTATION POND 2-A DISCHARGE TURBIDITY		PID No.: PPL-001-004		
AE-009		TURBIDITY SENSOR				
AIT-009		TURBIDITY TRANSMITTER	0 50 mg/L : 0 50 mg/L			
LOOP NO. 009-F		SEDIMENTATION POND 2-A DISCHARGE FLOW		PID No.: PPL-001-004		
FE-009		MAGNETIC FLOWTUBE	0-3700 m³/h : 0-3700 m³/h			
			SP2			
FIT-009		REMOTE MAGNETIC FLOW TRANSMITTER	0-3700 m³/h : 0-3700 m³/h			
			SP2			
LOOP NO. 009-L		SEDIMENTATION POND 2		PID No.: PPL-001-004		
LIT-009		SUBMERSIBLE LEVEL TRANSMITTER	0-30.00 m : 0-100 %			
			SP2			
LOOP NO. 009-P		SEDIMENTATION POND 2-A DISCHARGE PRESSURE		PID No.: PPL-001-004		
PI-009		PRESSURE GAUGE	0-1500 kPa : 0-1500 kPa			
			PU-10/11/12/13			
LOOP NO. 009-X		PU-18 DISCHARGE FLOW		PID No.: PPL-001-004		

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INSTRUMENT TAG		INSTRUMENT SERVICE AND TYPE	CAL. RANGE : DISPLAY RANGE	SUPPLY BY	DETAIL DRAWING	NOTES
REV. NO.	REV. DATE	MANUFACTURER AND MODEL	LINE NO. / EQUIP NO.	LOOP DRAWING	LOCATION PLAN	
XV-009		PU-18 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
			PU18			
LOOP NO. 010-F		SEDIMENTATION POND 2-B DISCHARGE FLOW		PID No.: PPL-001-004		
FE-010		MAGNETIC FLOWTUBE	0-1400 m³/h : 0-1400 m³/h			
			SP2			
FIT-010		REMOTE MAGNETIC FLOW TRANSMITTER	0-1400 m³/h : 0-1400 m³/h			
			SP2			
LOOP NO. 010-P		SEDIMENTATION POND 2-B DISCHARGE PRESSURE		PID No.: PPL-001-004		
PI-010		PRESSURE GAUGE	0-1500 kPa : 0-1500 kPa			
			PU-14/15/16/17/18			
LOOP NO. 010-X		PU-19 DISCHARGE FLOW		PID No.: PPL-001-004		
XV-010		PU-19 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
			PU19			
LOOP NO. 011-A		SEDIMENTATION POND 3 DISCHARGE TURBIDITY		PID No.: PPL-001-004		
AE-011		TURBIDITY SENSOR				
AIT-011		TURBIDITY TRANSMITTER	0 50 mg/L : 0 50 mg/L			
LOOP NO. 011-F		SEDIMENTATION POND 3 DISCHARGE FLOW		PID No.: PPL-001-004		
FE-011		MAGNETIC FLOWTUBE	0-3700 m³/h : 0-3700 m³/h			
			SP3			
FIT-011		REMOTE MAGNETIC FLOW TRANSMITTER	0-3700 m³/h : 0-3700 m³/h			
			SP3			
LOOP NO. 011-L		SEDIMENTATION POND 3		PID No.: PPL-001-004		
LIT-011		SUBMERSIBLE LEVEL TRANSMITTER	0-3.00 m : 0-100 %			
			SP3			
LOOP NO. 011-P		SEDIMENTATION POND 3 DISCHARGE PRESSURE		PID No.: PPL-001-004		

INDEX REVISION No.: 0

INSTRUMENT LIST

INSTRUMENT TAG		INSTRUMENT SERVICE AND TYPE	CAL. RANGE : DISPLAY RANGE	SUPPLY BY	DETAIL DRAWING	NOTES
REV. NO.	REV. DATE	MANUFACTURER AND MODEL	LINE NO. / EQUIP NO.	LOOP DRAWING	LOCATION PLAN	
PI-011		PRESSURE GAUGE	0-100 kPa : 0-100 kPa			
			PU-19/20			
LOOP NO. 011-X		PU-20 DISCHARGE FLOW		PID No.: PPL-001-004		
XV-011		PU-20 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
			PU20			
LOOP NO. 012-A		SEDIMENTATION POND 4 DISCHARGE TURBIDITY		PID No.: PPL-001-004		
AE-012		TURBIDITY SENSOR				
AIT-012		TURBIDITY TRANSMITTER	0 50 mg/L : 0 50 mg/L			
LOOP NO. 012-F		SEDIMENTATION POND 4 DISCHARGE FLOW		PID No.: PPL-001-004		
FE-012		MAGNETIC FLOWTUBE	0-3700 m³/h : 0-3700 m³/h			
			SP4			
FIT-012		REMOTE MAGNETIC FLOW TRANSMITTER	0-3700 m³/h : 0-3700 m³/h			
			SP4			
LOOP NO. 012-L		SEDIMENTATION POND 4		PID No.: PPL-001-004		
LIT-012		SUBMERSIBLE LEVEL TRANSMITTER	0-3.00 m : 0-100 %			
			SP4			
LOOP NO. 012-P		SEDIMENTATION POND 4 DISCHARGE PRESSURE		PID No.: PPL-001-004		
PI-012		PRESSURE GAUGE	0-100 kPa : 0-100 kPa			
			PU-21/22			
LOOP NO. 012-X		PU-21 DISCHARGE FLOW		PID No.: PPL-001-004		
XV-012		PU-21 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
			PU21			
LOOP NO. 013-X		PU-22 DISCHARGE FLOW		PID No.: PPL-001-004		
XV-013		PU-22 DISCHARGE FLOW CONTROL VALVE ON / OFF VALVE - KNIFE				
			PU22			

INSTRUMENT DATASHEET

SUMP 1 LEVEL

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-001**

EQUIPMENT NO.: SUMP 1 PID No.: PPL-001-002

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE SUMP
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 5.1 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 4.40 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	15 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-4.40 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **LIT-001** REV 0

INSTRUMENT DATASHEET

SUMP 2 LEVEL

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-002**

EQUIPMENT NO.: SUMP 2 PID No.: PPL-001-002

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE SUMP
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 4.0 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 3.50 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	15 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-3.50 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **LIT-002** REV 0

INSTRUMENT DATASHEET

SUMP 3 LEVEL

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-003**

EQUIPMENT NO.: SUMP 3 PID No.: PPL-001-002

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE SUMP
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 3.49 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 2.99 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	15 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-2.99 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **LIT-003** REV 0

INSTRUMENT DATASHEET

SUMP 5 LEVEL

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-004**

EQUIPMENT NO.: SUMP 5 PID No.: PPL-001-003

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE SUMP
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 3.3 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 2.96 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	15 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-2.96 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **LIT-004** REV 0

INSTRUMENT DATASHEET

SUMP 6 LEVEL

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-005**

EQUIPMENT NO.: SUMP 6 PID No.: PPL-001-003

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE SUMP
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 3.0 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 2.50 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	15 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-2.50 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **LIT-005** REV 0

INSTRUMENT DATASHEET

SUMP 7 LEVEL

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-006**

EQUIPMENT NO.: SUMP 7 PID No.: PPL-001-003

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE SUMP
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 4.46 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 4.16 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	15 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-4.16 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **LIT-006** REV 0

INSTRUMENT DATASHEET

SUMP 9 LEVEL

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-007**

EQUIPMENT NO.: SUMP 9 PID No.: PPL-001-003

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE SUMP
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 3.50 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 3.00 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	15 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-3.00 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **LIT-007** REV 0

INSTRUMENT DATASHEET

SEDIMENTATION POND 1

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-008**

EQUIPMENT NO.: SP1 PID No.: PPL-001-004

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE POND
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 3.50 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 3.00 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	15 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-3.00 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **LIT-008** REV 0

INSTRUMENT DATASHEET

SEDIMENTATION POND 2

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-009**

EQUIPMENT NO.: SP2 PID No.: PPL-001-004

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE POND
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 3.50 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 30 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	45 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-30.00 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:						
REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG	REV
LIT-009	0

INSTRUMENT DATASHEET

SEDIMENTATION POND 3

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-011**

EQUIPMENT NO.: SP3 PID No.: PPL-001-004

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE POND
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 3.50 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 3.00 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	15 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-3.00 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **LIT-011** REV 0

INSTRUMENT DATASHEET

SEDIMENTATION POND 4

SUBMERSIBLE LEVEL TRANSMITTER

Tag: **LIT-012**

EQUIPMENT NO.: SP4 PID No.: PPL-001-004

01:	TRANSMITTER TYPE	HYDROSTATIC LEVEL
02:	AREA CLASSIFICATION	NON-HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:		
05:	MOUNTING	SUSPENDED OVER THE POND
06:	TRANSMITTER OUTPUT	4 - 20 mA + HART
07:	INTRINSICALLY SAFE	NO
08:	INDICATOR SCALE AND UNITS	0 - 100 %
09:	ACCURACY	0.2%
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	LEVEL MIN / NOR / MAX	0 / --- / 3.50 m
13:	SPECIFIC GRAVITY	1
14:	TEMPERATURE MIN / MAX	0 / 30 DEG C
15:	AMBIENT TEMP. MIN / MAX	-20 / 40 DEG C
16:		
17:		
18:		
19:	ADJUSTMENT RANGE	0 - 3.00 mWC
20:	ELEMENT TYPE	HYDROSTATIC PRESSURE
21:	ELEMENT MATERIAL	CERAMIC
22:	BODY MATERIAL	SS316
23:	BODY RATING	*
24:	BODY CONNECTION	N/A
25:		
26:	ELEMENT COATING	N/A
27:		
28:		
29:	VENTED TERMINAL BOX	YES
30:	TERMINAL STRIP	YES
31:	ADDITIONAL WEIGHT	*
32:	SUSPENSION CLAMP	YES
33:		
34:		
35:		
36:		
37:		
38:		
39:		
40:	CABLE LENGTH	15 m

INSTRUMENT POWER TYPE: INTEG. WITH SIGNAL - 2-WIRE INSTRUMENT POWER: 24 VDC

CALIBRATION: 0-3.00 m

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **LIT-012** REV 0

TROILUS GOLD CORPORATION
SITE-WIDE WMP
LINE LIST

PROJECT NO.	22521549	
DATE	2024-02-12	
REV	A	
PREPARED BY	CHECKED BY	APPROVED BY
OA	MV	PP

Pipeline Tag	Size (in.)	Schedule	Starting From	Line Destination	Design Flowrate (m3/h)	Design TDH (kpa)	Remarks
16-WCW-001	16	DR 17	SUMP 1	SEDEMENTATION POND 2	900	293	
16-WCW-002	16	DR 17	SUMP 1B	DITCH D05	900	293	
20-WCW-003	20	DR 17	SUMP 2	TAILINGS STORAGE FACILITY	1080	518	
20-WCW-004	20	DR 17	SUMP 3	TAILINGS STORAGE FACILITY	1080	688	
16-WCW-005	16	DR 17	SUMP 5	DITCH D10A	720	311	
16-WCW-006	16	DR 17	SUMP 6	DITCH D06A	720	176	
10-WCW-007	10	DR 11	SUMP 7	TAILINGS STORAGE FACILITY	720	256	
16-WCW-008	16	DR 17	SUMP 9	DITCH D14B	1080	290	
18-WCW-009	18	DR 17	SEDIMENTATION POND 1	DIVERSION CHANNEL	1440	132	
32-WCW-010	32	DR 11	SEDIMENTATION POND 2	DIVERSION CHANNEL	3600	1136	
28-WCW-010	28	DR 17	SEDIMENTATION POND 2	DIVERSION CHANNEL	3600	1136	
24-WCW-011	24	DR 9	SEDIMENTATION POND 2	MILL	1703	1295	
24-WCW-011	24	DR 17	SEDIMENTATION POND 2	MILL	1703	1295	
28-WCW-012	28	DR 17	SEDIMENTATION POND 3	CHANNEL D18	3600	32	
28-WCW-013	28	DR 17	SEDIMENTATION POND 4	CHANNEL D16	3600	74	

Troilus Pumping
Load Analysis

Rev B
Date 2024-02-27

System	Starting Elevation	Ending Elevation	flowrate (m3/h)	length (m) (tdh m)	Motor size (hp)	Voltage	Drive	Eff	PF	Demand	Duty	Standby	Mtr kVA	FLA	Cable Amp	Cable Gauge	Cable Type	Cable Length (m)	Total Cable Length (m)	Agitator kVA	E-House kVA	Tfmr kVA	Total kW	Selected Tx
Sump 1	372	378	900	1615 [29]	200	600	RVSS	0.87	0.92	0.8	1		149	143	179	#4/0 AWG	3C-#4/0 AWG 1kV	200	200	2	30	555	510.6	750
Sump 2	384	400	1080	290 [52]	200	600	VSD	0.87	0.99	0.8	2		139	133	167	#4/0 AWG	3C-#4/0 AWG 1kV	200	400	2	50	371	367.29	500
Sump 3	370	400	1080	585 [69]	350	600	VSD	0.87	0.99	0.8	1		243	233	292	350 kcmil	3C-350 kcmil 1kV		0	2	50	332	328.68	500
Sump 5	368	381	720	1140 [31]	200	600	RVSS	0.87	0.92	0.8	1		149	143	179	#4/0 AWG	3C-#4/0 AWG 1kV	200	200	2	30	555	510.6	750
Sump 6	378	391	720	515 [18]	100	600	RVSS	0.87	0.92	0.8	1		75	72	90	#2 AWG	3C-#2 AWG 1kV	200	200	2	30	294	270.48	500
Sump 7	423	427	720	205 [26]	200	600	RVSS	0.87	0.92	0.8	1		149	143	179	#4/0 AWG	3C-#4/0 AWG 1kV	200	200	2	30	555	510.6	750
Sump 9	383	404	1080	395 [29]	250	600	RVSS	0.87	0.92	0.8	1		186	179	224	#4/0 AWG	3C-#4/0 AWG 1kV	200	200	2	30	685	630.2	750
SP 1	369	376	1440	300 [13]	150	600	RVSS	0.87	0.92	0.8	1		112	108	135	#1/0 AWG	3C-#1/0 AWG 1kV		0	2	30	424	390.08	500
SP 2A	300	375	3600	2700 [113]	700	600	VSD	0.87	0.99	0.8	3	1	485	467	583	350 kcmil	2x3C-350 kcmil 1kV		0	2	60	1736	1718.6	2500
SP 2B	300	401	1703	3530 [134]	700	600	VSD	0.87	0.99	0.8	3	2	485	467	583	350 kcmil	2x3C-350 kcmil 1kV		0	2	60	1736	1718.6	2500
SP 3	349	351	3600	10 [3]	250	600	RVSS	0.87	0.92	0.8	1	1	186	179	224	#2 AWG	3C-#2 AWG 1kV		0	2	30	685	630.2	750
SP 4	351	356	3600	20 [8]	250	600	RVSS	0.87	0.92	0.8	1	1	186	179	224	#4/0 AWG	3C-#4/0 AWG 1kV		0	2	30	685	630.2	750
TSF to Water Treatment Plant	396	377	1200	3190 [75]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water Treatment Plant Overflow	401	391	TBD	10 [0]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

INSTRUMENT DATASHEET

SUMP 1 DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-001**

EQUIPMENT NO.: PU-01 PID No.: PPL-001-002

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 293 / 300 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-1000 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG	REV
PI-001	0

INSTRUMENT DATASHEET

SUMP 2 DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-002**

EQUIPMENT NO.: PU-02 / PU-03 PID No.: PPL-001-002

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 518 / 550 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-1000 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **PI-002** REV 0

INSTRUMENT DATASHEET

SUMP 3 DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-003**

EQUIPMENT NO.: PU-04 PID No.: PPL-001-002

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 688 / 700 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-1000 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **PI-003** REV 0

INSTRUMENT DATASHEET

SUMP 5 DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-004**

EQUIPMENT NO.: PU-05 PID No.: PPL-001-003

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 311 / 350 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-500 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG	REV
PI-004	0

INSTRUMENT DATASHEET

SUMP 6 DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-005**

EQUIPMENT NO.: PU-06 PID No.: PPL-001-003

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 176 / 200 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-500 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG	REV
PI-005	0

INSTRUMENT DATASHEET

SUMP 7 DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-006**

EQUIPMENT NO.: PU-07 PID No.: PPL-001-003

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 256 / 300 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-500 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG	REV
PI-006	0

INSTRUMENT DATASHEET

SUMP 9 DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-007**

EQUIPMENT NO.: PU-08 PID No.: PPL-001-003

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 290 / 300 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-500 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **PI-007** REV 0

INSTRUMENT DATASHEET

SEDIMENTATION POND 1 DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-008**

EQUIPMENT NO.: PU-09 PID No.: PPL-001-004

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 132 / 150 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-500 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG	REV
PI-008	0

INSTRUMENT DATASHEET

SEDIMENTATION POND 2-A DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-009**

EQUIPMENT NO.: PU-10/11/12/13 PID No.: PPL-001-004

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 1136 / 1200 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-1500 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **PI-009** REV 0

INSTRUMENT DATASHEET

SEDIMENTATION POND 2-B DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-010**

EQUIPMENT NO.: PU-14/15/16/17/18 PID No.: PPL-001-004

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 1349 / 1400 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-1500 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG	REV
PI-010	0

INSTRUMENT DATASHEET

SEDIMENTATION POND 3 DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-011**

EQUIPMENT NO.: PU-19/20 PID No.: PPL-001-004

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 32 / 50 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-100 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **PI-011** REV 0

INSTRUMENT DATASHEET

SEDIMENTATION POND 4 DISCHARGE PRESSURE
PRESSURE GAUGE

Tag: **PI-012**

EQUIPMENT NO.: PU-21/22 PID No.: PPL-001-004

01:	TYPE	DIRECT READING
02:	DIAL SIZE	110 mm
03:	SCALE / DIAL COLOUR	BLACK / WHITE
04:	MOVEMENT TYPE / MATERIAL	ROTARY / STAINLESS STEEL
05:	ELEMENT TYPE / MATERIAL	BOURDON TUBE / STAINLESS STEEL
06:	CASE MATERIAL	STAINLESS STEEL
07:	CONSTRUCTION TYPE	SOLID FRONT BLOWOUT BACK
08:	BLOWOUT TYPE	DISK
09:	GLASS MATERIAL	SHATTER PROOF
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE MIN / NOR / MAX	0 / 74 / 100 kPa
13:	TEMPERATURE MIN / MAX	0 / 30 DEGC
14:		
15:	MOUNTING TYPE	DIRECT ON PIPE c/w BLOCK AND BLEED VALVE
16:	ZERO ADJUST TYPE	MICROMETER
17:	SOCKET MATERIAL	STAINLESS STEEL
18:	PROCESS CONNECTION / LOCATION	1/2" NPT / BOTTOM
19:	SCALE TYPE	LINEAR
20:	ACCURACY	+/- 0.5%
21:		
22:	FILL FLUID	OIL FILLED
23:		
24:	SYPHON SIZE / TYPE	NONE
25:	SYPHON MATERIAL / SCHEDULE	N/A
26:		
27:	AMBIENT TEMPERATURE MIN / MAX	-20 / 40 DEGC
28:		
29:		
30:	DIAPHRAGM SEAL TYPE	NONE
31:	TOP HOUSING MATERIAL	N/A
32:	BOTTOM HOUSING MATERIAL	N/A
33:	DIAPHRAGM MATERIAL	N/A
34:	DIAPHRAGM COATING	N/A
35:	SEAL FILL FLUID	N/A
36:	PROCESS CONNECTION	N/A
37:	FLUSHING CONNECTION	N/A
38:	SEAL MODEL NO.	N/A
39:	CAPILLARY LENGTH	N/A
40:		

CALIBRATION: 0-100 kPa

MANUFACTURER: MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG	REV
PI-012	0

INSTRUMENT DATASHEET

SEDIMENTATION POND 1 DISCHARGE TURBIDITY
TURBIDITY SENSOR

Tag: **AE-008**

PID No.: PPL-001-004

01:	SENSOR TYPE	4 BEAM PULSED LIGHT
02:	AREA CLASSIFICATION	NON HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:	SENSOR BODY MATERIAL	316L SS
05:	OPTICAL WINDOW MATERIAL	SAPPHIRE GLASS
06:		
07:		
08:		
09:		
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE NOR / MAX	3 / 5 mH2O
13:	FLUID TEMPERATURE NOR / MAX	0 /30 DEGC
14:		
15:		
16:		
17:		
18:	SENSOR RANGE	0-50 mg/L
19:	TEMPERATURE COMPENSATION	NA
20:		
21:		
22:		
23:		
24:	SENSOR PROCESS CONNECTION	SUSPENDED ASSEMBLY
25:	PIPE OR VESSEL CONNECTION	NA
26:	ADAPTER FLANGE MATERIAL	NA
27:		
28:		
29:		
30:	RETRACTION ASSEMBLY SIZE	NA
31:	RETRACTION ASSY MATERIAL	NA
32:	RETRACTION ASSY PART NO.	NA
33:	FLOW-THRU ASSY MATERIAL	NA
34:	FLOW-THRU ASSY CONNECTIONS	NA
35:	FLOW-THRU ASSY PART NO.	TBD
36:		
37:	AMB. TEMPERATURE MIN / MAX	-20 / 40 DEGC
38:	SENSOR CABLE LENGTH	15 m
39:		
40:		

INSTRUMENT POWER TYPE: EXTERNAL SOURCE - 4-WIRE

MANUFACTURER: MODEL:

NOTES:

1) SUSPENSION ASSEMBLY FOR POND/SUMP TO BE PROVIDED BY THE VENDOR
2) SENSOR TO BE CALIBRATED FOR SUSPENDED SOLIDS IN mg/L
3) COMPRESSED AIR CLEANING ASSEMBLY

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC			

INSTRUMENT TAG	REV
AE-008	0

INSTRUMENT DATASHEET

SEDIMENTATION POND 1 DISCHARGE TURBIDITY
TURBIDITY TRANSMITTER

Tag: **AIT-008**
PID No.: PPL-001-004

01:	TRANSMITTER TYPE	FOUR WIRED WITH DISPLAY
02:	AREA CLASSIFICATION	NON HAZARDOUS
03:	ENCLOSURE CLASS	NEMA4X
04:	ENCLOSURE MATERIAL	MANUFACTURER STANDARD
05:	MOUNTING	2" POST MOUNTED
06:		
07:	TRANSMITTER OUTPUT	4-20mA
08:		
09:	INTRINSICALLY SAFE	NO
10:	INDICATOR SCALE AND UNITS	0-50mG/L
11:		
12:		
13:		
14:		
15:	SENSOR TAG	AE-008
16:		
17:		
18:		
19:		
20:		
21:		
22:		
23:		
24:		
25:		
26:		
27:		
28:	LIGHTNING PROTECTION	NO
29:		
30:		
31:		
32:		
33:		
34:		
35:		
36:		
37:	AMB. TEMPERATURE MIN / MAX	-20 / 40 DEGC
38:		
39:		
40:		

INSTRUMENT POWER TYPE: EXTERNAL SOURCE - 4-WIRE
INSTRUMENT POWER: 115VAC/24 VDC
CALIBRATION: 0 50 mg/L
MANUFACTURER:
MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **AIT-008** | REV 0

INSTRUMENT DATASHEET

SEDIMENTATION POND 2-A DISCHARGE TURBIDITY
TURBIDITY SENSOR

Tag: **AE-009**

PID No.: PPL-001-004

01:	SENSOR TYPE	4 BEAM PULSED LIGHT
02:	AREA CLASSIFICATION	NON HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:	SENSOR BODY MATERIAL	316L SS
05:	OPTICAL WINDOW MATERIAL	SAPPHIRE GLASS
06:		
07:		
08:		
09:		
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE NOR / MAX	30 / 40 mH2O
13:	FLUID TEMPERATURE NOR / MAX	0 /30 DEGC
14:		
15:		
16:		
17:		
18:	SENSOR RANGE	0-50 mg/L
19:	TEMPERATURE COMPENSATION	NA
20:		
21:		
22:		
23:		
24:	SENSOR PROCESS CONNECTION	SUSPENDED ASSEMBLY
25:	PIPE OR VESSEL CONNECTION	NA
26:	ADAPTER FLANGE MATERIAL	NA
27:		
28:		
29:		
30:	RETRACTION ASSEMBLY SIZE	NA
31:	RETRACTION ASSY MATERIAL	NA
32:	RETRACTION ASSY PART NO.	NA
33:	FLOW-THRU ASSY MATERIAL	NA
34:	FLOW-THRU ASSY CONNECTIONS	NA
35:	FLOW-THRU ASSY PART NO.	TBD
36:		
37:	AMB. TEMPERATURE MIN / MAX	-20 / 40 DEGC
38:	SENSOR CABLE LENGTH	45 m
39:		
40:		

INSTRUMENT POWER TYPE: EXTERNAL SOURCE - 4-WIRE

MANUFACTURER: MODEL:

NOTES:

1) SUSPENSION ASSEMBLY FOR POND/SUMP TO BE PROVIDED BY THE VENDOR
2) SENSOR TO BE CALIBRATED FOR SUSPENDED SOLIDS IN mg/L
3) COMPRESSED AIR CLEANING ASSEMBLY

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC			

INSTRUMENT TAG	REV
AE-009	0

INSTRUMENT DATASHEET

SEDIMENTATION POND 2-A DISCHARGE TURBIDITY
TURBIDITY TRANSMITTER

Tag: **AIT-009**

PID No.: PPL-001-004

01:	TRANSMITTER TYPE	FOUR WIRED WITH DISPLAY
02:	AREA CLASSIFICATION	NON HAZARDOUS
03:	ENCLOSURE CLASS	NEMA4X
04:	ENCLOSURE MATERIAL	MANUFACTURER STANDARD
05:	MOUNTING	2" POST MOUNTED
06:		
07:	TRANSMITTER OUTPUT	4-20mA
08:		
09:	INTRINSICALLY SAFE	NO
10:	INDICATOR SCALE AND UNITS	0-50mG/L
11:		
12:		
13:		
14:		
15:	SENSOR TAG	AE-009
16:		
17:		
18:		
19:		
20:		
21:		
22:		
23:		
24:		
25:		
26:		
27:		
28:	LIGHTNING PROTECTION	NO
29:		
30:		
31:		
32:		
33:		
34:		
35:		
36:		
37:	AMB. TEMPERATURE MIN / MAX	-20 / 40 DEGC
38:		
39:		
40:		

INSTRUMENT POWER TYPE: EXTERNAL SOURCE - 4-WIRE
INSTRUMENT POWER: 115VAC/24 VDC
CALIBRATION: 0 50 mg/L
MANUFACTURER:
MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **AIT-009** | REV 0

INSTRUMENT DATASHEET

SEDIMENTATION POND 3 DISCHARGE TURBIDITY
TURBIDITY SENSOR

Tag: **AE-011**

PID No.: PPL-001-004

01:	SENSOR TYPE	4 BEAM PULSED LIGHT
02:	AREA CLASSIFICATION	NON HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:	SENSOR BODY MATERIAL	316L SS
05:	OPTICAL WINDOW MATERIAL	SAPPHIRE GLASS
06:		
07:		
08:		
09:		
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE NOR / MAX	3 / 5 mH2O
13:	FLUID TEMPERATURE NOR / MAX	0 /30 DEGC
14:		
15:		
16:		
17:		
18:	SENSOR RANGE	0-50 mg/L
19:	TEMPERATURE COMPENSATION	NA
20:		
21:		
22:		
23:		
24:	SENSOR PROCESS CONNECTION	SUSPENDED ASSEMBLY
25:	PIPE OR VESSEL CONNECTION	NA
26:	ADAPTER FLANGE MATERIAL	NA
27:		
28:		
29:		
30:	RETRACTION ASSEMBLY SIZE	NA
31:	RETRACTION ASSY MATERIAL	NA
32:	RETRACTION ASSY PART NO.	NA
33:	FLOW-THRU ASSY MATERIAL	NA
34:	FLOW-THRU ASSY CONNECTIONS	NA
35:	FLOW-THRU ASSY PART NO.	TBD
36:		
37:	AMB. TEMPERATURE MIN / MAX	-20 / 40 DEGC
38:	SENSOR CABLE LENGTH	15 m
39:		
40:		

INSTRUMENT POWER TYPE: EXTERNAL SOURCE - 4-WIRE

MANUFACTURER: MODEL:

NOTES:

1) SUSPENSION ASSEMBLY FOR POND/SUMP TO BE PROVIDED BY THE VENDOR
2) SENSOR TO BE CALIBRATED FOR SUSPENDED SOLIDS IN mg/L
3) COMPRESSED AIR CLEANING ASSEMBLY

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC			

INSTRUMENT TAG	REV
AE-011	0

INSTRUMENT DATASHEET

SEDIMENTATION POND 3 DISCHARGE TURBIDITY
TURBIDITY TRANSMITTER

Tag: **AIT-011**
PID No.: PPL-001-004

01:	TRANSMITTER TYPE	FOUR WIRED WITH DISPLAY
02:	AREA CLASSIFICATION	NON HAZARDOUS
03:	ENCLOSURE CLASS	NEMA4X
04:	ENCLOSURE MATERIAL	MANUFACTURER STANDARD
05:	MOUNTING	2" POST MOUNTED
06:		
07:	TRANSMITTER OUTPUT	4-20mA
08:		
09:	INTRINSICALLY SAFE	NO
10:	INDICATOR SCALE AND UNITS	0-50mG/L
11:		
12:		
13:		
14:		
15:	SENSOR TAG	AE-011
16:		
17:		
18:		
19:		
20:		
21:		
22:		
23:		
24:		
25:		
26:		
27:		
28:	LIGHTNING PROTECTION	NO
29:		
30:		
31:		
32:		
33:		
34:		
35:		
36:		
37:	AMB. TEMPERATURE MIN / MAX	-20 / 40 DEGC
38:		
39:		
40:		

INSTRUMENT POWER TYPE: EXTERNAL SOURCE - 4-WIRE
INSTRUMENT POWER: 115VAC/24 VDC
CALIBRATION: 0 50 mg/L
MANUFACTURER:
MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **AIT-011** | REV 0

INSTRUMENT DATASHEET

SEDIMENTATION POND 4 DISCHARGE TURBIDITY
TURBIDITY SENSOR

Tag: **AE-012**

PID No.: PPL-001-004

01:	SENSOR TYPE	4 BEAM PULSED LIGHT
02:	AREA CLASSIFICATION	NON HAZARDOUS
03:	ENCLOSURE CLASS	NEMA 6P
04:	SENSOR BODY MATERIAL	316L SS
05:	OPTICAL WINDOW MATERIAL	SAPPHIRE GLASS
06:		
07:		
08:		
09:		
10:		
11:	FLUID / STATE	MINE WATER / LIQUID
12:	PRESSURE NOR / MAX	3 / 5 mH2O
13:	FLUID TEMPERATURE NOR / MAX	0 /30 DEGC
14:		
15:		
16:		
17:		
18:	SENSOR RANGE	0-50 mg/L
19:	TEMPERATURE COMPENSATION	NA
20:		
21:		
22:		
23:		
24:	SENSOR PROCESS CONNECTION	SUSPENDED ASSEMBLY
25:	PIPE OR VESSEL CONNECTION	NA
26:	ADAPTER FLANGE MATERIAL	NA
27:		
28:		
29:		
30:	RETRACTION ASSEMBLY SIZE	NA
31:	RETRACTION ASSY MATERIAL	NA
32:	RETRACTION ASSY PART NO.	NA
33:	FLOW-THRU ASSY MATERIAL	NA
34:	FLOW-THRU ASSY CONNECTIONS	NA
35:	FLOW-THRU ASSY PART NO.	TBD
36:		
37:	AMB. TEMPERATURE MIN / MAX	-20 / 40 DEGC
38:	SENSOR CABLE LENGTH	15 m
39:		
40:		

INSTRUMENT POWER TYPE: EXTERNAL SOURCE - 4-WIRE

MANUFACTURER: MODEL:

NOTES:

1) SUSPENSION ASSEMBLY FOR POND/SUMP TO BE PROVIDED BY THE VENDOR
2) SENSOR TO BE CALIBRATED FOR SUSPENDED SOLIDS IN mg/L
3) COMPRESSED AIR CLEANING ASSEMBLY

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC			

INSTRUMENT TAG	REV
AE-012	0

INSTRUMENT DATASHEET

SEDIMENTATION POND 4 DISCHARGE TURBIDITY
TURBIDITY TRANSMITTER

Tag: **AIT-012**
PID No.: PPL-001-004

01:	TRANSMITTER TYPE	FOUR WIRED WITH DISPLAY
02:	AREA CLASSIFICATION	NON HAZARDOUS
03:	ENCLOSURE CLASS	NEMA4X
04:	ENCLOSURE MATERIAL	MANUFACTURER STANDARD
05:	MOUNTING	2" POST MOUNTED
06:		
07:	TRANSMITTER OUTPUT	4-20mA
08:		
09:	INTRINSICALLY SAFE	NO
10:	INDICATOR SCALE AND UNITS	0-50mG/L
11:		
12:		
13:		
14:		
15:	SENSOR TAG	AE-012
16:		
17:		
18:		
19:		
20:		
21:		
22:		
23:		
24:		
25:		
26:		
27:		
28:	LIGHTNING PROTECTION	NO
29:		
30:		
31:		
32:		
33:		
34:		
35:		
36:		
37:	AMB. TEMPERATURE MIN / MAX	-20 / 40 DEGC
38:		
39:		
40:		

INSTRUMENT POWER TYPE: EXTERNAL SOURCE - 4-WIRE
INSTRUMENT POWER: 115VAC/24 VDC
CALIBRATION: 0 50 mg/L
MANUFACTURER:
MODEL:

NOTES:

DATASHEET NO:

REV	REV DATE	DESCRIPTION	DES	PREP	CHK	REV/APP
0	21-Mar-24	ISSUED FOR REVIEW	SC	SC		

INSTRUMENT TAG **AIT-012** | REV 0

Appendix D2: Sedimentation

Technical Specifications

Sedimentation Pond Barge Pumping System 1

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF		Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	1		
	2,02		Operation	1 Operating		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	1		
	2,04	Nominal Flow Rate		1 440		m^3/h
	2,05	Static Clearance		10		
	2,06	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	13,1		m
	2,07	NPSHa				m H_2O
	2,08	% Availability Required		100		%
	2,09	Service Location	Outdoor (Y/N)	Y		
	2,10		Indoor (Y/N)	N		
	2,11	Temperature Sensor Requirement	Required on Pump	N		
	2,12		Required on Gearbox	N		
	2,13		Sensor Type	N/A		
	2,14		Sensor Specification	N/A		
	2,15	Vibration Sensor Requirement	Required on Pump	N		
	2,16		Required on Gearbox	N		
	2,17		Sensor Type	N/A		
	2,18		Sensor Output Type	N/A		
	2,19	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,20	VFD Required (Y/N)		N		
	2,21	Tests Required	Hydrostatic (Y/N)	Y		
	2,22		Performance (Y/N)	Y		
	2,23		NPSH (Y/N)	N		
Motor Data	3,00	Electrical Availability	Voltage	600		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	105 (140)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type on Pumps for Quote / Bid		Direct On Line		
	3,07	Temperature Sensor Requirement	Required	N		
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required	N		
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type		TEFC		
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
Pump General Details	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m (ft)
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 1440 m^3/h	Total Head	To be Completed by Supplier		m (ft)
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 1656 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h

Technical Specifications

Sedimentation Pond Barge Pumping System 1

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF		Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Pump Mechanical Details	5,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	5,01	Casing	Type	To be Completed by Supplier		
	5,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	5,03	Impeller	Type (open / close)	To be Completed by Supplier		
	5,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	5,05		Number of Vanes	To be Completed by Supplier		
	5,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	5,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	5,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	5,09	Shaft Seal	Type	To be Completed by Supplier		
	5,10		Manufacturer	To be Completed by Supplier		
	5,11		Model Number	To be Completed by Supplier		
	5,12	Gearbox	Type	To be Completed by Supplier		
	5,13		Manufacturer	To be Completed by Supplier		
	5,14		Model Number	To be Completed by Supplier		
	5,15		Ratio	To be Completed by Supplier		
	5,16		Mechanical Rating	To be Completed by Supplier		
	5,17		Thermal Rating	To be Completed by Supplier		
	5,18		Oil Cooler Details	To be Completed by Supplier		
	5,19		Input / Output Coupling Details	To be Completed by Supplier		
	5,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	5,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,23		Number of V-Belts	To be Completed by Supplier		
	5,24	Bearing Life		To be Completed by Supplier		hours
	5,25	RTD Specifications	Pump	To be Completed by Supplier		
	5,26		Gearbox	To be Completed by Supplier		
	5,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	5,28		Gearbox	To be Completed by Supplier		
	5,29	Materials of Construction	Casing	To be Completed by Supplier		
	5,30		Impeller	To be Completed by Supplier		
	5,31		Wear Parts	To be Completed by Supplier		
	5,32		Liner	To be Completed by Supplier		
	5,33		Sleeves	To be Completed by Supplier		
	5,34		Shaft	To be Completed by Supplier		
	5,35		Baseplate	To be Completed by Supplier		
	5,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	5,37		Baseplate	To be Completed by Supplier		
Barge Details	6,00	Type		To be Completed by Supplier		
	6,01	Manufacturer		To be Completed by Supplier		
	6,02	Primary Pond Depth	Minimum	369,00		m
	6,03		Maximum	372,33		m
	6,04	Pump Station Cell Elevation		368,33		m
	6,05	Footprint Size		To be Completed by Supplier		
	6,06	Overall Depth from Water Level Below		To be Completed by Supplier		
	6,07	Overall Height		To be Completed by Supplier		
	6,08	Bouyancy Force		To be Completed by Supplier		
	6,09	Additional Weight Allowance		To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Degree of Assembly for Delivery		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg
NOTES		VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".				
TBD = To Be Determined						

Technical Specifications

Sedimentation Pond Barge Pumping System 2A

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF	SP2 to Environment	Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
Motor Data	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	1		
	2,02		Operation	3 Operating 1 Standby		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	4		
	2,04	Nominal Flow Rate		3600 (1200 per pump)		m^3/h
	2,05	Static Clearance		10		
	2,06	Pressure at Discharge Point		1184 (172)		kPa (psi)
	2,07	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	117,8		m
	2,08	NPSHa				m H_2O
	2,09	% Availability Required		100		%
	2,10	Service Location	Outdoor (Y/N)	Y		
	2,11		Indoor (Y/N)	N		
	2,12	Temperature Sensor Requirement	Required on Pump	N		
	2,13		Required on Gearbox	N		
	2,14		Sensor Type	N/A		
	2,15		Sensor Specification	N/A		
	2,16	Vibration Sensor Requirement	Required on Pump	N		
	2,17		Required on Gearbox	N		
	2,18		Sensor Type	N/A		
	2,19		Sensor Output Type	N/A		
	2,20	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,21	VFD Required (Y/N)		Y		
	2,22	Tests Required	Hydrostatic (Y/N)	Y		
	2,23		Performance (Y/N)	Y		
	2,24		NPSH (Y/N)	N		
Pump General Details	3,00	Electrical Availability	Voltage	4 160		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	647 (868)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type on Pumps for Quote / Bid		VFD		
	3,07	Temperature Sensor Requirement	Required	N		
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required	N		
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type		TEFC		
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m (ft)
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 3600 m^3/h	Total Head	To be Completed by Supplier		m (ft)
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 4140 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h

Technical Specifications

Sedimentation Pond Barge Pumping System 2A

Client :	Troilus	**Troilus Gold Project**	**Project No:** 2257554004
Prepared by:	OA	**Site-Wide Water Management Plan**	**Document No :**
Verified by:	MV	**Feasibility Study**	**Revision :** A
Approved by:	AF	**SP2 to Environment**	**Date :** 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Pump Mechanical Details	5,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	5,01	Casing	Type	To be Completed by Supplier		
	5,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	5,03	Impeller	Type (open / close)	To be Completed by Supplier		
	5,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	5,05		Number of Vanes	To be Completed by Supplier		
	5,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	5,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	5,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	5,09	Shaft Seal	Type	To be Completed by Supplier		
	5,10		Manufacturer	To be Completed by Supplier		
	5,11		Model Number	To be Completed by Supplier		
	5,12	Gearbox	Type	To be Completed by Supplier		
	5,13		Manufacturer	To be Completed by Supplier		
	5,14		Model Number	To be Completed by Supplier		
	5,15		Ratio	To be Completed by Supplier		
	5,16		Mechanical Rating	To be Completed by Supplier		
	5,17		Thermal Rating	To be Completed by Supplier		
	5,18		Oil Cooler Details	To be Completed by Supplier		
	5,19		Input / Output Coupling Details	To be Completed by Supplier		
	5,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	5,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,23		Number of V-Belts	To be Completed by Supplier		
	5,24	Bearing Life		To be Completed by Supplier		hours
	5,25	RTD Specifications	Pump	To be Completed by Supplier		
	5,26		Gearbox	To be Completed by Supplier		
	5,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	5,28		Gearbox	To be Completed by Supplier		
	5,29	Materials of Construction	Casing	To be Completed by Supplier		
	5,30		Impeller	To be Completed by Supplier		
	5,31		Wear Parts	To be Completed by Supplier		
	5,32		Liner	To be Completed by Supplier		
	5,33		Sleeves	To be Completed by Supplier		
	5,34		Shaft	To be Completed by Supplier		
	5,35		Baseplate	To be Completed by Supplier		
	5,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	5,37		Baseplate	To be Completed by Supplier		
Barge Details	6,00	Type		To be Completed by Supplier		
	6,01	Manufacturer		To be Completed by Supplier		
	6,02	Primary Pond Depth	Minimum	330,00		m
	6,03		Maximum	360,00		m
	6,04	Pump Station Cell Elevation		330,00		m
	6,05	Footprint Size		To be Completed by Supplier		
	6,06	Overall Depth from Water Level Below		To be Completed by Supplier		
	6,07	Overall Height		To be Completed by Supplier		
	6,08	Bouyancy Force		To be Completed by Supplier		
	6,09	Additional Weight Allowance		To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Degree of Assembly for Delivery		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg
NOTES		VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".				
TBD = To Be Determined						

Technical Specifications

Sedimentation Pond Barge Pumping System 2B

Client :	Troilus	**Troilus Gold Project**	**Project No:** 2257554004
Prepared by:	OA	**Site-Wide Water Management Plan**	**Document No :**
Verified by:	MV	**Feasibility Study**	**Revision :** A
Approved by:	AF	**SP2 to Mill**	**Date :** 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	2		
	2,02		Operation	2 Operating 2 Standby		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	4		
	2,04	Nominal Flow Rate		1351 (675.5 per pump)		m^3/h
	2,05	Static Clearance		10		
	2,06	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	134,2		m
	2,07	NPSHa				m H_2O
	2,08	% Availability Required		100		%
	2,09	Service Location	Outdoor (Y/N)	Y		
	2,10		Indoor (Y/N)	N		
	2,11	Temperature Sensor Requirement	Required on Pump	N		
	2,12		Required on Gearbox	N		
	2,13		Sensor Type	N/A		
	2,14		Sensor Specification	N/A		
	2,15	Vibration Sensor Requirement	Required on Pump	N		
	2,16		Required on Gearbox	N		
	2,17		Sensor Type	N/A		
	2,18		Sensor Output Type	N/A		
	2,19	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,20	VFD Required (Y/N)		Y		
	2,21	Tests Required	Hydrostatic (Y/N)	Y		
	2,22		Performance (Y/N)	Y		
	2,23		NPSH (Y/N)	N		
Motor Data	3,00	Electrical Availability	Voltage	4 160		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	505 (677)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type on Pumps for Quote / Bid		VFD		
	3,07	Temperature Sensor Requirement	Required	N		
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required	N		
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type		TEFC		
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
Pump General Details	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m (ft)
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 1351 m^3/h	Total Head	To be Completed by Supplier		m (ft)
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 1554 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	5,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	5,01	Casing	Type	To be Completed by Supplier		

Technical Specifications

Sedimentation Pond Barge Pumping System 2B

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF	SP2 to Mill	Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Pump Mechanical Details	5,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	5,03	Impeller	Type (open / close)	To be Completed by Supplier		
	5,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	5,05		Number of Vanes	To be Completed by Supplier		
	5,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	5,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	5,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	5,09	Shaft Seal	Type	To be Completed by Supplier		
	5,10		Manufacturer	To be Completed by Supplier		
	5,11		Model Number	To be Completed by Supplier		
	5,12	Gearbox	Type	To be Completed by Supplier		
	5,13		Manufacturer	To be Completed by Supplier		
	5,14		Model Number	To be Completed by Supplier		
	5,15		Ratio	To be Completed by Supplier		
	5,16		Mechanical Rating	To be Completed by Supplier		
	5,17		Thermal Rating	To be Completed by Supplier		
	5,18		Oil Cooler Details	To be Completed by Supplier		
	5,19		Input / Output Coupling Details	To be Completed by Supplier		
	5,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	5,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,23		Number of V-Belts	To be Completed by Supplier		
	5,24	Bearing Life		To be Completed by Supplier		hours
	5,25	RTD Specifications	Pump	To be Completed by Supplier		
	5,26		Gearbox	To be Completed by Supplier		
	5,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	5,28		Gearbox	To be Completed by Supplier		
	5,29	Materials of Construction	Casing	To be Completed by Supplier		
	5,30		Impeller	To be Completed by Supplier		
	5,31		Wear Parts	To be Completed by Supplier		
	5,32		Liner	To be Completed by Supplier		
	5,33		Sleeves	To be Completed by Supplier		
	5,34		Shaft	To be Completed by Supplier		
	5,35		Baseplate	To be Completed by Supplier		
	5,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	5,37		Baseplate	To be Completed by Supplier		
Barge Details	6,00	Type		To be Completed by Supplier		
	6,01	Manufacturer		To be Completed by Supplier		
	6,02	Primary Pond Depth	Minimum	330,00		m
	6,03		Maximum	360,00		m
	6,04	Pump Station Cell Elevation		330,00		m
	6,05	Footprint Size		To be Completed by Supplier		
	6,06	Overall Depth from Water Level Below		To be Completed by Supplier		
	6,07	Overall Height		To be Completed by Supplier		
	6,08	Bouyancy Force		To be Completed by Supplier		
	6,09	Additional Weight Allowance		To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Degree of Assembly for Delivery		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg

NOTES

TBD = To Be Determined

VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".

Technical Specifications

Sedimentation Pond Barge Pumping System 3

Client :	Troilus	**Troilus Gold Project**	**Project No:** 2257554004
Prepared by:	OA	**Site-Wide Water Management Plan**	**Document No :**
Verified by:	MV	**Feasibility Study**	**Revision :** A
Approved by:	AF		**Date :** 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	1		
	2,02		Operation	1 Operating		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	1		
	2,04	Nominal Flow Rate		3 600		m^3/h
	2,05	Static Clearance		10		
	2,06	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	3,2		m
	2,07	NPSHa				m H_2O
	2,08	% Availability Required		100		%
	2,09	Service Location	Outdoor (Y/N)	Y		
	2,10		Indoor (Y/N)	N		
	2,11	Temperature Sensor Requirement	Required on Pump	N		
	2,12		Required on Gearbox	N		
	2,13		Sensor Type	N/A		
	2,14		Sensor Specification	N/A		
	2,15	Vibration Sensor Requirement	Required on Pump	N		
	2,16		Required on Gearbox	N		
	2,17		Sensor Type	N/A		
	2,18		Sensor Output Type	N/A		
	2,19	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,20	VFD Required (Y/N)		N		
	2,21	Tests Required	Hydrostatic (Y/N)	Y		
	2,22		Performance (Y/N)	Y		
	2,23		NPSH (Y/N)	N		
Motor Data	3,00	Electrical Availability	Voltage	600		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	84.7 (84.7)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type on Pumps for Quote / Bid		Direct On Line		
	3,07	Temperature Sensor Requirement	Required	N		
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required	N		
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type		TEFC		
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
Pump General Details	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m (ft)
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 3600 m^3/h	Total Head	To be Completed by Supplier		m (ft)
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 4140 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h

Technical Specifications

Sedimentation Pond Barge Pumping System 3

Client : Troilus	**Troilus Gold Project**	**Project No:** 2257554004	
Prepared by: OA	**Site-Wide Water Management Plan**	**Document No :**	
Verified by: MV	**Feasibility Study**	**Revision :** A	
Approved by: AF		**Date :** 26/10/2023	

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Pump Mechanical Details	5,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	5,01	Casing	Type	To be Completed by Supplier		
	5,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	5,03	Impeller	Type (open / close)	To be Completed by Supplier		
	5,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	5,05		Number of Vanes	To be Completed by Supplier		
	5,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	5,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	5,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	5,09	Shaft Seal	Type	To be Completed by Supplier		
	5,10		Manufacturer	To be Completed by Supplier		
	5,11		Model Number	To be Completed by Supplier		
	5,12	Gearbox	Type	To be Completed by Supplier		
	5,13		Manufacturer	To be Completed by Supplier		
	5,14		Model Number	To be Completed by Supplier		
	5,15		Ratio	To be Completed by Supplier		
	5,16		Mechanical Rating	To be Completed by Supplier		
	5,17		Thermal Rating	To be Completed by Supplier		
	5,18		Oil Cooler Details	To be Completed by Supplier		
	5,19		Input / Output Coupling Details	To be Completed by Supplier		
	5,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	5,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,23		Number of V-Belts	To be Completed by Supplier		
	5,24	Bearing Life		To be Completed by Supplier		hours
	5,25	RTD Specifications	Pump	To be Completed by Supplier		
	5,26		Gearbox	To be Completed by Supplier		
	5,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	5,28		Gearbox	To be Completed by Supplier		
	5,29	Materials of Construction	Casing	To be Completed by Supplier		
	5,30		Impeller	To be Completed by Supplier		
	5,31		Wear Parts	To be Completed by Supplier		
	5,32		Liner	To be Completed by Supplier		
	5,33		Sleeves	To be Completed by Supplier		
	5,34		Shaft	To be Completed by Supplier		
	5,35		Baseplate	To be Completed by Supplier		
	5,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	5,37		Baseplate	To be Completed by Supplier		
Barge Details	6,00	Type		To be Completed by Supplier		
	6,01	Manufacturer		To be Completed by Supplier		
	6,02	Primary Pond Depth	Minimum	349,08		m
	6,03		Maximum	352,58		m
	6,04	Pump Station Cell Elevation		348,58		m
	6,05	Footprint Size		To be Completed by Supplier		
	6,06	Overall Depth from Water Level Below		To be Completed by Supplier		
	6,07	Overall Height		To be Completed by Supplier		
	6,08	Bouyancy Force		To be Completed by Supplier		
	6,09	Additional Weight Allowance		To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Degree of Assembly for Delivery		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg

NOTES
TBD = To Be Determined

VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".

Technical Specifications

Sedimentation Pond Barge Pumping System 4

Client :	Troilus	**Troilus Gold Project**	**Project No:** 2257554004
Prepared by:	OA	**Site-Wide Water Management Plan**	**Document No :**
Verified by:	MV	**Feasibility Study**	**Revision :** A
Approved by:	AF		**Date :** 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	1		
	2,02		Operation	1 Operating 1 Standby		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	2		
	2,04	Nominal Flow Rate		3 600		m^3/h
	2,05	Static Clearance		10		
	2,06	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	7,4		m
	2,07	NPSHa				m H_2O
	2,08	% Availability Required		100		%
	2,09	Service Location	Outdoor (Y/N)	Y		
	2,10		Indoor (Y/N)	N		
	2,11	Temperature Sensor Requirement	Required on Pump	N		
	2,12		Required on Gearbox	N		
	2,13		Sensor Type	N/A		
	2,14		Sensor Specification	N/A		
	2,15	Vibration Sensor Requirement	Required on Pump	N		
	2,16		Required on Gearbox	N		
	2,17		Sensor Type	N/A		
	2,18		Sensor Output Type	N/A		
	2,19	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,20	VFD Required (Y/N)		N		
	2,21	Tests Required	Hydrostatic (Y/N)	Y		
	2,22		Performance (Y/N)	Y		
	2,23		NPSH (Y/N)	N		
Motor Data	3,00	Electrical Availability	Voltage	600		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	148 (198)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type on Pumps for Quote / Bid		Direct On Line		
	3,07	Temperature Sensor Requirement	Required	N		
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required	N		
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type		TEFC		
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
Pump General Details	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m (ft)
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 3600 m^3/h	Total Head	To be Completed by Supplier		m (ft)
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 4140 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h

Technical Specifications

Sedimentation Pond Barge Pumping System 4

Client :	Troilus	**Troilus Gold Project**	**Project No:** 2257554004
Prepared by:	OA	**Site-Wide Water Management Plan**	**Document No :**
Verified by:	MV	**Feasibility Study**	**Revision :** A
Approved by:	AF		**Date :** 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Pump Mechanical Details	5,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	5,01	Casing	Type	To be Completed by Supplier		
	5,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	5,03	Impeller	Type (open / close)	To be Completed by Supplier		
	5,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	5,05		Number of Vanes	To be Completed by Supplier		
	5,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	5,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	5,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	5,09	Shaft Seal	Type	To be Completed by Supplier		
	5,10		Manufacturer	To be Completed by Supplier		
	5,11		Model Number	To be Completed by Supplier		
	5,12	Gearbox	Type	To be Completed by Supplier		
	5,13		Manufacturer	To be Completed by Supplier		
	5,14		Model Number	To be Completed by Supplier		
	5,15		Ratio	To be Completed by Supplier		
	5,16		Mechanical Rating	To be Completed by Supplier		
	5,17		Thermal Rating	To be Completed by Supplier		
	5,18		Oil Cooler Details	To be Completed by Supplier		
	5,19		Input / Output Coupling Details	To be Completed by Supplier		
	5,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	5,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,23		Number of V-Belts	To be Completed by Supplier		
	5,24	Bearing Life		To be Completed by Supplier		hours
	5,25	RTD Specifications	Pump	To be Completed by Supplier		
	5,26		Gearbox	To be Completed by Supplier		
	5,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	5,28		Gearbox	To be Completed by Supplier		
	5,29	Materials of Construction	Casing	To be Completed by Supplier		
	5,30		Impeller	To be Completed by Supplier		
	5,31		Wear Parts	To be Completed by Supplier		
	5,32		Liner	To be Completed by Supplier		
	5,33		Sleeves	To be Completed by Supplier		
	5,34		Shaft	To be Completed by Supplier		
	5,35		Baseplate	To be Completed by Supplier		
	5,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	5,37		Baseplate	To be Completed by Supplier		
Barge Details	6,00	Type		To be Completed by Supplier		
	6,01	Manufacturer		To be Completed by Supplier		
	6,02	Primary Pond Depth	Minimum	350,67		m
	6,03		Maximum	354,17		m
	6,04	Pump Station Cell Elevation		350,17		m
	6,05	Footprint Size		To be Completed by Supplier		
	6,06	Overall Depth from Water Level Below		To be Completed by Supplier		
	6,07	Overall Height		To be Completed by Supplier		
	6,08	Bouyancy Force		To be Completed by Supplier		
	6,09	Additional Weight Allowance		To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Degree of Assembly for Delivery		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg

NOTES

TBD = To Be Determined

VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".

1.0 REVISIONS

Rev No.	Issued for	Date	Prepared	Checked	Approved
A	Tender RFQ	2023-10-26	OA	MV	AF

2.0 INSTRUCTIONS TO BIDDERS

2.1 Intent

2.1.1 WSP is currently performing a feasibility level study for Troilus. Troilus is located in the northeastern part of the Archaean Frotêt-Evans greenstone belt in Quebec, Ontario. Working within budget constraints please advise on the **most economical** models that meet our criteria.

2.1.2 WSP is acting as a consultant for the Purchaser and is responsible for issue of requests for quotation (RFQs), specification preparation, evaluation of bids and preparation of a recommendation to purchase for consideration by the Purchaser.

2.1.3 Any Purchase Order awarded because of this RFQ will be by and between the Purchaser and the Vendor.

2.1.4 The intent of this request for quotation is to obtain from a Vendor a quotation to design, fabricate, shop test, deliver and assist with the commissioning of the following:

Equip. Type	Quantity	Description
Vertical Turbine Pumps	13	Sedimentation Pond Pumps

2.2 Bid Submission

2.2.1 An electronic version of the Vendor's quotation, which includes all brochures, descriptions, and documentation shown in the hard copy, must be e-mailed to: Ms. Odessa Abtahi & Mr. Mike Valkenburg copied to Mr. Andre Fontaine at the following e-mails:

Odessa.Abtahi@wsp.com

Michael.Valkenburg@wsp.com

Andre.Fontaine@wsp.com

2.2.2 Quotations shall be delivered to the above address no later than ***3:00 p.m. (EST) on November 3, 2023***

2.2.3 Any questions during the bidding process should be submitted to Ms. Odessa Abtahi & Mr. Mike Valkenburg copied to Mr. Andre Fontaine at the following e-mails:

Odessa.Abtahi@wsp.com

Michael.Valkenburg@wsp.com

Andre.Fontaine@wsp.com

2.3 Bid Content

2.3.1 The Vendor shall complete Bid Form and attach it to their proposal. ***Noncompletion of the Bid Form may result in the rejection of the Vendor's Bid***. In addition to the Bid Form, the Vendor is invited to submit any additional material, brochures or technical descriptions that will further aid in the bid evaluation.

2.3.2 Vendor's pricing shall be **FIXED PRICE**. In addition to the Proposal Form, the Vendor is invited to submit any additional material, brochures or technical descriptions that will further aid the proposal evaluation. The specifications and design indicated in the RFQ are the minimum requirements for the plant. If additional enhancements are available, the cost and details of these enhancements can be added separately for evaluation.

2.3.3 The Vendor is also to submit with its quotation:

- General Arrangement drawings of the proposed equipment (or similar equipment suitably marked up to indicate principal dimensions, weights and maximum loads to be used for the design of the supporting structures).
- A list of major mechanical, electrical equipment and instruments with summary specifications.
- Pump curve and $NPSH_R$ curve that indicates both the operating and design points.
- A sample Quality Assurance Program for similar work previously completed.
- Commissioning spare parts list with all the parts recommended by the Vendor for the commissioning period. The list will include the list price at the time of submitting the proposal for each component.
- Operating spare parts list with all the parts recommended by the Vendor for 1 year of operation. The list will include the list price and lead time in weeks, especially for the long lead items at the time of submitting the proposal for each component.
- A maintenance plan (number of hours, number and type of personnel, location of personnel, scheduled maintenance frequency, type of maintenance etc.)
- Special tools list (if required).

3.0 DESIGN CRITERIA

3.1.1 The equipment will be operated continuously, 24 hours/day, 365 days/year with an allowance for plant downtime and maintenance.

3.1.2 There will be thirteen (13) sedimentation pumps. The pumps shall be single-stage pumps and barge mounted. The pumps discharge to environment and will be controlled by level control and turbidity meter.

3.1.3 Figure 1 & Figure 2 below shows sedimentation pond 1 and pump station cell as an example. Agitation and pump will sit in the pump station cell. Pump shall be capable of pumping out the entirety of the primary sedimentation pond.

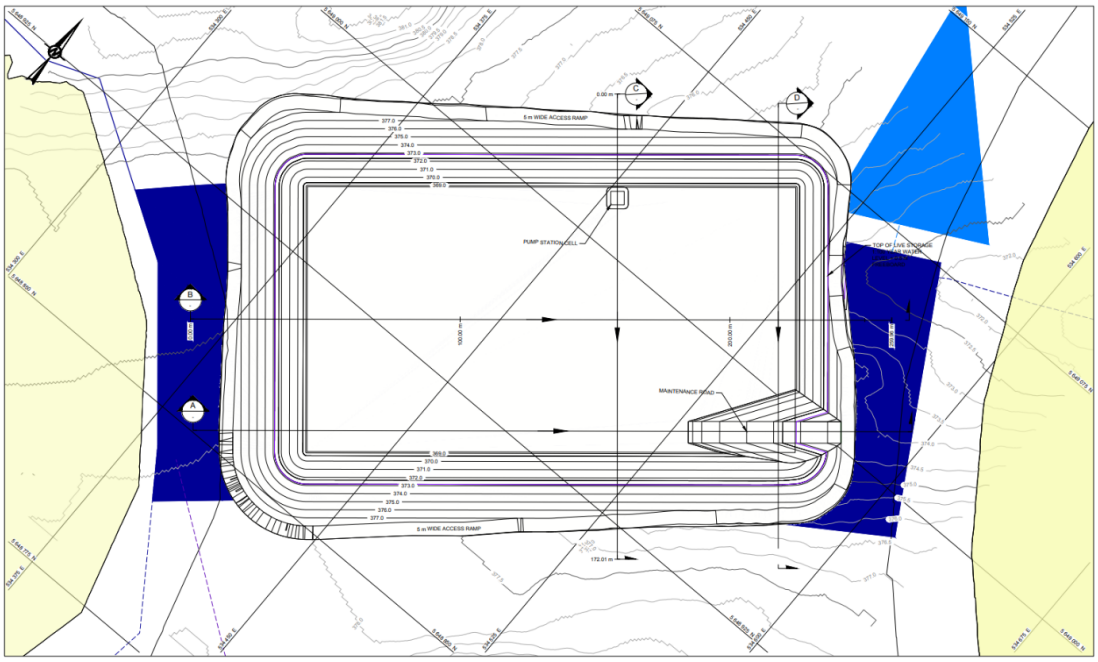

Figure 1 Sedimentation Pond 1

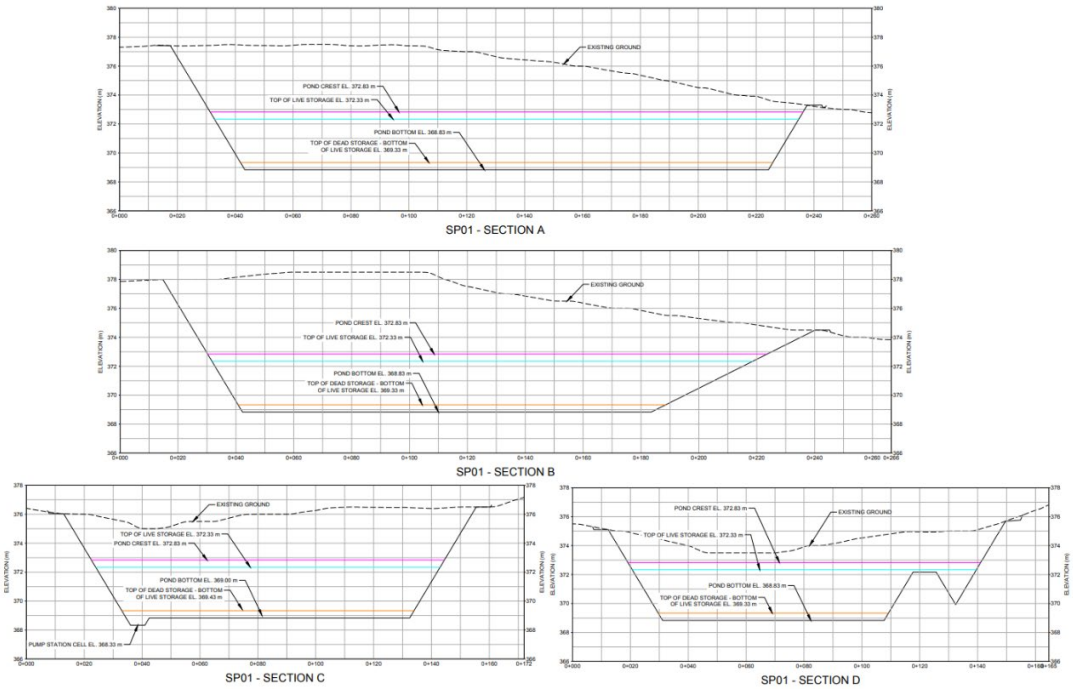

Figure 2 Sedimentation Pond 1 Section Views

3.1.4 The equipment shall be the manufacturer's standard design with a proven and successful service in similar operations and shall be suitable for mine dewatering, low slurry applications and the specified conditions with minimum maintenance. The design criteria for the operation of the equipment are given below (note all units are imperial unless noted otherwise):

General Operating and Design Conditions		
Material Description		Water
Specific Gravity		1.00
Expected Liquid Temperature at Inlet (°C)		0-30°
Sedimentation Pumps		
Pump Type		Single-stage
Installed Units		13 (redundancy on SP2a, SP2b, SP3 and SP4)
Operating Units		8
Total Flowrate Nominal (m3/hr)	SP 1	1440
	SP 2A	3600 (3 operating, 1 standby)
	SP 2B	1351 (2 operating, 2 standby)
	SP 3	3600 (1 operating, 1 standby)
	SP 4	3600 (1 operating, 1 standby)
Line Length, (m) [Total dynamic head (m) based on nominal flow]	SP 1	300 [13]
	SP 2A	2700 [113]
	SP 2B	3530 [134]
	SP 3	10 [3]
	SP 4	20 [8]
Nominal Pipe Size, (Inches)	SP 1	18 DR 17
	SP 2A	32" DR11 & 28" DR17
	SP 2B	24" DR7 & 20" DR17
	SP 3	20 DR 17
	SP 4	28 DR 17
Pipe Material		HDPE
Liquid to be Handled		Water
Liquid Specific Gravity		1.00
Liquid Temperature at Inlet (°C)		0-30°
VFD Service		Y – SP 2A, SP 2B
Soft Starter		Y - SP1, SP3, SP4
De-icing (Y/N)		Y - via water agitation

4.0 SCOPE OF SUPPLY

4.1 General

4.1.1 In all cases, safety shall be the primary design criteria.

4.1.2 The scope of supply for pumps shall include the pumps, electric motors, couplings, drive, guards, mounting skid, belts, sheaves and all parts and accessories so that the pumps are complete and operational. Except as specifically identified in Section 4.4 Exclusions.

4.1.3 All replaceable or wearing parts shall be supplied in accordance with North American standards and practices and commonly available equipment for piping, fittings, hardware, wiring, instrumentation, controls and accessories.

4.1.4 Any exceptions to this specification shall be stated in writing by the Vendor and a suitable alternative is to be priced as an option.

4.1.5 All equipment components and systems shall be North American standards and certifications.

4.1.6 All wearing or replaceable machine components shall be of standard manufacture and commonly available.

4.1.7 All necessary accessories and tool kits required for installation, operation and maintenance of the equipment shall be included.

4.1.8 Trial assembly and/or fit testing in the workshop shall be done for all the main items that do not ship fully assembled.

4.1.9 Compliance with this specification does not relieve the Vendor of its responsibility to supply equipment, which is durable, safe and reliable for the service described.

4.1.10 All drawings and calculations produced will be in U.S. customary units.

4.1.11 All equipment shall be tagged with:

- Manufacturer’s name
- Model number
- Date of fabrication
- Equipment name
- Equipment number
- P.O. number
- kW or horsepower rating of all motors
- Serial number

4.2 Electrical and Instrumentation

4.2.1 The Vendor shall furnish its recommended control and instrumentation, including Control Panel(s) or junction box that is required to control and monitor the system, equipment, or functions more complex than start/stop of motors. All panels to be rated for NEMA 4X.

4.2.2 The Purchaser will provide motor starter and local start/stop stations for motors.

4.2.3 All pump motors shall be designed for inverter duty.

4.2.4 All systems requiring protection will be provided with sensory devices to initiate alarms and, when required, transmit a signal to the Purchaser's PLC to provide automatic shutdown of the system. All alarm sensors will be fully adjustable over their full operating ranges. This could include vibration and temperature monitoring and shut down and should be priced separately.

4.2.5 The Vendor equipment will be required to completely interface with the Purchaser's PLC via a project standard control/communication network. The Vendor shall fully describe all the control and diagnostic functions and shall supply them with the package.

4.2.6 Typically motors 250 HP or larger that operate on an across-the-line / direct online (DOL) starter shall be supplied with 4160 V, 3 Phase, 60 Hz. Motors below this rating shall be supplied 480 V.

4.2.7 Typically motors larger than 400 HP that operate on Variable Frequency/Speed Drive (VFD) shall be supplied with 4160 V, 3 Phase, 60 Hz. Motors below this rating shall be supplied 480 V.

4.2.8 Load List for all motors is appended to the submission.

4.3 Work Included

4.3.1 For all of the Merchandise listed in., the supply of each item shall be complete with, but not necessarily limited to, the following:

- Motors;
- Motor drive and control package.
- Vent and drainage connections, complete with plugs and drain valves.
- Base plates.
- Lifting lugs and eye bolts.
- Drive coupling/belt and guard.
- Gaskets, sealants, nuts and bolts for assembly and erection.
- Initial lubrication charge, shipped separately in approved containers.
- Drawings and data.
- Operating and maintenance manuals.
- Installation and alignment of motor.
- Complete sets of all special tools required for maintenance.
- All quality control and quality assurance (QA/QC) activities and documentation as required for completion of Merchandise.

4.4 Exclusions

4.4.1 The following items are excluded from the scope of supply to be quoted by the Vendor:

- Material unloading and storage;
- Foundation and anchor bolts; however, the Vendor shall specify the requirements for anchor bolts;
- Piping to and from the equipment;
- Installation labor and materials;
- Electrical wiring and conduits external to the equipment and auxiliary system;
- Purchaser's PLC;

- Lubricants and hydraulic fluids;
- Service platforms, walkways, stairs, ladders, etc.; and
- Supply of services, including compressed air, water, and power.

4.5 Vendor Document Requirements

4.5.1 The selection of a successful Vendor will depend on technical data, commercial terms and the delivery time of engineering drawings and equipment to site. As a minimum, the Vendor will be required to meet maximum delivery times as follows:

- Issue of mechanical and layout approval drawings: 4 weeks after award of contract.
- Issue of electrical and instrumentation approval drawings: 6 weeks after award of contract.
- Issue of certified drawings: 2 weeks after receipt of marked-up approval drawings.

4.6 Vendor Data Requirements

4.6.1 Approval drawings must be submitted. Approval drawings will include 1 electronic copy in AutoCAD and 1 electronic copy in PDF format of:

- Dimensioned outline drawings for all equipment;
- Assembly/erection drawings;
- Detail drawings;
- P&IDs showing all instrumentation;
- Electrical wiring schematics;
- Electrical and instrumentation layout drawings & panel layouts;
- Technical data sheets for all motors, instruments, valves or any other equipment; and
- Calculations (including design loads on supports).

4.6.2 Final Certified drawings, manuals and lists specified by Site Conditions and Standards must be submitted no later than the time specified in Bid Form. The following items are required:

- All the deliverables listed in the Approval Drawings section above, updated to reflect the Purchaser's comments and as-built conditions;
- Logic diagram describing the functioning of the equipment and instrumentation (for use by the Purchaser's Process Control Systems (PCS) programmer);
- Recommended spare parts list (to be included with operating and maintenance manuals);
- Operating and maintenance manuals (3 hard copy sets in English), 3 sets of CD/DVDs;
- Certified drawings (a PDF copy, electronic copy in AutoCAD and AutoCAD 3D model), all certified drawings and documents shall be provided by electronic transfer;
- Drawings shall be in English; and
- Manufacturer's inspection and test reports are mandatory. Vendor to submit all inspections, testing plans and Quality Assurance Plan (QAP) with bid and successful bidder will need to submit test report, inspection report to Golder and the Purchaser prior to dispatch.

END OF DOCUMENT

Appendix D3: Sump Pumps

Technical Specifications

Sump Barge Pumping System 1

Client :	Troilus	**Troilus Gold Project**		**Project No:**	2257554004
Prepared by:	OA	**Site-Wide Water Management Plan**		**Document No :**	
Verified by:	MV	**Feasibility Study**		**Revision :**	A
Approved by:	AF			**Date :**	26/04/2024

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Sump Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	1		
	2,02		Operation	1 Operating		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	1		
	2,04	Nominal Flow Rate		900		m^3/h
	2,05	Static Clearance		10		
	2,06	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	29,1		m
	2,07	NPSHa				m H_2O
	2,08	% Availability Required		100		%
	2,09	Service Location	Outdoor (Y/N)	Y		
	2,10		Indoor (Y/N)	N		
	2,11	Temperature Sensor Requirement	Required on Pump	N		
	2,12		Required on Gearbox	N		
	2,13		Sensor Type	N/A		
	2,14		Sensor Specification	N/A		
	2,15	Vibration Sensor Requirement	Required on Pump	N		
	2,16		Required on Gearbox	N		
	2,17		Sensor Type	N/A		
	2,18		Sensor Output Type	N/A		
	2,19	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,20	VFD Required (Y/N)		N		
	2,21	Tests Required	Hydrostatic (Y/N)	Y		
	2,22		Performance (Y/N)	Y		
	2,23		NPSH (Y/N)	N		
Motor Data	3,00	Electrical Availability	Voltage	600		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	146 (195.7)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type for Pumps for Quote / Bid		Vendor supplied pump controller		
	3,07	Temperature Sensor Requirement	Required	N		
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required	N		
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type				
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
Pump General Details	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m (ft)
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 900 m^3/h	Total Head	To be Completed by Supplier		m (ft)
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 1035 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h

Technical Specifications

Sump Barge Pumping System 1

Client :	Troilus	**Troilus Gold Project**	**Project No:** 2257554004
Prepared by:	OA	**Site-Wide Water Management Plan**	**Document No :**
Verified by:	MV	**Feasibility Study**	**Revision :** A
Approved by:	AF		**Date :** 26/04/2024

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Pump Mechanical Details	5,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	5,01	Casing	Type	To be Completed by Supplier		
	5,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	5,03	Impeller	Type (open / close)	To be Completed by Supplier		
	5,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	5,05		Number of Vanes	To be Completed by Supplier		
	5,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	5,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	5,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	5,09	Shaft Seal	Type	To be Completed by Supplier		
	5,10		Manufacturer	To be Completed by Supplier		
	5,11		Model Number	To be Completed by Supplier		
	5,12	Gearbox	Type	To be Completed by Supplier		
	5,13		Manufacturer	To be Completed by Supplier		
	5,14		Model Number	To be Completed by Supplier		
	5,15		Ratio	To be Completed by Supplier		
	5,16		Mechanical Rating	To be Completed by Supplier		
	5,17		Thermal Rating	To be Completed by Supplier		
	5,18		Oil Cooler Details	To be Completed by Supplier		
	5,19		Input / Output Coupling Details	To be Completed by Supplier		
	5,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	5,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,23		Number of V-Belts	To be Completed by Supplier		
	5,24	Bearing Life		To be Completed by Supplier		hours
	5,25	RTD Specifications	Pump	To be Completed by Supplier		
	5,26		Gearbox	To be Completed by Supplier		
	5,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	5,28		Gearbox	To be Completed by Supplier		
	5,29	Materials of Construction	Casing	To be Completed by Supplier		
	5,30		Impeller	To be Completed by Supplier		
	5,31		Wear Parts	To be Completed by Supplier		
	5,32		Liner	To be Completed by Supplier		
	5,33		Sleeves	To be Completed by Supplier		
	5,34		Shaft	To be Completed by Supplier		
	5,35		Baseplate	To be Completed by Supplier		
	5,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	5,37		Baseplate	To be Completed by Supplier		
Barge Details	6,00	Type		To be Completed by Supplier		
	6,01	Manufacturer		To be Completed by Supplier		
	6,02	Primary Pond Depth	Minimum	371,81		m
	6,03		Maximum	376,51		m
	6,04	Pump Station Cell Elevation		371,31		m
	6,05	Footprint Size		To be Completed by Supplier		
	6,06	Overall Depth from Water Level Below		To be Completed by Supplier		
	6,07	Overall Height		To be Completed by Supplier		
	6,08	Bouyancy Force		To be Completed by Supplier		
	6,09	Additional Weight Allowance		To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Degree of Assembly for Delivery		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg
NOTES		VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".				
TBD = To Be Determined						

Technical Specifications

Sump Barge Pumping System 2

Client :	Troilus	**Troilus Gold Project**	**Project No:** 2257554004
Prepared by:	OA	**Site-Wide Water Management Plan**	**Document No :**
Verified by:	MV	**Feasibility Study**	**Revision :** A
Approved by:	AF		**Date :** 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Sump Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	1		
	2,02		Operation	1 Operating		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	1		
	2,04	Nominal Flow Rate		1 080		m^3/h
	2,05	Static Clearance		10		
	2,06	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	52,0		m
	2,07	NPSHa				m H_2O
	2,08	% Availability Required		100		%
	2,09	Service Location	Outdoor (Y/N)	Y		
	2,10		Indoor (Y/N)	N		
	2,11	Temperature Sensor Requirement	Required on Pump	N		
	2,12		Required on Gearbox	N		
	2,13		Sensor Type	N/A		
	2,14		Sensor Specification	N/A		
	2,15	Vibration Sensor Requirement	Required on Pump	N		
	2,16		Required on Gearbox	N		
	2,17		Sensor Type	N/A		
	2,18		Sensor Output Type	N/A		
	2,19	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,20	VFD Required (Y/N)		Y		
	2,21	Tests Required	Hydrostatic (Y/N)	Y		
	2,22		Performance (Y/N)	Y		
	2,23		NPSH (Y/N)	N		
Motor Data	3,00	Electrical Availability	Voltage	600		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	310 (416)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type on Pumps for Quote / Bid		VFD		
	3,07	Temperature Sensor Requirement	Required			
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required			
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type		TEFC		
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
Pump General Details	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 1080 m^3/h	Total Head	To be Completed by Supplier		m
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 1242 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h

Technical Specifications

Sump Barge Pumping System 2

Client :	Troilus	**Troilus Gold Project**		**Project No:**	2257554004
Prepared by:	OA	**Site-Wide Water Management Plan**		**Document No :**	
Verified by:	MV	**Feasibility Study**		**Revision :**	A
Approved by:	AF			**Date :**	26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Barge Details	5,00	Type		To be Completed by Supplier		
	5,01	Manufacturer		To be Completed by Supplier		
	5,02	Primary Pond Depth	Minimum	384,25		m
	5,03		Maximum	387,75		m
	5,04	Pump Station Cell Elevation		383,75		m
	5,05	Footprint Size		To be Completed by Supplier		
	5,06	Overall Depth from Water Level Below		To be Completed by Supplier		
	5,07	Overall Height		To be Completed by Supplier		
	5,08	Bouyancy Force		To be Completed by Supplier		
	5,09	Additional Weight Allowance		To be Completed by Supplier		
Pump Mechanical Details	6,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	6,01	Casing	Type	To be Completed by Supplier		
	6,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	6,03	Impeller	Type (open / close)	To be Completed by Supplier		
	6,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	6,05		Number of Vanes	To be Completed by Supplier		
	6,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	6,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	6,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	6,09	Shaft Seal	Type	To be Completed by Supplier		
	6,10		Manufacturer	To be Completed by Supplier		
	6,11		Model Number	To be Completed by Supplier		
	6,12	Gearbox	Type	To be Completed by Supplier		
	6,13		Manufacturer	To be Completed by Supplier		
	6,14		Model Number	To be Completed by Supplier		
	6,15		Ratio	To be Completed by Supplier		
	6,16		Mechanical Rating	To be Completed by Supplier		
	6,17		Thermal Rating	To be Completed by Supplier		
	6,18		Oil Cooler Details	To be Completed by Supplier		
	6,19		Input / Output Coupling Details	To be Completed by Supplier		
	6,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	6,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	6,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	6,23		Number of V-Belts	To be Completed by Supplier		
	6,24	Bearing Life		To be Completed by Supplier		hours
	6,25	RTD Specifications	Pump	To be Completed by Supplier		
	6,26		Gearbox	To be Completed by Supplier		
	6,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	6,28		Gearbox	To be Completed by Supplier		
	6,29	Materials of Construction	Casing	To be Completed by Supplier		
	6,30		Impeller	To be Completed by Supplier		
	6,31		Wear Parts	To be Completed by Supplier		
	6,32		Liner	To be Completed by Supplier		
	6,33		Sleeves	To be Completed by Supplier		
	6,34		Shaft	To be Completed by Supplier		
	6,35		Baseplate	To be Completed by Supplier		
	6,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	6,37		Baseplate	To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Degree of Assembly for Delivery		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg

NOTES
TBD = To Be Determined

VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".

Technical Specifications

Sump Barge Pumping System 3

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF		Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Sump Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	1		
	2,02		Operation	1 Operating		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	1		
	2,04	Nominal Flow Rate		1 080		m^3/h
	2,05	Static Clearance		10		
	2,06	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	68,4		m
	2,07	NPSHa				m H_2O
	2,08	% Availability Required		100		%
	2,09	Service Location	Outdoor (Y/N)	Y		
	2,10		Indoor (Y/N)	N		
	2,11	Temperature Sensor Requirement	Required on Pump	N		
	2,12		Required on Gearbox	N		
	2,13		Sensor Type	N/A		
	2,14		Sensor Specification	N/A		
	2,15	Vibration Sensor Requirement	Required on Pump	N		
	2,16		Required on Gearbox	N		
	2,17		Sensor Type	N/A		
	2,18		Sensor Output Type	N/A		
	2,19	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,20	VFD Required (Y/N)		Y		
	2,21	Tests Required	Hydrostatic (Y/N)	Y		
	2,22		Performance (Y/N)	Y		
	2,23		NPSH (Y/N)	N		
Motor Data	3,00	Electrical Availability	Voltage	600		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	358 (479.7)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type on Pumps for Quote / Bid		VFD		
	3,07	Temperature Sensor Requirement	Required			
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required			
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type		TEFC		
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
Pump General Details	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 1080 m^3/h	Total Head	To be Completed by Supplier		m
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 1242 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h

Technical Specifications

Sump Barge Pumping System 3

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF		Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Pump Mechanical Details	5,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	5,01	Casing	Type	To be Completed by Supplier		
	5,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	5,03	Impeller	Type (open / close)	To be Completed by Supplier		
	5,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	5,05		Number of Vanes	To be Completed by Supplier		
	5,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	5,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	5,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	5,09	Shaft Seal	Type	To be Completed by Supplier		
	5,10		Manufacturer	To be Completed by Supplier		
	5,11		Model Number	To be Completed by Supplier		
	5,12	Gearbox	Type	To be Completed by Supplier		
	5,13		Manufacturer	To be Completed by Supplier		
	5,14		Model Number	To be Completed by Supplier		
	5,15		Ratio	To be Completed by Supplier		
	5,16		Mechanical Rating	To be Completed by Supplier		
	5,17		Thermal Rating	To be Completed by Supplier		
	5,18		Oil Cooler Details	To be Completed by Supplier		
	5,19		Input / Output Coupling Details	To be Completed by Supplier		
	5,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	5,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,23		Number of V-Belts (Minimum of 2)	To be Completed by Supplier		
	5,24	Bearing Life		To be Completed by Supplier		hours
	5,25	RTD Specifications	Pump	To be Completed by Supplier		
	5,26		Gearbox	To be Completed by Supplier		
	5,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	5,28		Gearbox	To be Completed by Supplier		
	5,29	Materials of Construction	Casing	To be Completed by Supplier		
	5,30		Impeller	To be Completed by Supplier		
	5,31		Wear Parts	To be Completed by Supplier		
	5,32		Liner	To be Completed by Supplier		
	5,33		Sleeves	To be Completed by Supplier		
	5,34		Shaft	To be Completed by Supplier		
	5,35		Baseplate	To be Completed by Supplier		
	5,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	5,37		Baseplate	To be Completed by Supplier		
Barge Details	6,00	Type		To be Completed by Supplier		
	6,01	Manufacturer		To be Completed by Supplier		
	6,02	Primary Pond Depth	Minimum	369,50		m
	6,03		Maximum	372,99		m
	6,04	Pump Station Cell Elevation		369,00		m
	6,05	Footprint Size		To be Completed by Supplier		
	6,06	Overall Depth from Water Level Below		To be Completed by Supplier		
	6,07	Overall Height		To be Completed by Supplier		
	6,08	Bouyancy Force		To be Completed by Supplier		
	6,09	Additional Weight Allowance		To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Degree of Assembly for Delivery		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg

NOTES

TBD = To Be Determined

VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".

Technical Specifications

Sump Barge Pumping System 5

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF		Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Sump Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	1		
	2,02		Operation	1 Operating		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	1		
	2,04	Nominal Flow Rate		720		m^3/h
	2,05	Static Clearance		10		
	2,06	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	31,0		m
	2,07	NPSHa				m H_2O
	2,08	% Availability Required		100		%
	2,09	Service Location	Outdoor (Y/N)	Y		
	2,10		Indoor (Y/N)	N		
	2,11	Temperature Sensor Requirement	Required on Pump	N		
	2,12		Required on Gearbox	N		
	2,13		Sensor Type	N/A		
	2,14		Sensor Specification	N/A		
	2,15	Vibration Sensor Requirement	Required on Pump	N		
	2,16		Required on Gearbox	N		
	2,17		Sensor Type	N/A		
	2,18		Sensor Output Type	N/A		
	2,19	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,20	VFD Required (Y/N)		N		
	2,21	Tests Required	Hydrostatic (Y/N)	Y		
	2,22		Performance (Y/N)	Y		
	2,23		NPSH (Y/N)	N		
Motor Data	3,00	Electrical Availability	Voltage	600		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	124.2 (166.4)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type on Pumps for Quote / Bid		Direct On Line		
	3,07	Temperature Sensor Requirement	Required			
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required			
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type		TEFC		
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
Pump General Details	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 1080 m^3/h	Total Head	To be Completed by Supplier		m
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 1242 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h

Technical Specifications

Sump Barge Pumping System 5

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF		Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Pump Mechanical Details	5,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	5,01	Casing	Type	To be Completed by Supplier		
	5,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	5,03	Impeller	Type (open / close)	To be Completed by Supplier		
	5,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	5,05		Number of Vanes	To be Completed by Supplier		
	5,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	5,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	5,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	5,09	Shaft Seal	Type	To be Completed by Supplier		
	5,10		Manufacturer	To be Completed by Supplier		
	5,11		Model Number	To be Completed by Supplier		
	5,12	Gearbox	Type	To be Completed by Supplier		
	5,13		Manufacturer	To be Completed by Supplier		
	5,14		Model Number	To be Completed by Supplier		
	5,15		Ratio	To be Completed by Supplier		
	5,16		Mechanical Rating	To be Completed by Supplier		
	5,17		Thermal Rating	To be Completed by Supplier		
	5,18		Oil Cooler Details	To be Completed by Supplier		
	5,19		Input / Output Coupling Details	To be Completed by Supplier		
	5,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	5,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,23		Number of V-Belts	To be Completed by Supplier		
	5,24	Bearing Life		To be Completed by Supplier		hours
	5,25	RTD Specifications	Pump	To be Completed by Supplier		
	5,26		Gearbox	To be Completed by Supplier		
	5,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	5,28		Gearbox	To be Completed by Supplier		
	5,29	Materials of Construction	Casing	To be Completed by Supplier		
	5,30		Impeller	To be Completed by Supplier		
	5,31		Wear Parts	To be Completed by Supplier		
	5,32		Liner	To be Completed by Supplier		
	5,33		Sleeves	To be Completed by Supplier		
	5,34		Shaft	To be Completed by Supplier		
	5,35		Baseplate	To be Completed by Supplier		
	5,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	5,37		Baseplate	To be Completed by Supplier		
Barge Details	6,00	Type		To be Completed by Supplier		
	6,01	Manufacturer		To be Completed by Supplier		
	6,02	Primary Pond Depth	Minimum	376,66		m
	6,03		Maximum	370,96		m
	6,04	Pump Station Cell Elevation		367,16		m
	6,05	Footprint Size		To be Completed by Supplier		
	6,06	Overall Depth from Water Level Below		To be Completed by Supplier		
	6,07	Overall Height		To be Completed by Supplier		
	6,08	Bouyancy Force		To be Completed by Supplier		
	6,09	Additional Weight Allowance		To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Degree of Assembly for Delivery		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg

NOTES

TBD = To Be Determined

VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".

Technical Specifications

Sump Barge Pumping System 6

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF		Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Sump Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	1		
	2,02		Operation	1 Operating		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	1		
	2,04	Nominal Flow Rate		720		m^3/h
	2,05	Static Clearance		10		
	2,06	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	18		m
	2,07	NPSHa		N/A		m H_2O
	2,08	% Availability Required		100		%
	2,09	Service Location	Outdoor (Y/N)	Y		
	2,10		Indoor (Y/N)	N		
	2,11	Temperature Sensor Requirement	Required on Pump	N		
	2,12		Required on Gearbox	N		
	2,13		Sensor Type	N/A		
	2,14		Sensor Specification	N/A		
	2,15	Vibration Sensor Requirement	Required on Pump	N		
	2,16		Required on Gearbox	N		
	2,17		Sensor Type	N/A		
	2,18		Sensor Output Type	N/A		
	2,19	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,20	VFD Required (Y/N)		N		
	2,21	Tests Required	Hydrostatic (Y/N)	Y		
	2,22		Performance (Y/N)	Y		
	2,23		NPSH (Y/N)	N		
Motor Data	3,00	Electrical Availability	Voltage	600		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	70.4 (94.3)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type on Pumps for Quote / Bid		Direct On Line		
	3,07	Temperature Sensor Requirement	Required			
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required			
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type		TEFC		
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
Pump General Details	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 1080 m^3/h	Total Head	To be Completed by Supplier		m
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 1242 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h

Technical Specifications

Sump Barge Pumping System 6

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF		Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Pump Mechanical Details	5,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	5,01	Casing	Type	To be Completed by Supplier		
	5,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	5,03	Impeller	Type (open / close)	To be Completed by Supplier		
	5,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	5,05		Number of Vanes	To be Completed by Supplier		
	5,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	5,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	5,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	5,09	Shaft Seal	Type	To be Completed by Supplier		
	5,10		Manufacturer	To be Completed by Supplier		
	5,11		Model Number	To be Completed by Supplier		
	5,12	Gearbox	Type	To be Completed by Supplier		
	5,13		Manufacturer	To be Completed by Supplier		
	5,14		Model Number	To be Completed by Supplier		
	5,15		Ratio	To be Completed by Supplier		
	5,16		Mechanical Rating	To be Completed by Supplier		
	5,17		Thermal Rating	To be Completed by Supplier		
	5,18		Oil Cooler Details	To be Completed by Supplier		
	5,19		Input / Output Coupling Details	To be Completed by Supplier		
	5,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	5,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,23		Number of V-Belts	To be Completed by Supplier		
	5,24	Bearing Life		To be Completed by Supplier		hours
	5,25	RTD Specifications	Pump	To be Completed by Supplier		
	5,26		Gearbox	To be Completed by Supplier		
	5,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	5,28		Gearbox	To be Completed by Supplier		
	5,29	Materials of Construction	Casing	To be Completed by Supplier		
	5,30		Impeller	To be Completed by Supplier		
	5,31		Wear Parts	To be Completed by Supplier		
	5,32		Liner	To be Completed by Supplier		
	5,33		Sleeves	To be Completed by Supplier		
	5,34		Shaft	To be Completed by Supplier		
	5,35		Baseplate	To be Completed by Supplier		
	5,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	5,37		Baseplate	To be Completed by Supplier		
Barge Details	6,00	Type		To be Completed by Supplier		
	6,01	Manufacturer		To be Completed by Supplier		
	6,02	Primary Pond Depth	Minimum	378,0		m
	6,03		Maximum	381,0		m
	6,04	Footprint Size		To be Completed by Supplier		
	6,05	Overall Depth from Water Level Below		To be Completed by Supplier		
	6,06	Overall Height		To be Completed by Supplier		
	6,07	Bouyancy Force		To be Completed by Supplier		
	6,08	Additional Weight Allowance		To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Poles		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg

NOTES

VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".

TBD = To Be Determined

Technical Specifications

Sump Barge Pumping System 7

Client :	Troilus	Troilus Gold Project	Project No: 2257554004
Prepared by:	OA	Site-Wide Water Management Plan	Document No :
Verified by:	MV	Feasibility Study	Revision : A
Approved by:	AF		Date : 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Process Fluid	1,00	Service		Sump Water		
	1,01	Design Life		30		years
	1,02	Specific Gravity		1,00		
	1,03	Viscosity		0,001		Pa.S
	1,04	Liquid Temperature at Inlet (°C)		0-30		°C
	1,05	Vapour Pressure		N/A		kPa
	1,06	Froth Factor		N/A		%
	2,00	Pump Configuration at Pump Station	Number of Pumps in Series Per Train	1		
	2,01		Number of Pump Trains	1		
	2,02		Operation	1 Operating		
	2,03	Pumps for Quotation / Bid	Total Number of Pumps For Quote / Bid	1		
	2,04	Nominal Flow Rate		720		m^3/h
	2,05	Static Clearance		10		
	2,06	Total Dynamic Head at Nominal Flow Rate	Per Pump Head Required	25,5		m
	2,07	NPSHa				m H_2O
	2,08	% Availability Required		100		%
	2,09	Service Location	Outdoor (Y/N)	Y		
	2,10		Indoor (Y/N)	N		
	2,11	Temperature Sensor Requirement	Required on Pump	N		
	2,12		Required on Gearbox	N		
	2,13		Sensor Type	N/A		
	2,14		Sensor Specification	N/A		
	2,15	Vibration Sensor Requirement	Required on Pump	N		
	2,16		Required on Gearbox	N		
	2,17		Sensor Type	N/A		
	2,18		Sensor Output Type	N/A		
	2,19	Seal Type Required (Gland / Mechanical)		Mechanical		
	2,20	VFD Required (Y/N)		N		
	2,21	Tests Required	Hydrostatic (Y/N)	Y		
	2,22		Performance (Y/N)	Y		
	2,23		NPSH (Y/N)	N		
Motor Data	3,00	Electrical Availability	Voltage	600		V
	3,01		Phase	3		Phase
	3,02		Frequency	60		Hz
	3,03	Calculated Power Required	Nominal	102.4 (137.2)		kW (hp)
	3,04	Motor Service Factor Required		1,15		
	3,05	Continuous Duty (Y/N)		Y		
	3,06	Motor Starter Type on Pumps for Quote / Bid		Direct On Line		
	3,07	Temperature Sensor Requirement	Required			
	3,08		Sensor Type	N/A		
	3,09		Sensor Specification	N/A		
	3,10	Vibration Sensor Requirement	Required			
	3,11		Sensor Type	N/A		
	3,12		Sensor Output Type	N/A		
	3,13	Motor Efficiency		NEMA Premium		
	3,14	Enclosure Type				
	3,15	Area Classification		Unclassified		
	3,16	Motor / Reducer Connection Type				
	3,17	Mounting Method (Horizontal / Vertical)		Vertical		
Pump General Details	4,00	Manufacturer		To be Completed by Supplier		
	4,01	Model Number		To be Completed by Supplier		
	4,02	Pump Size		To be Completed by Supplier		
	4,03	Pump Characteristic Curve Number		To be Completed by Supplier		
	4,04	Number of Impeller Stages		1		
	4,05	Discharge Flange	Size	To be Completed by Supplier		mm (inch)
	4,06		Type	To be Completed by Supplier		
	4,07	Impeller Diameter		To be Completed by Supplier		mm (inch)
	4,08	Drive Configuration		To be Completed by Supplier		
	4,09	Shutoff Head of Pump		To be Completed by Supplier		m
	4,10	Seal Type (Gland / Mechanical)		To be Completed by Supplier		
	4,11	Nominal Duty - 1080 m^3/h	Total Head	To be Completed by Supplier		m
	4,12		Consumed Power	To be Completed by Supplier		kW (hp)
	4,13		Pump Speed	To be Completed by Supplier		rpm
	4,14		Efficiency	To be Completed by Supplier		%
	4,15		NPSHr	To be Completed by Supplier		m
	4,16		Head Derating	To be Completed by Supplier		
	4,17		Efficiency Derating	To be Completed by Supplier		
	4,18		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h
	4,19	Design Duty - 1242 m^3/h	Total Head	To be Completed by Supplier		m
	4,20		Consumed Power	To be Completed by Supplier		kW (hp)
	4,21		Pump Speed	To be Completed by Supplier		rpm
	4,22		Efficiency	To be Completed by Supplier		%
	4,23		NPSHr	To be Completed by Supplier		m
	4,24		Head Derating	To be Completed by Supplier		
	4,25		Efficiency Derating	To be Completed by Supplier		
	4,26		Minimum Allowable Flow Rate of Pump	To be Completed by Supplier		m^3/h

Technical Specifications

Sump Barge Pumping System 7

Client :	Troilus	**Troilus Gold Project**	**Project No:** 2257554004
Prepared by:	OA	**Site-Wide Water Management Plan**	**Document No :**
Verified by:	MV	**Feasibility Study**	**Revision :** A
Approved by:	AF		**Date :** 26/10/2023

SUBJECT	ITEM NUMBER	PARAMETER	SUB PARAMETER	BUYER-SUPPLIED DATA	VENDOR-SUPPLIED DATA	UNITS
Pump Mechanical Details	5,00	Rotation - Facing Drive End (CW / CCW)		To be Completed by Supplier		
	5,01	Casing	Type	To be Completed by Supplier		
	5,02		Pressure Rating	To be Completed by Supplier		kPa (psi)
	5,03	Impeller	Type (open / close)	To be Completed by Supplier		
	5,04		Shaft Connection (threaded / keyway)	To be Completed by Supplier		
	5,05		Number of Vanes	To be Completed by Supplier		
	5,06		Diameter - Selected	To be Completed by Supplier		mm (inch)
	5,07		Diameter - Maximum	To be Completed by Supplier		mm (inch)
	5,08		Maximum Clear Passage	To be Completed by Supplier		mm (inch)
	5,09	Shaft Seal	Type	To be Completed by Supplier		
	5,10		Manufacturer	To be Completed by Supplier		
	5,11		Model Number	To be Completed by Supplier		
	5,12	Gearbox	Type	To be Completed by Supplier		
	5,13		Manufacturer	To be Completed by Supplier		
	5,14		Model Number	To be Completed by Supplier		
	5,15		Ratio	To be Completed by Supplier		
	5,16		Mechanical Rating	To be Completed by Supplier		
	5,17		Thermal Rating	To be Completed by Supplier		
	5,18		Oil Cooler Details	To be Completed by Supplier		
	5,19		Input / Output Coupling Details	To be Completed by Supplier		
	5,20		Input / Output Speed (Maximum)	To be Completed by Supplier		rpm
	5,21	Belt Drive	Motor Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,22		Pump Pulley Diameter	To be Completed by Supplier		mm (inch)
	5,23		Number of V-Belts	To be Completed by Supplier		
	5,24	Bearing Life		To be Completed by Supplier		hours
	5,25	RTD Specifications	Pump	To be Completed by Supplier		
	5,26		Gearbox	To be Completed by Supplier		
	5,27	Vibration Sensor Specifications	Pump	To be Completed by Supplier		
	5,28		Gearbox	To be Completed by Supplier		
	5,29	Materials of Construction	Casing	To be Completed by Supplier		
	5,30		Impeller	To be Completed by Supplier		
	5,31		Wear Parts	To be Completed by Supplier		
	5,32		Liner	To be Completed by Supplier		
	5,33		Sleeves	To be Completed by Supplier		
	5,34		Shaft	To be Completed by Supplier		
	5,35		Baseplate	To be Completed by Supplier		
	5,36	Surface Treatment	Pump Casing	To be Completed by Supplier		
	5,37		Baseplate	To be Completed by Supplier		
Barge Details	6,00	Type		To be Completed by Supplier		
	6,01	Manufacturer		To be Completed by Supplier		
	6,02	Primary Pond Depth	Minimum	422,54		m
	6,03		Maximum	427,00		m
	6,04	Pump Station Cell Elevation		422,04		m
	6,05	Footprint Size		To be Completed by Supplier		
	6,06	Overall Depth from Water Level Below		To be Completed by Supplier		
	6,07	Overall Height		To be Completed by Supplier		
	6,08	Bouyancy Force		To be Completed by Supplier		
	6,09	Additional Weight Allowance		To be Completed by Supplier		
Motor Details	7,00	Manufacturer		To be Completed by Supplier		
	7,01	Model Number		To be Completed by Supplier		
	7,02	Installed Power		To be Completed by Supplier		kW (hp)
	7,03	Voltage		To be Completed by Supplier		V
	7,04	Phase		To be Completed by Supplier		
	7,05	Frequency		To be Completed by Supplier		Hz
	7,06	Full Load Amperes		To be Completed by Supplier		A
	7,07	Poles		To be Completed by Supplier		
	7,08	Speed		To be Completed by Supplier		rpm
	7,09	Service Factor Applied		To be Completed by Supplier		
	7,10	NEMA Design Letter		To be Completed by Supplier		
	7,11	Motor Frame Size		To be Completed by Supplier		
	7,12	Nominal Full Load Efficiency		To be Completed by Supplier		%
	7,13	Insulation Class		To be Completed by Supplier		
	7,14	Temperature Sensor Specifications		To be Completed by Supplier		
	7,15	Vibration Sensor Specifications		To be Completed by Supplier		
	7,16	Bearing Type		To be Completed by Supplier		
Assembly and Testing	8,00	Degree of Shop Assembly		To be Completed by Supplier		
	8,01	Degree of Shop Testing		To be Completed by Supplier		
	8,02	Degree of Assembly for Delivery		To be Completed by Supplier		
Weights	9,00	Barrel and Shaft		To be Completed by Supplier		kg
	9,01	Impeller		To be Completed by Supplier		kg
	9,02	Cover Plate		To be Completed by Supplier		kg
	9,03	Gearbox		To be Completed by Supplier		kg
	9,04	Wet End		To be Completed by Supplier		kg
	9,05	Installed (Total Full Assembly)		To be Completed by Supplier		kg

NOTES

TBD = To Be Determined

VENDOR TO COMPLETE ALL OF DATA COLUMN "VENDOR-SUPPLIED DATA". IF NOT APPLICABLE, INCLUDE "N/A".

1.0 REVISIONS

Rev No.	Issued for	Date	Prepared	Checked	Approved
A	Tender RFQ	2023-10-26	OA	MV	AF

2.0 INSTRUCTIONS TO BIDDERS

2.1 Intent

2.1.1 WSP is currently performing a feasibility level study for Troilus. Troilus is located in the northeastern part of the Archaean Frotêt-Evans greenstone belt in Quebec, Ontario. Working within budget constraints please advise on the **most economical** models that meet our criteria.

2.1.2 WSP is acting as a consultant for the Purchaser and is responsible for issue of requests for quotation (RFQs), specification preparation, evaluation of bids and preparation of a recommendation to purchase for consideration by the Purchaser.

2.1.3 Any Purchase Order awarded because of this RFQ will be by and between the Purchaser and the Vendor.

2.1.4 The intent of this request for quotation is to obtain from a Vendor a quotation to design, fabricate, shop test, deliver and assist with the commissioning of the following:

Equip. Type	Quantity	Description
Submersible Pumps	6	Sump Pumps

2.2 Bid Submission

2.2.1 An electronic version of the Vendor's quotation, which includes all brochures, descriptions, and documentation shown in the hard copy, must be e-mailed to: Ms. Odessa Abtahi & Mr. Mike Valkenburg copied to Mr. Andre Fontaine at the following e-mails:

Odessa.Abtahi@wsp.com

Michael.Valkenburg@wsp.com

Andre.Fontaine@wsp.com

2.2.2 Quotations shall be delivered to the above address no later than ***3:00 p.m. (EST) on November 3, 2023***

2.2.3 Any questions during the bidding process should be submitted to Ms. Odessa Abtahi & Mr. Mike Valkenburg copied to Mr. Andre Fontaine at the following e-mails:

Odessa.Abtahi@wsp.com

Michael.Valkenburg@wsp.com

Andre.Fontaine@wsp.com

2.3 Bid Content

2.3.1 The Vendor shall complete Bid Form and attach it to their proposal. ***Non-completion of the Bid Form may result in the rejection of the Vendor's Bid***. In addition to the Bid Form, the Vendor is invited to submit any additional material, brochures or technical descriptions that will further aid in the bid evaluation.

2.3.2 Vendor's pricing shall be **FIXED PRICE**. In addition to the Proposal Form, the Vendor is invited to submit any additional material, brochures or technical descriptions that will further aid the proposal evaluation. The specifications and design indicated in the RFQ are the minimum requirements for the plant. If additional enhancements are available, the cost and details of these enhancements can be added separately for evaluation.

2.3.3 The Vendor is also to submit with its quotation:

- General Arrangement drawings of the proposed equipment (or similar equipment suitably marked up to indicate principal dimensions, weights and maximum loads to be used for the design of the supporting structures).
- A list of major mechanical, electrical equipment and instruments with summary specifications.
- Pump curve and $NPSH_R$ curve that indicates both the operating and design points.
- A sample Quality Assurance Program for similar work previously completed.
- Commissioning spare parts list with all the parts recommended by the Vendor for the commissioning period. The list will include the list price at the time of submitting the proposal for each component.
- Operating spare parts list with all the parts recommended by the Vendor for 1 year of operation. The list will include the list price and lead time in weeks, especially for the long lead items at the time of submitting the proposal for each component.
- A maintenance plan (number of hours, number and type of personnel, location of personnel, scheduled maintenance frequency, type of maintenance etc.)
- Special tools list (if required).

3.0 Design Criteria

3.1.1 The equipment will be operated continuously, 24 hours/day, 365 days/year with an allowance for plant downtime and maintenance.

3.1.2 There will be six (6) sump pumps located at various ponds. The pumps shall be single-stage pumps, controlled by level control and barge mounted.

3.1.3 Figure 1 & Figure 2 below shows sump pond 1 and pump station cell as an example. Agitation and pump will sit in the pump station cell. Pump shall be capable of pumping out the entirety of the primary sump pond.

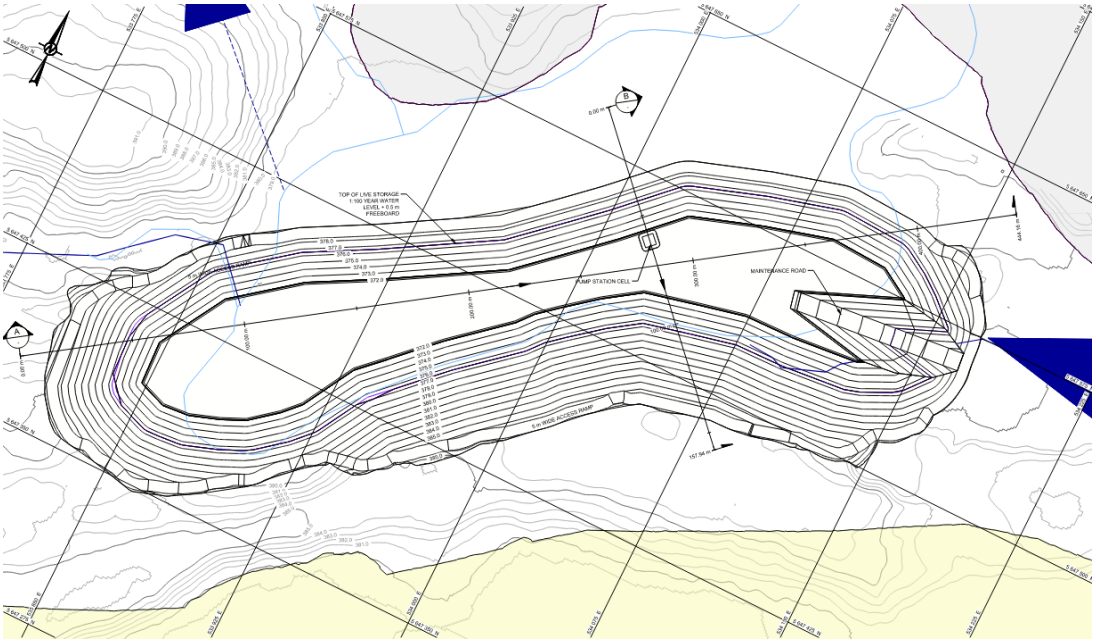

Figure 1 Sump Pond 1

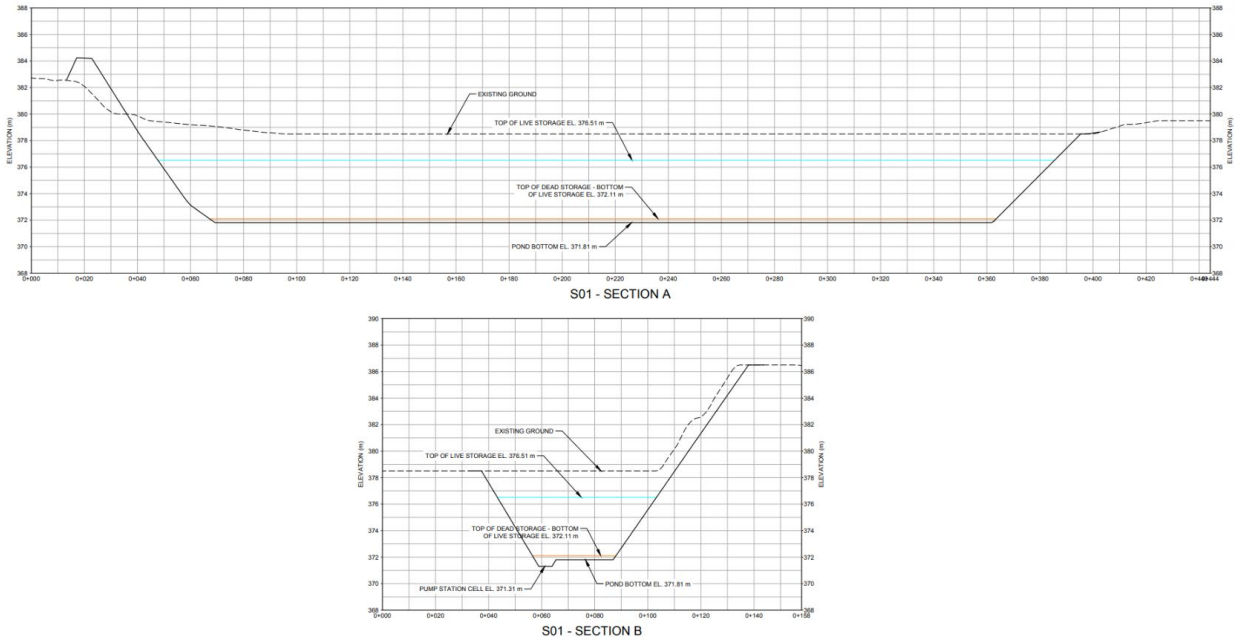

Figure 2 Sump Pond 1 Section

3.1.4 The equipment shall be the manufacturer's standard design with a proven and successful service in similar operations and shall be suitable for mine dewatering, low slurry applications and the specified conditions with minimum maintenance. The design criteria for the operation of the equipment are given below (note all units are imperial unless noted otherwise):

General Operating and Design Conditions		
Material Description		Process Water
Specific Gravity		1.00
Expected Liquid Temperature at Inlet (°C)		0-30°
Sump Pumps		
Pump Type		Single-stage
Installed Units		6
Operating Units		6
Flowrate Nominal (m3/hr)	Sump 1	900
	Sump 2	1080
	Sump 3	1080
	Sump 5	720
	Sump 6	720
	Sump 7	720
Line Length, (m) [Total dynamic head (m) based on nominal flow]	Sump 1	1615 [29]
	Sump 2	290 [52]
	Sump 3	585 [69]
	Sump 5	1140 [31]
	Sump 6	515 [18]
	Sump 7	205 [26]
Nominal Pipe Size, (Inches)	Sump 1, 5, 6	16 DR17
	Sump 2, 3	20 DR17
	Sump 7	10 DR 11
Pipe Material	Sump 1-6	HDPE DR 17
	Sump 7	HDPE DR 11
Liquid to be Handled		Water
Liquid Specific Gravity		1.00
Liquid Temperature at Inlet (°C)		0-30°
VFD Service		Y (On Sump 3)
Soft Starter		Y (On Sumps 1,2,5,6,7)
De-icing required (Y/N)		Y - via water agitation

4.0 SCOPE OF SUPPLY

4.1 General

4.1.1 In all cases, safety shall be the primary design criteria.

4.1.2 The scope of supply for pumps shall include the pumps, electric motors, couplings, drive, guards, mounting skid, belts, sheaves and all parts and accessories so that the pumps are complete and operational. Except as specifically identified in Section 4.4 Exclusions.

4.1.3 All replaceable or wearing parts shall be supplied in accordance with North American standards and practices and commonly available equipment for piping, fittings, hardware, wiring, instrumentation, controls and accessories.

4.1.4 Any exceptions to this specification shall be stated in writing by the Vendor and a suitable alternative is to be priced as an option.

4.1.5 All equipment components and systems shall be North American standards and certifications.

4.1.6 All wearing or replaceable machine components shall be of standard manufacture and commonly available.

4.1.7 All necessary accessories and tool kits required for installation, operation and maintenance of the equipment shall be included.

4.1.8 Trial assembly and/or fit testing in the workshop shall be done for all the main items that do not ship fully assembled.

4.1.9 Compliance with this specification does not relieve the Vendor of its responsibility to supply equipment, which is durable, safe and reliable for the service described.

4.1.10 All drawings and calculations produced will be in U.S. customary units.

4.1.11 All equipment shall be tagged with:

- Manufacturer’s name
- Model number
- Date of fabrication
- Equipment name
- Equipment number
- P.O. number
- kW or horsepower rating of all motors
- Serial number

4.2 Electrical and Instrumentation

4.2.1 The Vendor shall furnish its recommended control and instrumentation, including Control Panel(s) or junction box that is required to control and monitor the system, equipment, or functions more complex than start/stop of motors. All panels to be rated for NEMA 4X.

4.2.2 The Purchaser will provide motor starter and local start/stop stations for motors.

4.2.3 All pump motors shall be designed for inverter duty.

4.2.4 All systems requiring protection will be provided with sensory devices to initiate alarms and, when required, transmit a signal to the Purchaser’s PLC to provide automatic shutdown of the system. All alarm sensors will be fully adjustable over their full operating ranges. This could include vibration and temperature monitoring and shut down and should be priced separately.

4.2.5 The Vendor equipment will be required to completely interface with the Purchaser's PLC via a project standard control/communication network. The Vendor shall fully describe all the control and diagnostic functions and shall supply them with the package.

4.2.6 Typically motors 200 HP or larger that operate on an across-the-line / direct online (DOL) starter shall be supplied with 4160 V, 3 Phase, 60 Hz. Motors below this rating shall be supplied 600 V.

4.2.7 Typically Motors larger than 500 HP will operate on Variable Frequency/Speed Drive (VFD) shall be supplied with 4160 V, 3 Phase, 60 Hz. Motors below this rating shall be supplied 480 V.

4.2.8 Load List for all motors is appended to the submission.

4.3 Work Included

4.3.1 For all of the Merchandise listed in., the supply of each item shall be complete with, but not necessarily limited to, the following:

- Motors;
- Motor drive and control package.
- Vent and drainage connections, complete with plugs and drain valves.
- Base plates.
- Lifting lugs and eye bolts.
- Drive coupling/belt and guard.
- Gaskets, sealants, nuts and bolts for assembly and erection.
- Initial lubrication charge, shipped separately in approved containers.
- Drawings and data.
- Operating and maintenance manuals.
- Installation and alignment of motor.
- Complete sets of all special tools required for maintenance.
- All quality control and quality assurance (QA/QC) activities and documentation as required for completion of Merchandise.

4.4 Exclusions

4.4.1 The following items are excluded from the scope of supply to be quoted by the Vendor:

- Material unloading and storage;
- Foundation and anchor bolts; however, the Vendor shall specify the requirements for anchor bolts;
- Piping to and from the equipment;
- Installation labor and materials;
- Electrical wiring and conduits external to the equipment and auxiliary system;
- Purchaser's PLC;
- Lubricants and hydraulic fluids;
- Service platforms, walkways, stairs, ladders, etc.; and
- Supply of services, including compressed air, water, and power.

4.5 Vendor Document Requirements

4.5.1 The selection of a successful Vendor will depend on technical data, commercial terms and the delivery time of engineering drawings and equipment to site. As a minimum, the Vendor will be required to meet maximum delivery times as follows:

- Issue of mechanical and layout approval drawings: 4 weeks after award of contract.
- Issue of electrical and instrumentation approval drawings: 6 weeks after award of contract.
- Issue of certified drawings: 2 weeks after receipt of marked-up approval drawings.

4.6 Vendor Data Requirements

4.6.1 Approval drawings must be submitted. Approval drawings will include 1 electronic copy in AutoCAD and 1 electronic copy in PDF format of:

- Dimensioned outline drawings for all equipment;
- Assembly/erection drawings;
- Detail drawings;
- P&IDs showing all instrumentation;
- Electrical wiring schematics;
- Electrical and instrumentation layout drawings & panel layouts;
- Technical data sheets for all motors, instruments, valves or any other equipment; and
- Calculations (including design loads on supports).

4.6.2 Final Certified drawings, manuals and lists specified by Site Conditions and Standards must be submitted no later than the time specified in Bid Form. The following items are required:

- All the deliverables listed in the Approval Drawings section above, updated to reflect the Purchaser's comments and as-built conditions;
- Logic diagram describing the functioning of the equipment and instrumentation (for use by the Purchaser's Process Control Systems (PCS) programmer);
- Recommended spare parts list (to be included with operating and maintenance manuals);
- Operating and maintenance manuals (3 hard copy sets in English), 3 sets of CD/DVDs;
- Certified drawings (a PDF copy, electronic copy in AutoCAD and AutoCAD 3D model), all certified drawings and documents shall be provided by electronic transfer;
- Drawings shall be in English; and
- Manufacturer's inspection and test reports are mandatory. Vendor to submit all inspection, testing plans and Quality Assurance Plan (QAP) with bid and successful bidder will need to submit test report, inspection report to Golder and the Purchaser prior to dispatch.

END OF DOCUMENT

APPENDIX H

Water Treatment Plant

TECHNICAL MEMORANDUM

DATE April 29, 2024 **Reference No.** 062-2257554003-TM-Rev0

TO Ian Pritchard, Senior Vice-President, Technical Services
Troilus Gold Corporation

FROM Max Nodwell and Pierre Primeau **EMAIL Max.nodwell@wsp.com; Pierre.primeau@wsp.com**

TROILUS GOLD WATER TREATMENT PLANT RELOCATION AND REPLACEMENT FEASIBILITY STUDY

1.0 INTRODUCTION

1.1 Background

Troilus Gold Corporation (Troilus) retained WSP Canada Inc. (WSP) to prepare the feasibility study (FS) for the site-wide water management plan of the Troilus Gold Project in central Quebec. Included in this scope is the FS design for the replacement of the existing and aging water treatment plant (WTP). Troilus uses the WTP to lower the total suspended solids (TSS) in the excess water at its Tailings Storage Facility (TSF) that needs to be discharged to the environment.

WSP's understanding of the site, history, and current project is as follows:

- A previous mine at the Troilus site operated between 1996 and 2009.
- Since 2009, the site and the TSF have been in care & maintenance (C&M) or active closure phases.
- During the operations, C&M, and active closure periods, water collected in the TSF was pumped to a polishing pond.
- From the polishing pond, the water was pumped to a WTP for total suspended solids (TSS) removal before discharge to the environment.
- Troilus plans to re-open the mine operations with a new mill and the current TSF without the use of a polishing pond.
- Surplus water at the TSF will require treatment for TSS before discharge to the environment.
- The current WTP is at the end of its usable life cycle and requires replacement.

The current FS design eliminated the polishing pond. As discussed in separate FS deliverable, WSP considered that the TSF Pond retention time is sufficient to allow the settlement of the larger particles and that the design of the TSF Pond pumping station would consider measures to prevent the resuspension of particles.

1.2 Design Deliverables

The current document is the WTP FS WTP design, containing the following deliverables:

- The major equipment list including quoted or estimated costs (as applicable) and electrical load.
- Comparison and selection of the core water treatment technologies.
- General arrangement drawings including major pipe routes.
- Piping and instrumentation diagrams (P&ID)
- Preliminary instrument list
- Capital expenditures (CAPEX) (Class 3 -20% or +30%) and preliminary operating expenditures (OPEX):
  - CAPEX and OPEX contain WSP's costs for equipment, material, labour, and other items.
  - Both estimates also include the quantities for unitized items so the owner may use preferred or site-specific unit costs.

2.0 DATA REVIEW

2.1 Data Received

Table 1 presents key documents received from Troilus. WSP reviewed the documents and data for use in developing the design basis in Section 5.0 of this memorandum.

Table 1: Documents from Troilus[1]

File Name	File Type	Description
Actiflo pictures	jpg	Photos and drawings of the existing Actiflo system onsite.
MES 2017	xlsx	Daily TSS concentration of the treated final effluent and weekly TSS concentration in the water at the TSF (upstream of the polishing pond) and at the polishing pond (upstream of the WTP).
MES 2018	xlsx	
MES 2019	xlsx	
MES 2020	xlsx	▪ Daily TSS concentration of the treated final effluent and weekly TSS concentration in the water at the TSF (upstream of the polishing pond) and at the polishing pond (upstream of the WTP). ▪ Daily pH and iron concentration at the PR-5 TSF effluent point.
MES 2021	xlsx	Daily TSS concentration of the treated final effluent and weekly TSS concentration in the water at the TSF (upstream of the polishing pond) and at the polishing pond (upstream of the WTP).
MES 2022	xlsx	
Map	pdf	Map of the existing water quality sampling locations
Water quality information-Troilus	Email	▪ Email from Troilus: ▪ Including Final Effluent Discharge Limits (Table showing the applicable limits for the effluent, both average monthly and maximum acceptable concentrations) ▪ Including link to Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP) database with final effluent water quality and flows from 2006 to 2019.

1) Transmitted by email Michaud M. 2023/05/08.

2.2 Data Gaps and Assumptions

The following assumptions were made after reviewing the data in Section 2.1 and the water balance data presented in the Prefeasibility Study (PFS) (WSP, 2022):

- Flow rates:
  - The capacity of the existing WTP is 1,200 m^3/h.
  - The PFS site-wide water balance estimated that the 1,200 m^3/h would be sufficient to respond to the needs of the new Project.
  - The results of the FS site-wide water balance, which were not published at the time of preparation of this report, supported the PFS conclusion.
  - Based on the previous points, WSP will proceed with the WTP design capacity of 1,200 m^3/h.
- Water quality:
  - Water is assumed to be fed directly from the TSF to the WTP.
  - TSS is the only parameter of potential concern.
  - Modelling or estimating TSS levels in the TSF upon mine restart is not feasible. WSP has instead made the following considerations:
    - The current TSF TSS values (mine not operating, minimal disruption to the TSF water quality) range between approximately 15 to 90 mg/L (MES 2016–2022 water data from Troilus – see Table 1).
    - Troilus indicated during discussions with WSP that the TSF average TSS concentrations during the 1996–1997 operations start-up were in the range of 150 mg/L, with peaks up to 300 mg/L.
    - Troilus indicated during discussions with WSP that milling at the re-opened Troilus mine would produce finer particle-size tailings with potential to settle more slowly than historical tailings.
    - Troilus indicated during discussions with WSP that the tailings at the Troilus mine would be thickened, which has potential to decrease TSS in the TSF.
- WSP assumes the select influent TSS concentrations:
  - A minimum of 30 mg/L (grab sample limit).
  - An average of 150 mg/L (Troilus history).
  - A maximum of 300 mg/L (double the average, tenfold the minimum, in line with Troilus' history).
- WSP acknowledges the uncertainty of the data and proposes the indicated TSS range as a reasonable set of design values:
  - The average and maximum values correspond to Troilus observations during active operations start-up.
  - The minimum value corresponds to non-operational periods.
  - The range of treatable influent TSS (i.e., WTP turn-up and turn-down in response to changes in) is a parameter for comparison between the water treatment technologies under review.

- The actual TSF TSS concentrations during mine start-up activities will be monitored and evaluated in conjunction with upstream activities. Excursions of the influent TSS outside of the design range will be addressed as appropriate (e.g., upstream water management may be adjusted to bring the TSF water quality in line with the indicated range).
- The existing effluent discharge regulatory limit for the TSS concentration. The TSS concentration treatment targets are (MELCCFP, 2012 - *Directive 019 sur l'industrie minière*):
  - Less than a monthly average of 15 mg/L.
  - Less than the grab sample limit of 30 mg/L.
- The pH of the WTP inflow is between 5 and 9. This is based on historical data from the polishing pond (MELCCFP, 2023).
- The WTP inflow water is non-corrosive and non-abrasive. Equipment in contact with the water does not require specific chemical-resistant materials.
- Multi-annual mean monthly site ambient temperature ranges between -19°C and 16°C (WSP, 2022).
- WTP feed water temperature ranges between 2°C during the winter months and 25°C during the summer months, with the design temperature of 20°C.
- Treatment for iron removal is not currently required. WSP understands that Troilus has historically observed high iron concentrations in the TSF seepage, especially during the winter months. The WTP currently treats TSF Pond water primarily during the spring and summer months, when iron concentrations have not been and are not expected to be of concern.
- WTP lifespan is 35 years, based on 30 years of mine life and 5 years for planned reclamation.
  - This lifespan assumes diligent maintenance when in and out of service.

All assumptions are subject to review.

2.3 Water Treatment Initial Design Basis

Based on the proposal, TSS is the only parameter of potential concern, needed to be treated in the influent. The other regulatory limits for the WTP effluent are attached in Appendix A.

The design flow rate is 1,200 m^3/h. For design purposes, the assumed minimum, average, and maximum concentration of TSS in the WTP influent is 30 mg/L, 150 mg/L and 300 mg/L, as shown in Table 2.

Table 2: Influent and Effluent Flowrates and TSS

Parameter	Stream	Influent			Effluent		
	Units	Minimum	Average	Maximum	Minimum	Average	Maximum
Flow Rate	m^3/h	–	1,200	–	–	1,200	–
TSS	mg/L	30	100	300	0	15	30

3.0 WATER TREATMENT PLANT LOCATION SELECTION

WSP was retained by Troilus to recommend a site location for the replacement water treatment plant.

The location selection tables are in Appendix B. In the process selection study, WSP recommended two WTP locations.

- Location 1: North of TSF, near the 87 South Pit/existing Mining Complex (close to the proposed mill / mining complex)
- Location 2: South of the TSF, near the Emergency Spillway Location

In discussion between Troilus and WSP, the final WTP location selected is northwest of SP01 and NE from the SW Pit, close to the treated water discharge. The map indicating the final location in Appendix D. This location is selected due to:

- Possibility for future expansion—the selected location is in an area between two waste rock piles and a natural waterway. This location is unlikely to be developed or otherwise impacted by possible mine expansion.
- Reduced pipeline length and a slight decline from the TSF to the WTP-reduces both capital and operating expenses.

The principal disadvantage of the selected location is the distance from the mining complex. The selected location is remote from site infrastructure and would require operators travel to and work remotely at the plant when operating.

For the purposes of this design phase, the parties agree to use WTP location that is northwest of SP01 and northeast from the SW Pit, as indicated in Figure H1 in Attachment H. This location is subject to further review in later design phases.

4.0 WATER TREATMENT CORE TECHNOLOGY COMPARISON AND SELECTION

WSP compared four different water treatment technologies for removal of TSS as indicated by the design basis. The four technologies are based on two solid-liquid separation principles:

- Gravity separation, with specific core technology:
  - Lamella clarifier
  - Ballasted-flocculation lamella clarifier.
- Filter Separation, with specific core technology:
  - Disc Filter
  - Ultrafiltration.

Each technology, their merits, and their relative suitability to the Troilus Gold project are described in Attachment D.

The comparison and selection task of Attachment D was performed prior to the FS design study, and the design, consumptions, costs, and other values may be slightly different in the FS design than in the prior selection exercise.

From the technology selection analysis, WSP recommends that Troilus purchase and install a water treatment plant based on the ballasted-flocculation lamella clarifier core water treatment technology for removal of TSS.

5.0 FEASIBILITY STUDY DESIGN

5.1 Introduction

Based on the core water treatment technology selection by Troilus, WSP developed the feasibility-level design for the single-unit Veolia ACTIFLO ballasted flocculation design.

5.1.1 Inclusion and Exclusions

The following deliverables are included in the scope of this design per the relevant work order:

- Design criteria
- P&IDs.
- Mass balances.
- Major equipment list and motor list.
- General arrangement (GA) drawings.
- Instrument list
- CAPEX and OPEX estimates.

Each of the deliverables summarizes the key specifications for the following in-scope items:

- Treatment process equipment and their relative locations
- Building footprint
- In-plant major piping
- Adjacent sludge pond
- Electrical load calculations
- Preliminary instrument list.

Items that are not in the scope of this design, except as used in estimating costs:

- Chemical procurement
- Influent/effluent pumping and piping
- Utilities (electricity, potable water, heating, sewage)

- This design has a load list for major equipment only, with a nominal services electrical load scaled from the equipment direct costs.

- Telecommunications
- Other infrastructure for the plant

5.2 Design Criteria and Mass Balance

The WTP mass balance is calculated based on the expanded design criteria as shown in Table 3.

Table 3: Design Basis and Assumptions for Mass Balance Calculations

Inputs	Values	Units	Source
TSF to ACTIFLO			
Water	1,200	m^3/h	Design Basis
TSS	300	mg/L	Design Basis
Inlet Coagulant to ACTIFLO			
Ferric sulphate density	7,870	kg/m^3	(Elements 2023)
Ferric sulphate demand in influent	0.010	kg/m^3	Nominal demand, subject to refinement
Ferric sulphate stock concentration	44%		From Veolia proposal (Veolia 2023) 12.2% as Iron
Inlet Microsand to ACTIFLO			
Weekly addition	50	kg	Veolia (Oliphant and He 2023, pers. comm.)
Microsand addition duration	30	min	Selected
Microsand slurry pulp density	40%	dry microsand to total slurry w/w	Selected
Inlet Polymer to ACTIFLO			
Polymer demand in influent	0.10	mg/L dry floc/water	WSP assumed 2023
Polymer stock solution concentration	0.20%	Dry floc solids/stock solution mass	WSP assumed 2023
Polymer make-up frequency	1	Fill per day	WSP assumed 2023
Polymer make-up duration	1	h	WSP assumed 2023
Polymer transfer time	1	h	WSP assumed 2023
Polymer storage tank capacity	2	Days capacity	WSP assumed 2023
Clarifier Overflow (O/F) Discharge to Environment			
TSS concentration	5	ppm	WSP assumed 2023
Clarifier Underflow (U/F)			
Solids pulp density	20%	w/w	WSP assumed 2023
Material Densities			
TSS Density	2,600	kg/m^3	WSP assumed 2023
Ferric sulphate Density	3,100	kg/m^3	(Elements 2023)
Polymer Density	1,000	kg/m^3	WSP assumed 2023
Microsand Density	2,300	kg/m^3	WSP assumed 2023

Table 3: Design Basis and Assumptions for Mass Balance Calculations

Inputs	Values	Units	Source
Microsand Recycle (Hydrocyclone U/F)			
Microsand recovery rate	95%		WSP assumed 2023
Cyclone U/F solids pulp density	20%	solids w/w	WSP assumed 2023
Sludge Pond and Handling			
Compacted layer solids density	30%	solids w/w	WSP assumed 2023
Vac truck volume	6.0	m^3	WSP assumed 2023
Emergency Shower and Eyewash			
Minimum shower flowrate	76	L/min	(CCOHS 2023)
Minimum shower time	20	min	
Minimum eyewash flowrate	11	L/min	
Minimum eyewash time	20	min	
No. of shower and eyewash	1		

The process mass balance is shown in Attachment E. A block flow diagram of the WTP is shown in Figure 1.

Through water treatment process, influent is 0.36 tonne per hour of TSS in 1200 m^3/h flow, approximately 300 mg/L in solid concentration; the effluent discharge is 1198 m^3/h, while sludge stream will be condensed to 20% TSS, with total flowrate of 1.1 m^3/h to the sludge holding pond.

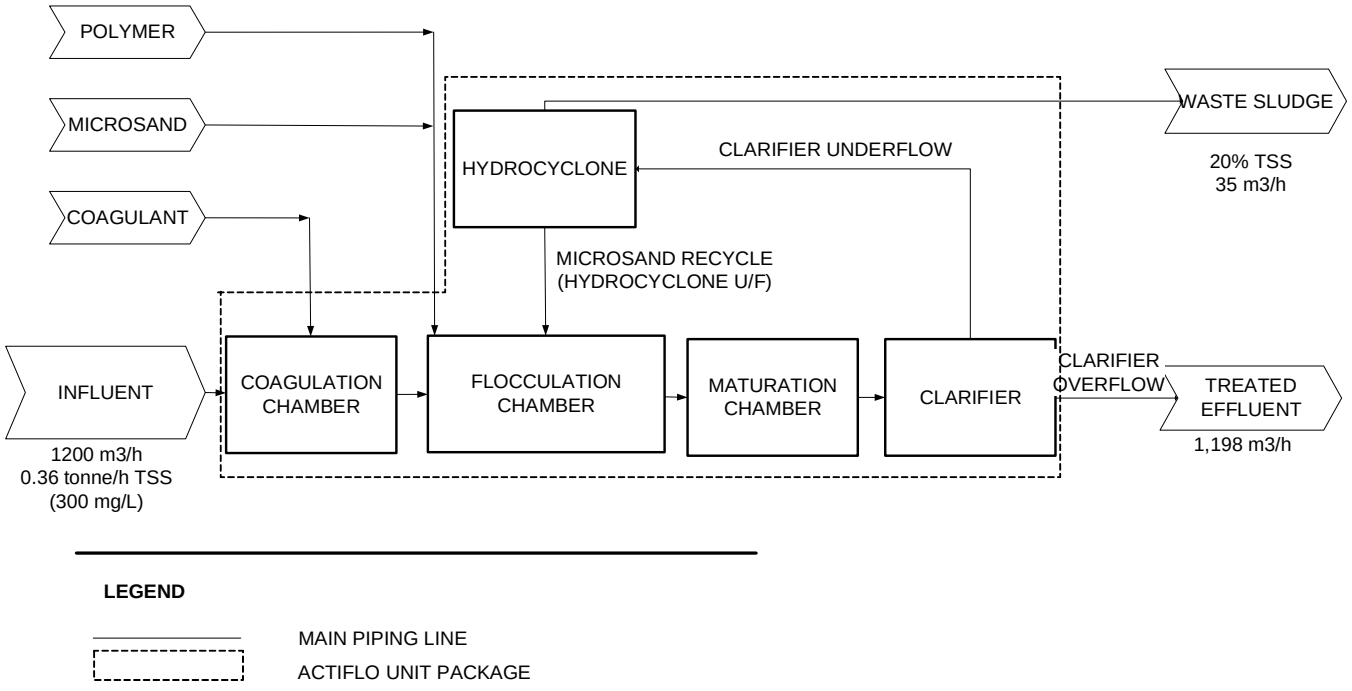

Figure 1: Block Flow Diagram for Ballasted Flocculation System

5.3 Piping and Instrumentation Diagrams and Mass Balance

The P&IDs for the plant design are contained in Attachment F. The P&IDs for the plant are separated into 3 areas:

- Area P&ID 100:
  - Main water treatment. Including ACTIFLO and treated water holding tank.
- Area P&ID 200:
  - Chemical preparation. Polymer, coagulant, and microsand is prepared here before sending to PID-100. Sludge holding pond is also included.
- Area P&ID 300:
  - Safety, sump, and utility. Including potable water treatment for safety shower, sump pump, and plant utility.

5.4 Process Descriptions

5.4.1 Main Water Treatment (PID-100)

The recommended Veolia ACTIFLO treatment system was described in the water treatment core technology comparison and selection task, contained in Attachment D. The complete quote with a drawing of the ACTIFLO unit from Veolia is included in Attachment C.

5.4.2 Chemical Handling (PID-200)

Three major chemicals are added to the WTP: coagulant (ferric sulphate), flocculant (polymer), and ballast (microsand). The function of each chemical was described in the core technology comparison and selection task in Attachment D.

Coagulant is delivered to site in solution form, held in the coagulant solution storage tank, then added to the ACTIFLO system by the coagulant metering pump.

Polymer is delivered to site as solid powder in bags. These bags will be lifted by a hoist onto the flocculant make-up system. A polymer feeder sends dry flocculant to an eductor for even water blending, then to a polymer maturation tank where it is mixed with additional water to the tank top. The resulting fluid is then gently agitated to develop long molecular chains. Once the chain growth is complete, the flocculant mixture is then sent to polymer solution storage tank, then added to ACTIFLO system through polymer metering pump.

Clean effluent from the WTP will be filtered and heated for use as the make-up water source.

Dry microsand is delivered to site in 50lb bags. From the bags, the microsand is transferred by eductor with treated effluent water as the motive fluid. The microsand-water slurry reports directly to the ACTIFLO system as make-up for losses with the waste sludge.

5.4.3 Influent, Sump, and Utility (PID-300)

The wastewater influent to the WTP comes from the TSF pond. The TSF water is a combination of mill process water and surface runoff. If the treated water from the ACTIFLO system does not meet the 15ppm TSS treatment target, it is recycled back to the ACTIFLO inlet for retreatment.

A sump collects run-off and spills from the plant. The collected fluid will be sent back to the ACTIFLO inlet for retreatment.

Treated effluent from the WTP may not meet requirement for safety shower and eye wash water quality, therefore potable water from other sources is needed. Potable water will be stored in potable water holding tank and then pumped to diaphragm tank to maintain consistent pressure before piping to the safety shower and eyewash. The flowrate and storage quantity of potable water is based on conservative assumption that both the safety shower and eyewash stations will be operating at the same time with 87 L/min flowrate for 20 min, as required by Canada Centre for Occupational Health and Safety (CCOHS 2023).

5.5 Major Equipment and Motor List

All major equipment, their specifications, power draws, approximate dimensions and weights, supplier, and quoted or estimated costs are shown in the major equipment list in Attachment G.

The major equipment and motor list, plus building footprint and costs, are derived from the process mass balance, the core-technology provider (Veolia) proposal information, other equipment quotes, and database values from previous projects. Other assumptions for equipment sizing include:

- Treated water standpipe is designed to hold effluent water for chemical make-up, and to provide buffer time for the system to adjust to effluent recycling if the treated effluent does not meet discharge specification
- Clarified water outlet on the ACTIFLO unit is approximately 3 meters above ground. Clarified water will flow to the treated water standpipe, then clean treated water reports to the environmental discharge point by gravity; no effluent pump is designed
- For pumps, head is assumed to be 50 m for a conservative design
- All pumps have 70% efficiency
- The TSS in the TSF water is in the ppm range, and the SG of the raw influent is assumed to be 1.

After the size of each equipment is determined and special process, chemical conditions, or fluid containment requirements are considered, suitable equipment was selected from vendors with new quotes, or from WSP database of prior projects.

The volume of sludge pond is 536 m^3 from the bottom to the ground surface, corresponding to approximately 21 days of plant operation at full capacity.

5.6 General Arrangement Drawings

General arrangements (GA) are primarily based on the equipment sizing indicated in Section 5.5 with the following considerations:

- Prefabricated insulated building will have two roll up door for truck access and two personnel doors on each side of the building for onsite workers.
- Electrical controls are placed in a separate electrical/control room to reduce possible contact with liquid or chemicals. A personnel door allows access to the electrical room.
- Air dryer and compressor is placed in a compressor room to reduce noise in the main building. A personnel door allows access to the compressor room.
- A lab bench is placed inside the main building for on-site experiment.
- At least 1.2 m spacing is placed to one or more side of major equipment to allow piping, operation, and maintenance.
- Influent piping uses HDPE DR17 pipe with 500 mm inner diameter; effluent piping uses the same material and diameter of 600 mm. These dimensions are the ACTILFO unit pipe connections, and the full length of the influent and effluent pipes may be small diameter depending on hydraulics.

5.7 Preliminary Instrument List

The preliminary instrument list is shown in Attachment K.

5.8 Capital and Operating Expense Estimates

WSP calculated a Class 3 CAPEX and OPEX estimates, with a range of +30% / -20%.

The CAPEX estimate was derived from the following sources:

- Vendor budgetary proposals, supplier quotes, WSP internal equipment and cost databases
- Reference quoted prices of individual equipment from WSP’s catalogue of projects
- Reference labour productivity and costs from WSP’s catalogue of projects
- Reference concrete and building costs from WSP's catalogue of projects.

The CAPEX is supplied with material take-offs (MTO) so unit costs may be changed.

The OPEX estimate was based on:

- chemical consumption estimates (mass balance)
- electrical power estimates (hydraulics and mass balance)
- labour requirements (plant size)
- labour rates (estimated)
- maintenance allowance (6% of the major equipment purchase costs).

5.8.1 Capital Cost and Basis of Estimate

The Class 3 CAPEX summary is shown in Table 4 below.

Table 4: Water Treatment Plant Material Take Off Summary CAPEX (-20% +30%)

Discipline	Direct Costs	Direct Contingency (20%)	Total Direct Costs
Building and architecture	$1,184,470	$236,894	$1,421,364
Civil and earthworks	$80,112	$16,022	$96,134
Concrete	$286,834	$57,367	$344,201
Equipment and mechanical	$2,306,712	$155,477	$2,462,189
Instrumentation and control	$618,289	$123,658	$741,947
Piping	$338,713	$67,743	$406,455
Power and electrical	$337,663	$76,283	$431,446
Service electrical	$269,197	$53,839	$323,037
Service mechanical	$215,309	$43,062	$258,371
Totals	**$5,637,299**	**$830,345**	**$6,485,144**

The detailed material take-off (MTO) list with unit costs is shown in Attachment I.

The MTO and CAPEX direct costs are derived from the equipment list shown in Attachment G. All costs are shown in 2023 CAD. All material or equipment unit costs are either quoted, estimated, or derived, as indicated in the major equipment list.

- Derived unit costs are from WSP's internal equipment and costs databases, with adjustments to account for currency exchange, inflation, and equipment scaling
- Per unit installation labour hours are from WSP's internal modelling parameters, subject to owner's approval or replacement
- A flat labour rate of $150 CAD/hour is applied, subject to owner's approval or replacement.

Lot and budget amounts

- Budget and lot amounts are assigned for labour mobilization and demobilization and hardware for each discipline
- The labour mob/demob budget is set at 10% of all other discipline labour costs
- The hardware lot costs are set to 10% of all other discipline material (but not equipment) costs.

Discipline items, with quantities and unit costs

- Civil and earthworks:
  - Digging, loading, and hauling from 22 m x 22 m pad 1.2 m foundation excavation
  - Equivalent crush and granular fill.

- Concrete:
  - Concrete for slab, walls, and equipment pedestals
  - Rebar, formworks, and aggregate are unitized per cubic meter of concrete, and assigned the same material and labour unit costs as concrete.
- Building and architecture:
  - Building material and labour costs are scaled from recent project.
- Equipment and mechanical
  - Equipment costs are summarized in the Major Equipment List in Attachment G. Costs are indicated as either quoted or estimated from cost databases.
  - Spares are indicated in equipment list as either installed or uninstalled.
- Piping
  - Major pipes and valves are indicated in the P&ID drawings.
  - Pipe lengths are approximated from the plant layout GA drawing.
- Power and electrical
  - Major electrical costs (15 kVa main power supply, MCC, control areas) are scaled from prior project costs and their respective total installed power.
  - Electrical components are derived from the motor list.
  - Cable lengths are approximated from the plant layout GA drawing.
- Instrumentation and control
  - PLC, cards, and programming budget are scaled from prior project costs and their respective IO count.
  - Instruments are indicated in the P&ID drawings.
- Service electrical
  - Electrical services include lighting, distribution, and fire safety components.
  - Lighting and distribution equipment and labour costs are assumed at 4% of the building and equipment costs and labour cost subtotals, respectively.
- The fire safety direct costs are assumed at 2.5% of the building and equipment costs and labour cost subtotals, respectively.
- Service mechanical
  - Mechanical services include HVAC and ducting.
  - HVAC and ducting costs are assumed at 5% of the building and equipment costs and labour cost subtotals, respectively.

5.8.2 Operating Cost and Basis of Estimate

The Troilus WTP maximum design flow rate is 1,200 m^3/hr. The annual treatment volume under average climate conditions is 2.6 M m^3/year. From the review, the net OPEX is estimated at M$0.53 CAD/year, or $0.20 CAD/$m^3$. The detailed OPEX estimate is shown in Attachment J.

The OPEX costs are derived from the following assumptions:

- Building heating:
  - Average climate condition of the site was used to calculate the energy required to heat the building to a minimum of 10°C using the estimated building size and typical insulation factors.
- Electrical power consumption:
  - Operating power is less than installed power, based on motor sizing and duty/installed spare pump arrangements.
  - Operating power is assumed to be 80% of installed power (Veolia, 2023).
  - Power consumption is assumed to scale linearly with flowrate.
- Chemical consumption, including feedstocks and chemical additives required to support the process:
  - Microsand and coagulant usage are estimated by Veolia.
  - Polymer usage is calculated based on WSP experience.
  - Unit prices for chemicals were based on November 2022 budgetary quotations from Quadra Chemical.
  - The 2022 costs were adjusted to account for inflation for the current year.
- For equipment maintenance requirements:
  - Annual maintenance allowance is assumed to be 6% of equipment purchase (uninstalled) cost.
- For labour requirements:
  - Costs assume full-time-equivalents (FTE) of 0.5 manager, 1 operator, and 0.5 maintenance person, for approximately double the estimated 91-day operating window.

6.0 CLOSING STATEMENT

We trust that the above meets your expectation, and we look forward to developing this project further.

Regards,

WSP CANADA INC.

<Original signed by>

Max Nodwell
Principal Process Specialist

Pierre Primeau, P. Eng.
Principal Process Engineer

MN/PP/hp

Attachments: Attachment A – Regulatory Limits for Existing WTP Effluent
Attachment B – WTP Location Selection Table
Attachment C – Veolia's Scope
Attachment D – Technology Description and Comparison
Attachment E – Mass Balance
Attachment F – P&IDs
Attachment G – Equipment List
Attachment H – General Arrangement Drawings and Site Plan
Attachment I – MTO and CAPEX
Attachment J – OPEX
Attachment K – Preliminary Instrument List

https://wsponline.sharepoint.com/sites/gld-169483/project files/6 deliverables/062-2257554003 fs design water treatment plant/rev0/062-2257554003-tm-rev0 wtp relocation and replacement fs 26apr_24.docx

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ATTACHMENT A

Regulatory Limits for Existing WTP Effluent

ATTACHMENT A: REGULATORY LIMITS FOR EXISTING WTP EFFLUENT

Table 1 presents the Troilus regulatory limits for the existing WTP effluent.

Of the listed parameters, only TSS is considered parameter of potential concern for treatment in the existing and future WTP design criteria. WSP assumes that the updated regulatory TSS limits (15 mg/L monthly average, 30 mg/L max) remain unchanged for the new WTP design.

Table 1: Existing Average and Maximum Discharge Criteria (MELCCFP, 2012)

Parameters	Unit	Average Monthly Acceptable Concentration	Maximum Acceptable Concentration
Total Arsenic	mg/L	0.2	0.4
Total Copper	mg/L	0.3	0.6
Total Iron	mg/L	3	6
Total Nickel	mg/L	0.5	1
Total Lead	mg/L	0.2	0.4
Total Zinc	mg/L	0.5	1
Total Cyanides	mg/L	1	2
Hydrocarbon (C10 - C50)	mg/L	-	2
TSS	mg/L	15	30

Reference:

Ministère du Développement durable, de l'Environnement et des Parcs (MDDEP). 2012. Directive 019 sur l'industrie minière, Government of Québec. March 2012.

ATTACHMENT B

WTP Location Selection Table

ATTACHMENT B: WTP LOCATION SELECTION TABLE

Table B1 presents the criteria, scores based on a six-point scale and resulting weighted scores, comments to justify the given scores, and total score for each feasible option and rankings for the two proposed water treatment plant locations. The overall ranking of the locations from the highest score to the lowest score is the location north of the TSF and the location south of the TSF.

Information used to select the optimal location was in terms of environment, distance with TSF infrastructure, geological and geotechnical parameters, and cost. The nine criteria used to evaluate the identified locations are available space, infrastructure, pipeline, facilities, remote monitoring, operation, and control, buffer pond, cost, safety, and closure. Weightings are assigned to each criterion to emphasize criteria that have higher relative importance based on the water treatment plant conditions.

A score between one and six is assigned to each water treatment plant location for each criterion, where a score of six represents the best scoring option. A six-point scale was adopted to provide sufficient ability to differentiate options. At least one of the water treatment plant locations is assigned a score of six for a respective criterion, and the remaining water treatment plant is scored relatively. A weighted score is then calculated by multiplying the assigned score by the associated criteria weighting.

Table B1: Water Treatment Plant Location Comparison

Criteria	Criteria Weighting	Location 1: North of TSF, near the 87 South Pit/existing Mining Complex - close to the proposed mill / mining complex			Location 2: South of the TSF, near the Emergency Spillway Location - comparatively remote location		
		Score (1 to 6)[(a)]	Weighted Score[(b)]	Comments	Score (1 to 6)[(a)]	Weighted Score[(b)]	Comments
Available space	8%	4	3	Limited footprint.	5	4	Larger footprint, but some limitations.
Infrastructure	8%	6	5	Well-established infrastructure.	4	3	Requires additional infrastructure development.
Pipeline	8%	4	3	New pipeline required for some connections.	5	4	Minor modifications to existing pipelines.
Facilities	4%	6	2	Shared resources with mining complex, fewer facility needs.	3	1	Independent facilities required.
Remote monitoring, operation, and control	4%	5	2	Easier remote monitoring and operation.	3	1	Monitoring challenges due to distance and weather.
Buffer pond	4%	5	2	Close to SP2 pond with potential benefits for sedimentation and water treatment. Water recycling option available, but consider potential impact on water release from SP2.	4	2	Pond may be required for emergencies or non-compliant effluent. Limited space; potential integration with planned sumps.
Cost	35%	6	21	Possible CAPEX and OPEX cost savings due to proximity to the mill/mining complex.	3	11	Operation and maintenance costs are comparatively higher due to the remote location. Possibility of increased CAPEX and OPEX.

Table B1: Water Treatment Plant Location Comparison

Criteria	Criteria Weighting	Location 1: North of TSF, near the 87 South Pit/existing Mining Complex - close to the proposed mill / mining complex			Location 2: South of the TSF, near the Emergency Spillway Location - comparatively remote location		
		Score (1 to 6)[(a)]	Weighted Score[(b)]	Comments	Score (1 to 6)[(a)]	Weighted Score[(b)]	Comments
Safety	25%	6	15	Easier to access the WTP during winter.	1	3	Difficult access during snowy/heavy rainfall conditions.
Closure	4%	5	2	May require rearrangement of the WTP due to its proximity to the mining complex and proposed mill.	5	2	Advantageous during closure if the mill/mining complex is decommissioned, as it allows streamlined operation and monitoring of the TSF and spillway.
TOTAL SCORE	100%	47	56	Strongly recommended location	33	30	

ATTACHMENT C

Veolia's Scope

WSP

Attention: Congxiao He, Junior Water Treatment Engineer

BUDGET PROPOSAL

Troilus Gold Mine- Total Suspended Solids Removal

June 21, 2023, Revision 0

CA_06_23_511783

Prepared By:
Myriam De Ladurantaye-Noël, Process Engineer- Heavy Industry
David Oliphant, Vice President Business Development - Heavy Industry

Veolia Water Technologies Canada
ISO 9001: 2015
4105 Sartelon, St-Laurent (QC) H4S 2B3
Tel: 514 334-7230 ● Fax: 514 334-5070
www.veoliawatertechnologies.ca

PROPRIETARY NOTICE
This proposal is confidential and contains proprietary information.
It is not to be disclosed to a third party without the written consent of Veolia Water Technologies Canada.

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1 Introduction

1.1 Project Introduction

WSP has contacted Veolia Water Technologies Canada (Veolia) to provide a water treatment system for suspended solids removal at Troilus Gold Mine, in Quebec. At this stage of the pre-feasibility study, little information is available for the design of the water treatment plant. For this reason, Veolia considered a standard application for the design of the proposed water treatment chain. However, please note that Veolia would be pleased to modify its proposal in accordance with the client's needs.

1.2 Veolia Presentation

Veolia provides unique water treatment solutions for industries and municipalities. Veolia can count on hundreds of technologies and thousands of patents to find the best solution for each application. These resources, combined with our know-how acquired over 165 years of existence in the water treatment industry allow us to ensure that your water treatment needs are met in view of the cost and operation optimization.

We understand the specific needs of the industry and help our customers achieve their goals by providing innovative water treatment solutions in line with the highest quality standards. In addition, the solutions offered are respectful of the environment through projects focused on safety, quality and customer satisfaction.

Veolia has strong and determined goals in order to protect the planet and its ecosystems. To do so, the company has implemented an Ecological Transformation approach which aims to: depollute, cleanse, purify, recycle, enhance, preserve, and facilitate access to resources.

1.3 Veolia's Design Tools and Resources

To design the proposed treatment chain, Veolia has access to many tools and resources.

1.3.1 Veolia Experts

Veolia has a water treatment process department in Paris. This team's mission is to provide support and validate the water process chain designed by the local process engineers. This team is composed of PhD and engineer specialists in water treatment. Veolia also maintains a strong community of process specialists through its installations worldwide.

1.3.2 Software

To design our water treatment plants, Veolia's engineers have access to the state of the art software in design and simulation, including but not limited to:

- PEARL®: a Veolia proprietary software used in designing water treatment plants by Veolia business units all around the world. The software uses operational benchmarks from over 4,500 water treatment plants operated around the world by Veolia.
- OLI Studio: this software was developed by OLI SYSTEMS INC. It comes with the largest chemistry database available on the market and we use it to develop the chemistry required to

meet the criteria before starting work in the lab. It's widely used by many industries worldwide including in the mining industry.

1.3.3 Laboratory and Process Simulation

Software tools are good and getting better, but laboratory testing is critical to characterizing water for treatability, as well as providing indications on the overall performance of an existing system. Veolia's in-house laboratory field analytical services include, but not limited to:

- Comprehensive water and wastewater characterizations
- Physical / Chemical testing
- Sludge analysis
- Microfiltration membranes testing
- Biological treatability
- Research and development
- System troubleshooting
- Predictive modeling & simulation
- Scale & corrosion studies
- Microbiological efficacy studies

Veolia has a full-equipped laboratory in its Montreal headquarters that performs detailed bench-scale studies of all of the technologies in its portfolio.

Figure 1 Veolia's Laboratory in Montreal

Veolia's laboratory capabilities help reduce risk in technology selection and also to help identify solutions to ongoing operational problems. Through lab pilot studies, Veolia clients can be provided

predictive simulation data on both new and existing treatment processes. This approach identifies the most effective solutions for each customer's specific treatment needs. The technicians are used to working with mine water with heavy metals.

1.3.4 Pilot Fleet

When investing in water treatment projects, it may sometimes be necessary to validate processes and technologies prior to executing a full-scale project through field pilot studies. We suggest that kind of test if, for example, the water quality fluctuates rapidly over a short period and it is difficult to collect a representative sample that can be treated on a lab-scale test. The pilot plant can usually test any upset conditions that can occur.

Veolia has the capability to validate performance and optimize design by pilot testing many of our proprietary processes. Our mobile pilot treatment units are brought to the site and operated by experienced personnel under a range of conditions to ensure the best technological solution for specific water characteristics.

We have pilot units available for our key technologies and processes including:

- ACTIFLO® / MULTIFLO™ Clarification and Softening
- Biothane® Anaerobic Wastewater Treatment
- AnoxKaldnes® Aerobic Wastewater Treatment
- ANITA™ Mox Biological Nutrient Removal
- Hydrotech Disc/Drum Filtration
- HPD® Evaporation & Crystallization
- EVALED® Point Source Evaporators
- NEOZEP® Membrane Reactors
- IDRAFLOT® DAF (Dissolved Air Flotation)
- BIOMECTAN® Hybrid Grit Chamber
- Membrane Technologies
- And more...

2 Design Basis

The information used herein was provided to Veolia in an email titled “Request for budgetary pricing for Troilus project” by C. He (WSP) to D. Oliphant (Veolia) dated June 8, 2023.

2.1 Influent Composition and Effluent Criteria

The expected water quality for the proposed design is the following:

Table 1: Expected water quality to the water treatment plant and Effluent Criteria

Parameters	Units	Influent Design conditions	Effluent Criteria
TSS	mg/L	10- 250	15

2.2 Influent flow rate

The expected flowrate is 1 200 m^3/h (28 800 m^3/d) of treated water.

The capacity of the proposed water treatment plant are the following:

- 1 X 100% of the flow: 306 m^3/h to 1 200 m^3/h of treated water;
- 2 X 50% of the flow: 171 m^3/h to 1 300 m^3/h of treated water (minimal flow is obtained by operating a single ACTIFLO unit).

2.3 Hypotheses used for sizing the equipment

Little information is available for the design of the water treatment chain. The following assumptions were made to complete the design:

- Veolia assumes the effluent criteria is on a monthly average;
- Veolia designed the water treatment chain for TSS removal only;
- Veolia assumes the chloride concentration in the mine water to be < 2 000 mg/L. A highly chloride concentration would result in a different material of construction selection for the equipments;
- Veolia assumes the treated water to be sent for discharge to the environment (no consideration of downstream equipment);
- Veolia assumes prescreening of the mine water to be done by others to protect the hydrocyclones and pumps. If screening is required, Veolia can provide the required equipment;
- Veolia assumes the mine water to contain enough alkalinity to support coagulation of colloid materials without requiring any alkalinity dosage;

- Veolia assumes the TSS to be mainly inorganic and heavy, as typically seen in mining applications;
- Please note that the option for 2 X 50% will allow more flexibility of operation as it will provide a higher turndown.

2.4 Additional Information about Design of the Treatment Chain

A design TSS concentration of 250 mg/L was fixed for the design of the mine water treatment plant. Considering a strict TSS removal application, estimation of the maximum TSS that could be fed to the water treatment chain was done considering the following hypotheses:

- Operation of the treatment chain at design conditions is 1 200 m^3/h;
- During TSS peak, it is possible to start the second micro-sand recirculation pump to allow more sludge extraction, thus higher TSS concentration to the influent (while still operating at design flow);
- During even higher TSS peak, it is possible to lower the influent flow while keeping both extraction pumps on to allow high TSS concentrations to the feed. The minimal flow to the water treatment plant is indicated in the Influent Flow Rate section.

These three scenarios limitations are presented in Table 2.

Table 2: Maximum TSS concentration that could be treated by the proposed water treatment chain

Parameters	Max TSS in design operating conditions	Max TSS at high flow	Max TSS to the treatment plant
1 X 100% scenario	920 mg/L	1 850 mg/L	7 200 mg/L
2 X 50% scenario	920 mg/L	1 850 mg/L	6 500 mg/L

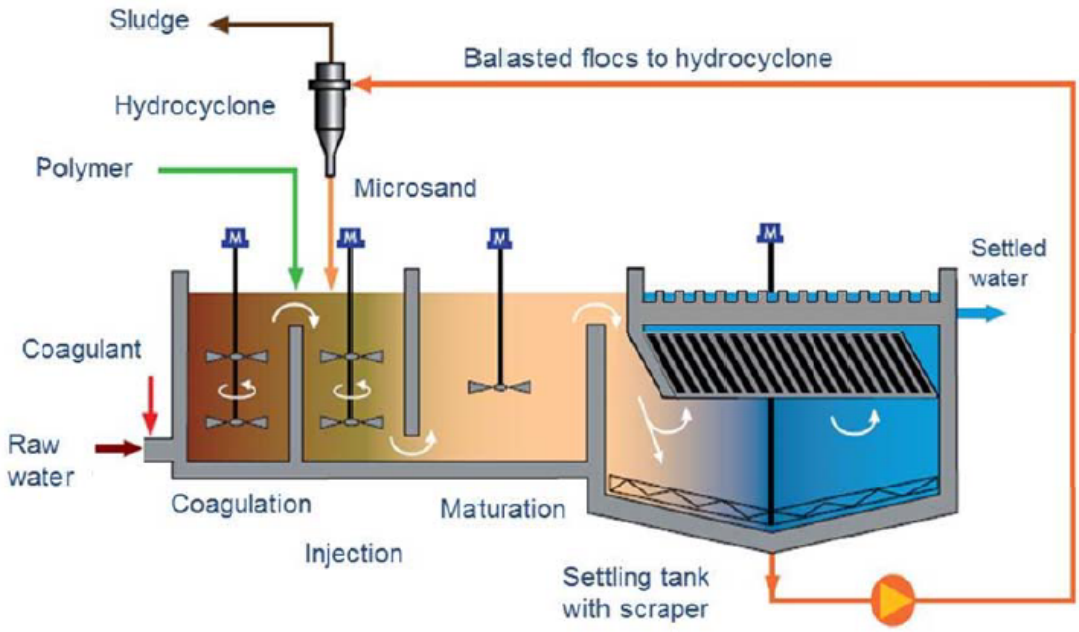
Please note it is possible to increase even more the capacity of the system to high TSS concentrations with slight modifications to the design. However, such modification would result in thinner sludges during regular operation.

3 Proposed Treatment Chain

3.1 ACTIFLO Ballasted Flocculation

The mine water, pumped and screened down to 6 mm, flows through ACTIFLO unit(s). The raw water flows to a coagulation chamber, where coagulation of the colloids material is initiated. Extended coagulation time is available to allow sufficient time for colloid precipitation. Following the coagulation chamber, the water flows into an injection chamber where polymeric flocculant and microsand are added to initiate floc formation. These serve as a "seed" for floc formation and development in the next process step. The water then flows into the maturation tank where slower mixing provides optimal conditions for bridging between the microsand and the destabilized suspended solids. From this tank, the fully formed ballasted floc enters a settling tank equipped with a lamella, which provides the rapid and effective removal of the microsand/sludge floc. The clarified water exits the system via a series of collection troughs or weirs and is monitored for turbidity. The clarified water can then flow to discharge (by others).

The sand-sludge mixture settles to the bottom of the clarifier. Scrapers force the sludge collected at the bottom of the clarifier into a center cone from which it is continuously withdrawn and pumped to hydrocyclone where sludge and microsand are separated by centrifugal force. After separation, the higher density microsand is discharged from the bottom of the hydrocyclone and re-injected into the process for re-use. The lighter density sludge is discharged from the top of the hydrocyclone and directed to the sludge management facilities.



The proposed ACTIFLO units are designed with two recirculation lines. At design conditions, one recirculation line is in operation. If required, the two recirculation lines (pump, piping and

hydrocyclone) can be used for sludge extraction (please refer to Section 2.4 for indication about TSS concentration limitations to the designed water treatment chain).

An air scour system is provided in order to assist with the lamella cleaning process.

More information on Veolia's ACTIFLO technology is available online here.

3.2 Chemical Preparation and Distribution Systems

An optimal Water Treatment Process depends on reagents selection and dosing. Here is a summary of reagents to be used for the current processes.

Coagulant:

Ferric Sulfate

The selected coagulant is Hydrex 3253, a ferric sulfate coagulant. It will be received in bulk tanker at 12.2 % concentration as iron. The solution will be stored in a FRP reservoir with a capacity of 40 m^3 and can be used as is. Hydrex 3253 has a freezing point of -18 °C. The dosage will be performed using a mechanical diaphragm metering pump.

Polymer:

Anionic Polymer

The use of a flocculation agent is essential for a suspended solids removal process. Polymer enables the attachment of the floc onto the microsand and as such is required in order to obtain good process performance. The polymer is typically selected during laboratory tests but the Hydrex 3543 has shown good results on similar water. Hydrex 3543 is a solid, anionic polymer used to enhance flocculation and will be received in super bags. One HydraPol automatic preparation system will be supplied to prepare a 0.2 % solution. Warm water is used for the polymer preparation. The automatic polymer preparation/dilution system is an automatically controlled batching unit capable of preparing polymer. The system utilizes sequential batching from a high shear, first stage wetting system into a mix tank with a low shear mixer. The system is equipped with a hoist and trolley system for use of super bags. The solution will be dosed using a progressive cavity pump to keep the polymer chains complete.

Media:

Microsand

The presence of microsand allows:

- An increase in the probability of encounters between particles;
- An increase in the exchange surface and consequently in the adsorption capacity compared to conventional flocculation;
- The formation of solid and dense ballasted flocs which will resist an energetic stirring followed by rapid settling.

These properties lead to very short residence times for flocculation and settling.

Most of the microsand is recycled in the process but about 2 to 5 g/m^3 is lost, depending on initial turbidity and flow rate. The microsand will be supplied in 25 kg bags and will be added manually as required, approximately once or twice a week. A manual microsand dosing system (Hydrasand Mini) is used for the safe addition of microsand in the system.

4 Additional Engineering Information

4.1 Electrical and Control

The treatment plant will be equipped with one PLC in a main control panel. In addition, Veolia will supply the motor starters and variable frequency drives (VFD) for the process equipment.

4.2 Hubgrade

Hubgrade, the digital service designed by Veolia, is the combination of digital tools and the expertise of Veolia employees at the service of operational and environmental efficiency. Its specificity: capitalizing on human competency and digital power to process data in order to provide our customers with a continuous supply of optimized solutions adapted to their priorities.

Hubgrade can be implemented for a single technology, a range of equipment or for a complete industrial or municipal water or wastewater treatment plant, for Veolia and non-Veolia equipment.

It provides our clients with 24/7 secure access to a web portal, it guarantees the best user experience and provides a customizable interface for each user (e.g. managers, operators, business developers). It relies on multiple sources of data, versatile data collection (manual entry or automatic collection) and best in class algorithms to ensure the reliability of data.

The gateway to Hubgrade is a private and secure customizable and mobile friendly user interface. This customer web portal is designed to maximize transparency, control and increase operational efficiency of your water treatment system. It seamlessly consolidates your water and wastewater treatment equipment performance data and service interactions into a robust dashboard that can be accessed from any location, anytime, from any device.

Typical Hubgrade support contract includes two modular offers whose features can be flexibly packaged to deliver value to your operation.

4.2.1 Hubgrade Essential: Veolia's secure digital platform

Hubgrade Essential collects and displays process data from the treatment plant, making it available 24/7 from any location on the customer portal. Our digital platform runs on today's most secure, state-of-the-art cloud-based system. Cybersecurity is fully integrated at every level, from data acquisition and transfer to data aggregation, analysis and reporting. Hubgrade Essential typically includes :

- Dedicated web portal, accessible 24/7 from any device;
- Acquisition, aggregation and cloud storage of all data;
- Remote monitoring of critical operating parameters;
- Process Data Trends and alarm reports;
- Critical alarms alert (E-mail and SMS);
- Ability to enter data manually, upload Excel files (such as laboratory analysis results) and trend this data.

4.2.2 Hubgrade Assist: Dedicated access to Veolia experts

Hubgrade Assist essential components are the access to Veolia's long-term experience and expertise in water treatment combined with the support of digital tools for global assets around the world as well as specific site assets. It aims at supporting operation teams in their daily monitoring with a proactive, data-driven service and site support that includes troubleshooting and long term drifts resolution.

Typical services provided in contracts include :

- Process hotline support (7 days a week, from 8 AM to 5 PM Eastern);
- Automation hotline support (weekdays except holidays, from 8 AM to 5 PM);
- Periodic Key process indicators data review;
- Review of laboratory testing results & optimization recommendations;
- Continuous Education (Training certificates can be provided);
- Site visits (process & chemical audits, maintenance, training);
- Remote audits (Augmented Reality Tool);
- Support & optimization bank time.

Refer to this web page for more details on the Veolia's Hubgrade offer.

4.3 Redundancy features

The following redundancy features are incorporated in the proposed treatment plant:

- Each tank will have level switches and an independant level indicator;
- Each dosing skid will include one installed spare pump;
- Each lifting pump will include one installed spare pump;
- Sludge and microsand recirculation pumps will include one installed spare pump for normal conditions but the spare pumps can be on duty for peak conditions;
- The control panel will include 30% spare room to accommodate any future input/output (I/O) requirements;
- A portable turbidity meter and portable pH meter will be provided to be used in the event one of the automated turbidity or pH meters is under repair; and
- An appropriate set of spare parts will be stored to minimize repair times in the event of equipment breakdown.

5 Scope of Supply

5.1 Items included in 1 X 100% ACTIFLO Option

5.1.1 ACTIFLO Ballasted Flocculation- 1X 100% Option

The scope of the prefabricated ACTIFLO is the following:

- One ACTIFLO ACP2-75 ballasted flocculation systems including:
  - The ACTIFLO package plant with TURBOMIX;
  - Ancillary equipment to the ACTIFLO such as sludge extraction pumps and microsand recirculation system;
  - Lamella cleaning system, including a dedicated air compressor;
- Instrumentation.

5.1.2 Chemical Preparation and Distribution Systems

The chemical preparation and distribution systems included in the proposal are the following:

- One coagulant storage and dosing system including:
  - One coagulant storage tanks with a capacity of 60 m^3;
  - One ACTIFLO coagulant duplex dosing skid, including two coagulant dosing pumps (one on duty; one stand-by) skid-mounted and pre-wired to a junction box.
- One dry polymer preparation and dosing system including:
  - One HYDRAPOL automatic dry polymer preparation system;
  - One polymer duplex dosing skid including two polymer dosing pumps (one on duty; one stand-by) skid-mounted and pre-wired to a junction box.
- One manual microsand feed system.

5.2 tems included in 2 X 50% ACTIFLO Option

5.2.1 ACTIFLO Ballasted Flocculation- 2X 50% Option

The scope of the prefabricated ACTIFLO is the following:

- Two ACTIFLO ACP2-60 ballasted flocculation systems including:
  - The ACTIFLO package plant with TURBOMIX;
  - Ancillary equipment to the ACTIFLO such as sludge extraction pumps and microsand recirculation system;
  - Lamella cleaning system, including a dedicated air compressor;
- Instrumentation.

5.2.2 Chemical Preparation and Distribution Systems

The chemical preparation and distribution systems included in the proposal are the following:

- One coagulant storage and dosing system including:
  - One coagulant storage tanks with a capacity of 60 m^3;

    - One ACTIFLO coagulant triplex dosing skid, including three coagulant dosing pumps (two on duty; one stand-by) skid-mounted and pre-wired to a junction box.
- One dry polymer preparation and dosing system including:
    - One HYDRAPOL automatic dry polymer preparation system;
    - One polymer triplex dosing skid including three polymer dosing pumps (two on duty; one stand-by) skid-mounted and pre-wired to a junction box.
- One manual microsand feed system.

Please note that the chemical preparation systems are the same for both options; however, the dosing systems are modified to allow dosing to the number of units included in each option.

5.3 Additional Scope (applicable for both options)

5.3.1 Hubgrade services

For a period of one year starting at the substantial completion of commissioning / on successful completion of the performance test, the following Hubgrade services are included in this offer:

- 12 months access to Hubgrade Essential : Veolia's Cloud based Services with access to key process indicators and trends
- 12 months access to Emergency Hotline (12/7) : Process and Automation phone support
- Bank of 40 hours of remote support services (Hubgrade Assist)
- Remote access service through Ewon modem
- Monthly Process review and optimization conf calls
- 1 Site visit per year for training and process optimisation (2 days on site)

5.3.2 Electrical and Control

The system is controlled by one PLC in a main control panel. This PLC has a human-machine interface (HMI) and modifications can be done locally. The operator is able to control and check the status of all components through this HMI.

A summary of the Electrical and Control scope is shown below:

- One (1) NEMA 4, painted steel floor mount Panel;
- One (1) PLC;
- One (1) Ethernet Router;
- Polymer preparation systems are supplied with their own PLC and HMI (Allen-Bradley) and will communicate to the main PLC;
- Control system engineering;
- PLC programming;
- Operator interface programming;
- Veolia shop testing;
- All the description / programming / interface view as per Veolia standards;
- CSA approval.

5.4 Deliverables

Veolia scope for engineering deliverables is limited to items listed below.

5.4.1 Before start of fabrication

The following deliverables will be prepared by Veolia and must be approved before fabrication can start. The second payment is due after these deliverables are submitted.

- Detailed PFD, showing process equipment, ancillary equipment and controls;
- Preliminary P & ID, showing how equipment will be connected and baseline information for piping, but without control;
- Process Data Sheets for each technology (characteristics and design conditions);
- Equipment drawings (general dimensions, connection points, junction boxes, motors, services to be supplied, weights and lifting points);
- Network architecture drawing;
- Dimensions of electrical panels and junction boxes;
- Material Safety Data Sheets (MSDS).

5.4.2 Before delivery

The following deliverables will be submitted before delivery.

- Documents previously submitted updated as per comments
- Equipment, Instrument and Valve Lists;
- Field installation drawings;
- Electrical Panels and Junction Boxes drawings with detailed material list;
- Sub component data sheets;
- Storage condition.

5.4.3 Before commissioning

The following deliverables will be submitted before the start of commissioning

- Electrical control drawing or single line diagram (final);
- Control Narrative (Final)
- P&ID (Final)
- Operation and maintenance manual, as per the table of content in appendix.
- Start up protocol;
- Performance test protocol.

5.5 Exclusions

The following items are NOT in Veolia scope of supply:

- Installation of the supplied equipment, including civil work, anchoring, interconnecting piping and connection to power and control systems;
- Supply of electrical power (3 phases, 60 Hz, 575 V) to the Motor Control Centre;
- Permanent utilities (hot water heater, service water, instrument air, etc.)
- Commissioning and training of operators;
- First fill of chemicals for start up;
- Internet connection for Hubgrade;
- Permitting and support to permitting beyond the preparation of the deliverables listed above;
- Preparation of Standard Operation Procedures.

5.6 Clarifications

In addition to the hypotheses used for sizing the equipment listed above, Veolia used the following list of assumptions and constraints in developing the scope and pricing for the proposed project:

- General
    - Unless stated otherwise, the equipment proposed herein will be installed indoor in a building heated above the freezing point.
    - Equipment and instruments will be numbered using Veolia standard unless Veolia receives instructions to do otherwise within five days after the purchase order acceptance. After this date, new instructions or significant changes to previous instructions will force a revision of the price and schedule.
    - Veolia's proposal is based on its best experience and understanding of the current application. However, further tests and analysis of the application's water could lead to changes in chemical dosages and application points.
    - Veolia production shut downs every year for two weeks at the end of July and two more weeks for Christmas Holidays.
    - Force Majeure includes any obligations resulting from the Covid-19 pandemic.
- Electrical and Control
    - Veolia has considered that the equipment will be installed in a non-hazardous environment.
    - Electrical enclosures will be rated NEMA 4.
- Mechanical and piping
    - Any equipment included in this offer will be designed using Veolia standards.
        - Steel tanks are designed as per ASCE 7, 2010 with the exception of section 15.7.7 (safety factor will not be based on AWWA D100).
        - Unless stated otherwise, steel tanks are not designed to withstand earthquakes.
        - In this context steel tanks include all model numbers starting with ACP, DUS, EP, MCP, RX and steel mixing tanks used for chemical preparation.

- All chemical preparation and distribution skids and instrumentation on pressurized piping will be designed according to ASME B31.3 when required by local regulations[1], using the following fluid category. It is the responsibility of the client to confirm these choices:
  - Water and polymer: Category D
  - All other chemical products (coagulant): Normal Fluid Service
- Connecting flanges on tanks or skids supplied by Veolia are not designed to support extra loads.

- Construction
  - The supplied equipment is pre-mounted as much as possible. However the installation of some items will need to be completed on site by the contractor.
- Commissioning
  - Veolia assumes that trade personnel (pipe fitters, electricians, etc.) will be available free of charge during commissioning.
  - Start up, commissioning and training are to be charged on a time and material basis. Rates and details are to be found here.

[1] The B31.3 code requires an ASME BPVC Section VIII relief device that is not adapted to chemical dosing applications. Veolia follows industry standards for this application and provides adjustable relief devices that do not follow ASME B31.3 code.

6 Price and Schedule

6.1 Price

The budget price for the equipment described in the Scope of Supply, as per Veolia's material of construction and industrial standards, is the following:

SCENARIOS	PRICE
Price for 1 X 100% ACTIFLO	**$1 889 100**
Price for 2 X 50% ACTIFLO	**$2 495 300**

This offer is an indicative, non-legally binding budgetary estimate. It is provided for the sole purpose of being used as an initial guide price and for information only. The information contained herein is subject to change at any time and does not commit us. The terms of this offer do not in any way whatsoever constitute a binding contractual commitment from us.

6.2 Schedule

A preliminary project schedule is shown below:

Element	Schedule
Deliverables as per section 4.2.1	6 to 8 weeks after acceptance of purchase order
Equipment ready for shipping	22 to 26 weeks after approval of previous deliverables
Delivery on site	2 to 3 weeks after shipping

6.3 Terms and Conditions

This proposal is subject to Veolia Water Technologies Canada Inc. General Terms and Conditions, except as stated below:

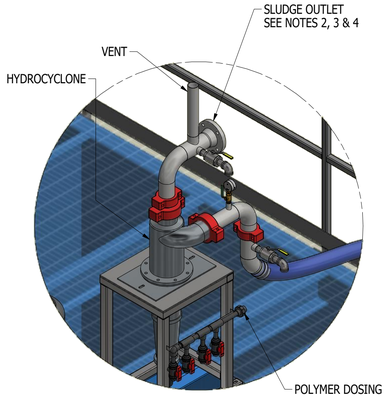
- The prices are in Canadian dollar;
- The prices exclude any applicable tax (HST, GST, PST);
- The prices are Incoterms 2020's FCA Veolia's premises in Saint-Laurent, QC. If requested, Veolia can provide delivery at the site at cost plus 10%.

- Bonds are not included in this offer.
- The terms of payment are 20% on the purchase order acceptance, 20% on submittal of the deliverables dues before start of fabrication, 50% on equipment ready to ship and 10% on substantial completion of commissioning.
- In case of conflict between this letter and the drawings attached to this letter, this letter shall prevail, followed by the drawings attached to this letter.
- Veolia reserves the right to do a credit check before accepting any purchase order.
- Veolia takes exception to all liquidated damages clauses.

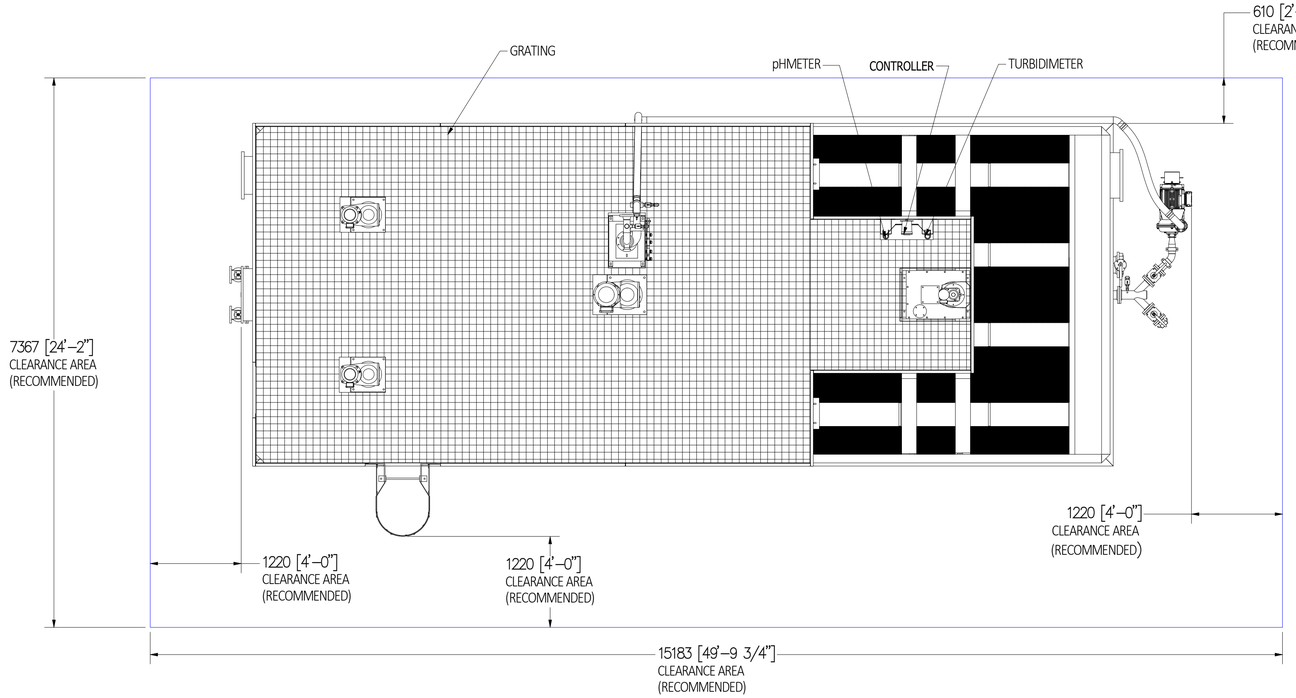
Kindest Regards,

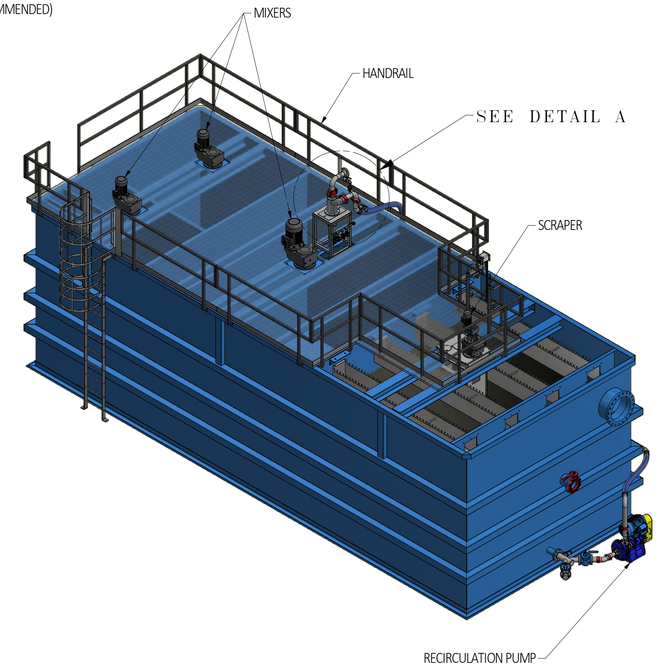
David Oliphant
Vice President Business Development-Heavy Industry
Veolia Water Technologies Canada Inc.
2000 Argentia Rd, Plaza IV, Suite 430
Mississauga, ON, L5N 1W1
Tel. 905-286-4846
Fax. 905-286-0488
Cell. 519-501-1046
david.oliphant@veolia.com
www.veoliawatertechnologies.ca

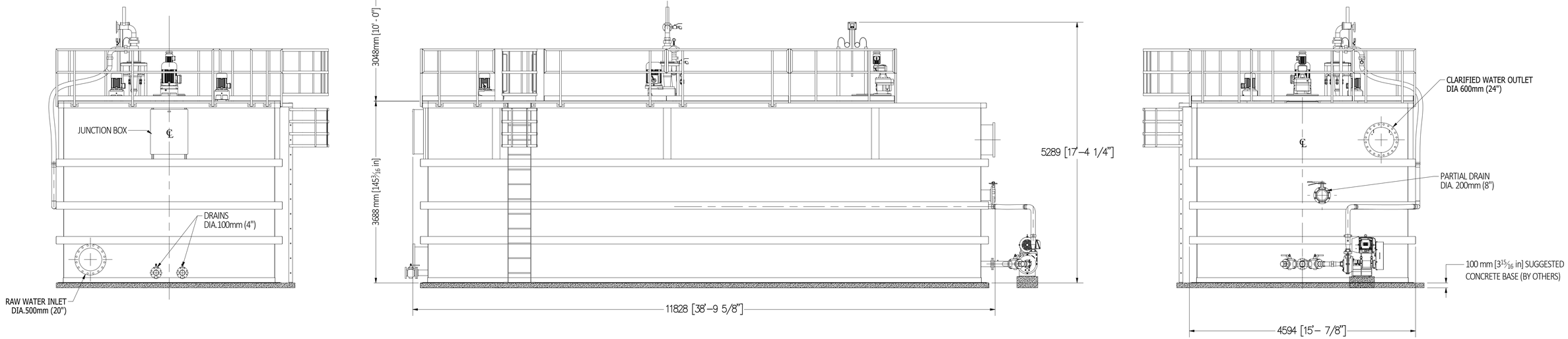
7 ACTIFLO DRAWING - 1 X 100%



DETAIL A







TOUTES LES DIMENSIONS SONT EN / ALL DIMENSIONS ARE IN: mm

NOTES:

1- FOR COMPLETE EQUIPMENT LIST, PLEASE REFER TO THE TECHNICAL SPECIFICATIONS.

2- HYDROCYCLONE OUTLET ELEVATION MUST BE CONFIRMED BASED ON SUPPLIED RECIRCULATION FLOW (UPON AVAILABLE SELECTIONS).

3- IT IS IMPORTANT TO DROP 3 FEET AT EACH HYDROCYCLONE OULET TO AVOID BACKFLOW. SUBMERGED SLUDGE DISCHARGE PIPE IT NOT ACCEPTED.

4- HYDROCYCLONE DIMENSIONS TO BE CONFIRMED BASED ON RECIRCULATION FLOWRATE.

5- TANK SHALL NOT BE USED AS SUPPORT FOR ANY OTHER EQUIPMENT. EQUIPMENT THAT NEEDS TO BE CONNECTED TO TANK SHALL BE SELF-SUPPORTED.

6- WEIGHT FOR (1) ACTIFLO:
TOTAL WEIGHT: 22 000 kg (48 500 LBS) (WITHOUT WATER)
TOTAL WEIGHT IN SERVICE:
195 000 kg (429 900 LBS) (WITH WATER)

PRELIMINARY

RÉV. REV.	DESCRIPTION	DATE	M.M. RÉVISÉ REVISED	G.J. VÉRIFIÉ CHECKED	G.P. APPROUVÉ APPROVED	ECN
A	PRELIMINARY	2020-12-08	M.M.	G.J.	G.P.	N/A

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DESSINÉ PAR DRAWN BY	M.M.	DATE 2020-12-08
VÉRIFIÉ PAR CHECKED BY	G.J.	DATE 2020-12-08
INGÉNIERIE PAR ENGINEERING BY	G.P.	DATE 2020-12-08
ÉCHELLE: SCALE:	1:25	

TITRE / TITLE: ACTIFLO PACKAGE PLANT
MK III / MODEL ACP2-75
GENERAL ARRANGEMENT

CLIENT

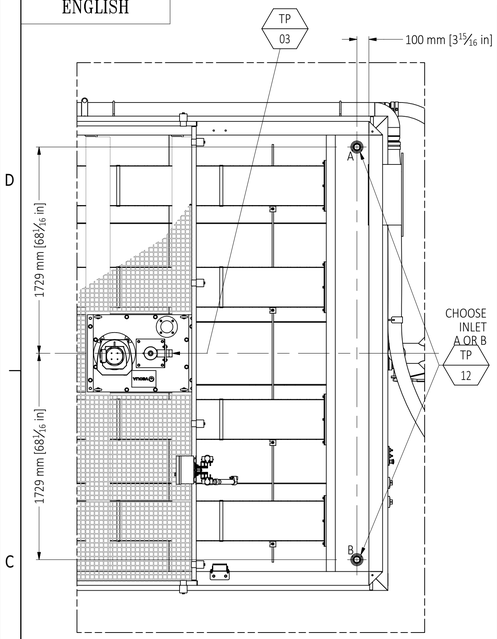
VEOLIA
VEOLIA WATER TECHNOLOGIES CANADA INC. 4105 Sartelon, Saint-Laurent, Qc, Canada. Tel: (514) 334-7230

PROJET - PROJECT	DESSIN - DRAWING	NUMÉRO INTERNE INTERNAL NUMBER	FEUILLETS PAGES	RÉV. REV.
-	EQ275		1 / 1	A

STD: "D" 22 X 34 | REF: | BARRE = 1" À L'ÉCHELLE D'IMPRESSION / BAR = 1" AT PLOT SCALE

8 ACTIFLO DRAWING - 2 X 50%

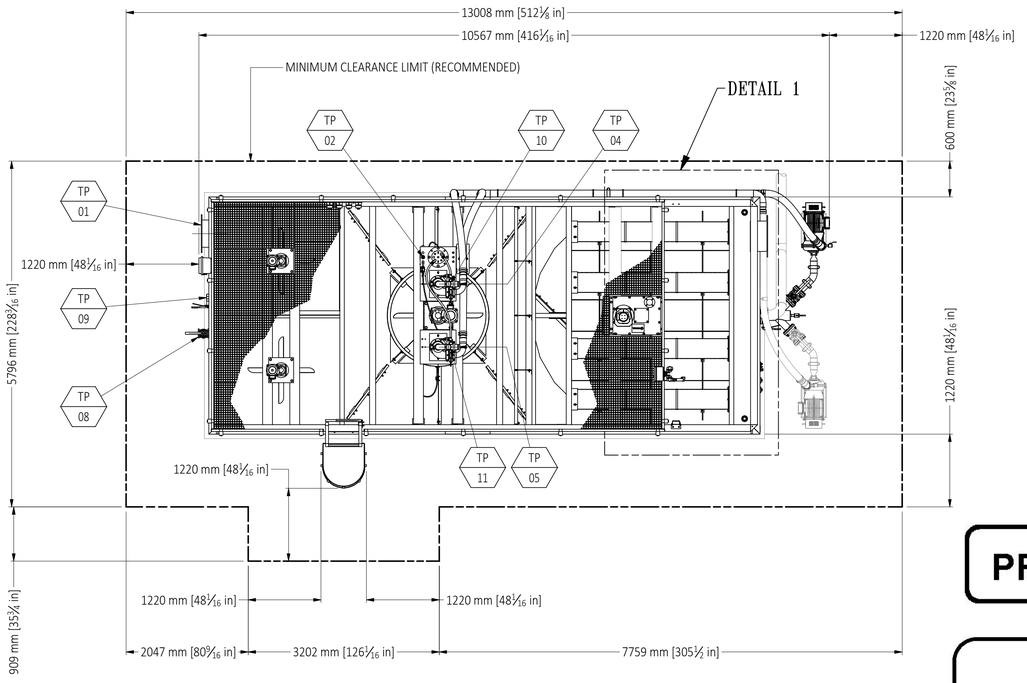
ENGLISH



DETAIL 1

SCALE: 1:25

LAMELLAS AIR CLEANING



CONNECTION POINTS		
TIE-POINT #	DESCRIPTION	DIMENSION / TYPE
TP-01	RAW WATER INLET	Ø450 [Ø18"] - FLANGE 1/2" THK, OD & BOLT PATTERN AS PER ASME B16.5 - #150
TP-02	POLYMER INLET	Ø20 [Ø3/4"] - SOLVENT CEMENTED SOCKET UNION PVC SCH.80
TP-03	LAMELLA AIR CLEANING INLET (OPTIONAL)	Ø50 [Ø2"] - MNPT
TP-04	SLUDGE OUTLET	GROOVED END - SEE NOTE IN DESIGN COORDINATION
TP-05	SLUDGE OUTLET	GROOVED END - SEE NOTE IN DESIGN COORDINATION
TP-06	CLARIFIED WATER OUTLET	Ø500 [Ø20"] - FLANGE 1/2" THK, OD & BOLT PATTERN AS PER ASME B16.5 - #150
TP-07	PARTIAL SETTLING TANK DRAIN	Ø150 [Ø6"] - BUTTERFLY VALVE - #150
TP-08	FLOCCULATION & COAGULATION TANK DRAIN	Ø50 [Ø2"] - PLUG VALVE - #150
TP-09	EXTENDED COAGULATION DRAIN	Ø50 [Ø2"] - BUTTERFLY VALVE - #150
TP-10	HYDROCYCLONE VENT	GROOVED END - SEE NOTE IN DESIGN COORDINATION
TP-11	HYDROCYCLONE VENT	GROOVED END - SEE NOTE IN DESIGN COORDINATION
TP-12	LAMELLA AIR CLEANING INLET (OPTIONAL)	Ø50 [Ø2"] - FNPT

PRELIMINARY

NOT FOR CONSTRUCTION

ONLY FOR INFORMATION

NOTES:

GENERAL :

- REFER TO THE INSTALLATION,OPERATION AND MAINTENANCE MANUAL (IOM) BEFOREHAND TO COORDINATE THE PLANT DESIGN, INSTALLATION AND START UP OF THE ACTIFLO PACK UNIT.

M.O.C. :
- TANK : PAINTED CARBON STEEL
- PIPING : GALVANIZED STEEL AND ABRASION RESISTANT HOSE EXCEPT FOR RECIRCULATION PIPE UNDER SETTLING TANK (STAINLESS STEEL 304L).

COLORS :
- TANK - WINDOW GRAY RAL 7040
- HANDRAILS, LADDER OR STAIRCASE - SAFETY YELLOW

TANK WEIGHTS:
- DRY SHIPPING WEIGHT: 14363 KG (31664 LBS)
- INSTALLED WET (FULL OF WATER) WEIGHT: 114594 KG (252636 LBS)

DESIGN COORDINATION :

- DO NOT SUPPORT ANY OTHER EQUIPMENT (PLATFORM, STAIRS, GRATING, PIPING, ETC..) ON UNIT STRUCTURE.
- THE TANK MUST BE GROUNDED.
- HATCHED AREA SHOWN ON THE FOOTPRINT NEEDS TO BE SUPPORTED.
- ROTATION DETECTION MONITOR (IFM DD2503) MUST BE INSTALLED IN THE STARTERS PANEL OR MCC (REFER TO IOM FOR MORE DETAILS).
- IMPORTANT TO DROP 3 FEET AT THE SLUDGE OUTLET OF EACH HYDROCYCLONE TO AVOID BACKFLOW THROUGH HYDROCYCLONE (SEE P&ID FOR MORE DETAILS).
- REFER TO HYDRAULIC PROFILE DRAWING HY_2015_ACP.
- ELEVATIONS AND DIAMETERS FOR TP-04, TP-05, TP-11 ARE TO BE CONFIRMED BASED ON PROVIDED RECIRCULATION LINE(S) (PER AVAILABLE SELECTIONS), SEE P&ID.

UTILITIES :

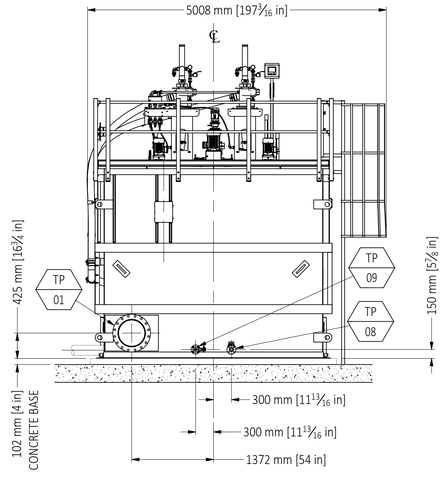
- (OPTIONAL IF E&H TURBIDITY SENSOR) COMPRESSED AIR REQUIREMENT FOR CLEANING TURBIDITY SENSOR: 13.2 US GAL/MIN AT 22 TO 30 PSIG.
- (OPTIONAL) COMPRESSED AIR REQUIREMENT FOR VALVE ACTUATORS: 4.8 Nm3/h (3 SCFM) at 80 PSIG.
- (OPTIONAL) SURPRESSED AIR FOR LAMELLA AIR SCOURING : 349 Nm3/h (217 SCFM) at 5.75 PSIG.

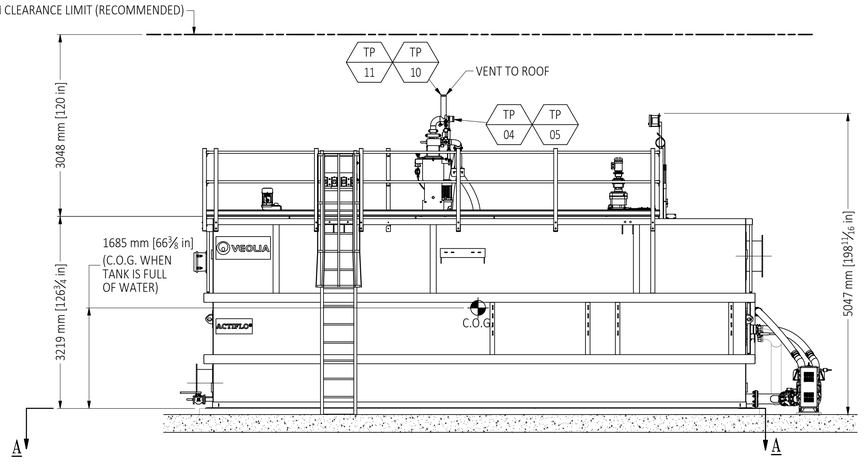
INSTALLATION :

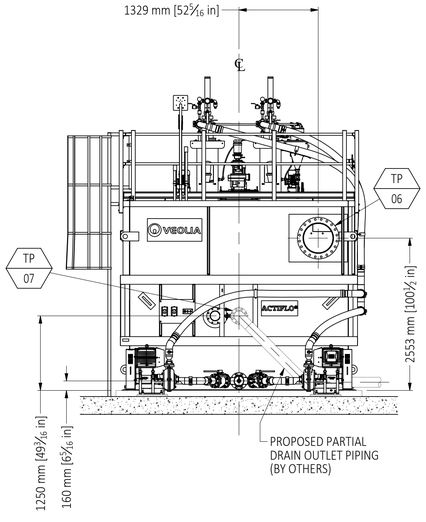
- ACTIFLO PACK UNITS ARE PREASSEMBLED IN SHOP BUT FOR FREIGHT PURPOSE SOME OF THEIR COMPONENTS MUST BE INSTALLED ON SITE BY A CONTRACTOR (LADDER OR STAIRCASE, PUMPS, HYDROCYCLONE SUPPORTS, MIXERS, ETC..).
- CHECK CONCRETE PAD FLATNESS BEFORE INSTALLING THE ACTIFLO UNIT.
- REFER TO FIELD INSTALLATION DRAWINGS AND IOM MANUAL FOR INSTALLATION DETAILS.
- DO NOT PULL THE UNIT ON GROUND.
- DO NOT USE LATERAL LUGS (SEE DRAWING) TO LIFT OR PULL THE UNITS.
- REMOVE LIFTING LUGS AFTER INSTALLATION.

COMMISSIONING :

- REFER TO IOM FOR COMMISSIONING INSTRUCTIONS.







REV.	DESCRIPTION	DATE	RÉVISÉ REVISED	VÉRIFIÉ CHECKED	APPROUVÉ APPROVED
1	FOR INFORMATION	2020-12-21	M.M.	G.J.	G.P.

DESSINATEUR/DESIGNER	M.M.	DATE	2020-12-21
VÉRIFICATEUR/CHECKER	G.J.	DATE	2020-12-21
INGÉNIEUR/ENGINEER	G.P.	DATE	2020-12-21

CLIENT

VEOLIA WATER TECHNOLOGIES

TITRE / TITLE

ACTIFLO PACKAGE PLANT
MK III / MODEL ACP2-60
GENERAL ARRANGEMENT

ÉCHELLE / SCALE: 1:50

PROJET / PROJECT - DESSIN No / DRAWING No	INTERNE / INTERNAL	FEUILLET / SHEET	RÉV/REV
- GA2015	ACP	1 / 2	1

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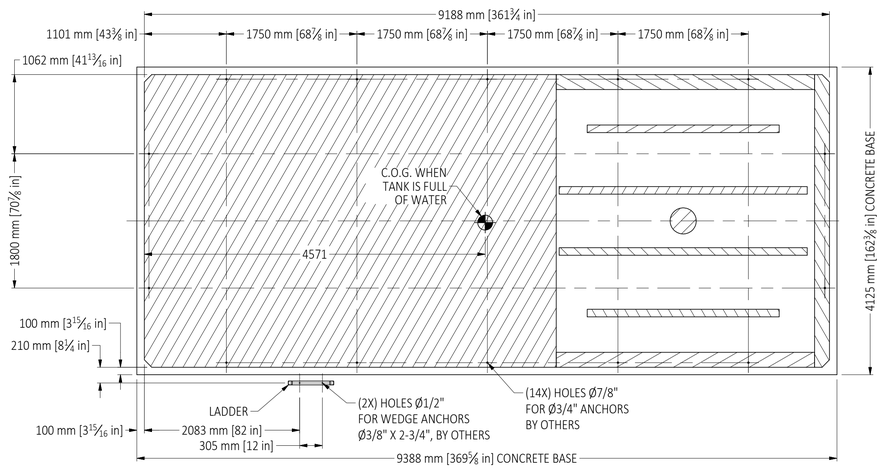
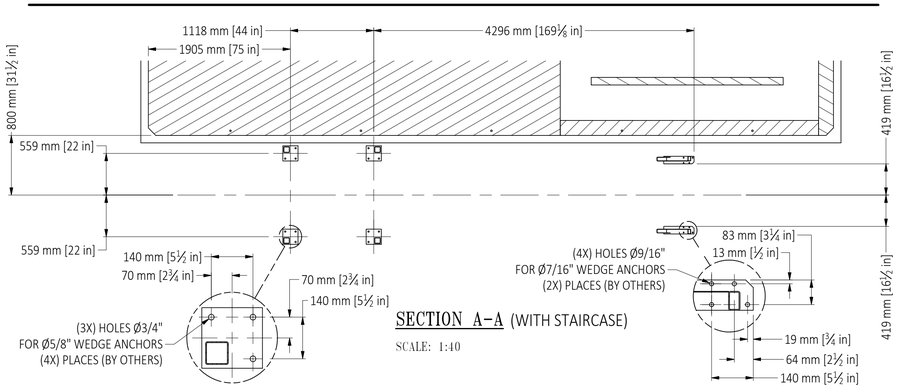
ANSI D



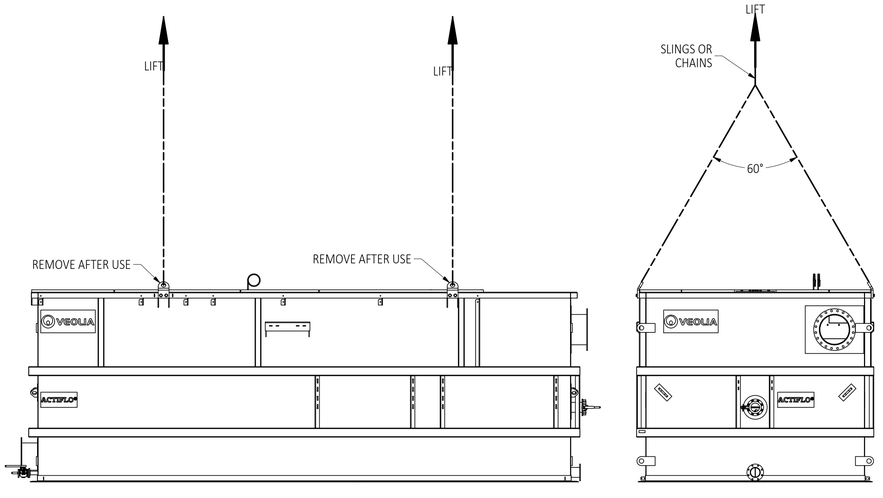
SECTION A-A (WITH LADDER)

SCALE: 1:40



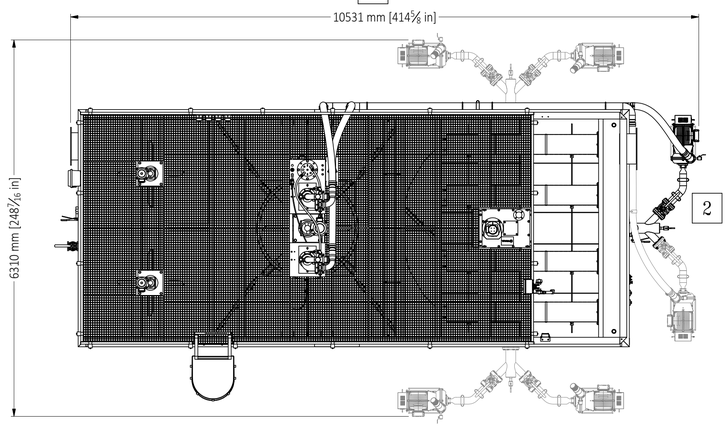
SECTION A-A (WITH STAIRCASE)

SCALE: 1:40



TANK HANDLING

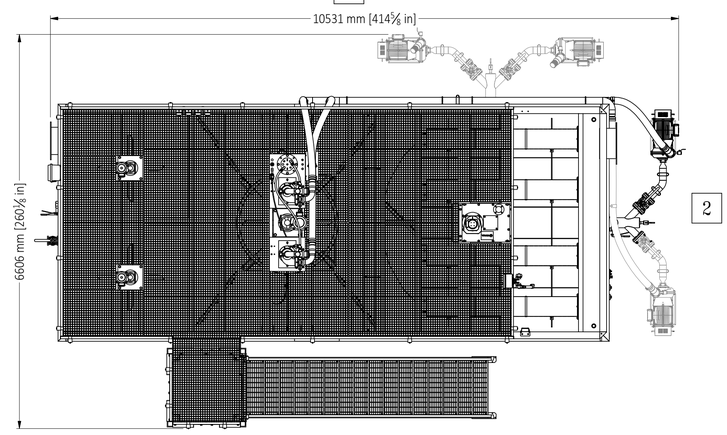
SCALE: 1:50



LADDER POSITION 3

PUMP(S) POSITION 1 OR 2 OR 3

SCALE: 1:50



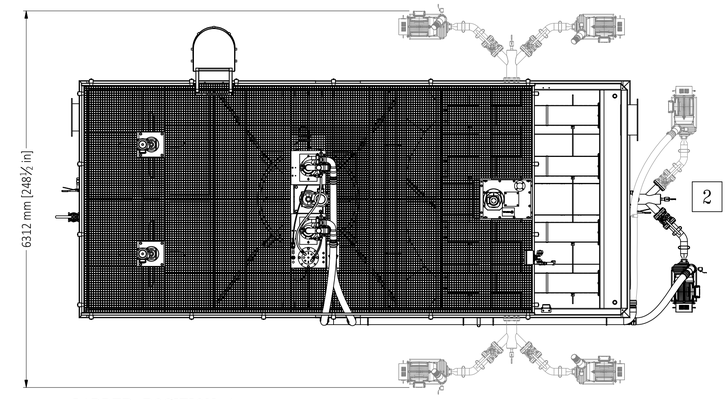
STAIRCASE POSITION 3

PUMP(S) POSITION 1 OR 2

SCALE: 1:50

CONFIGURATIONS - OPTIONS

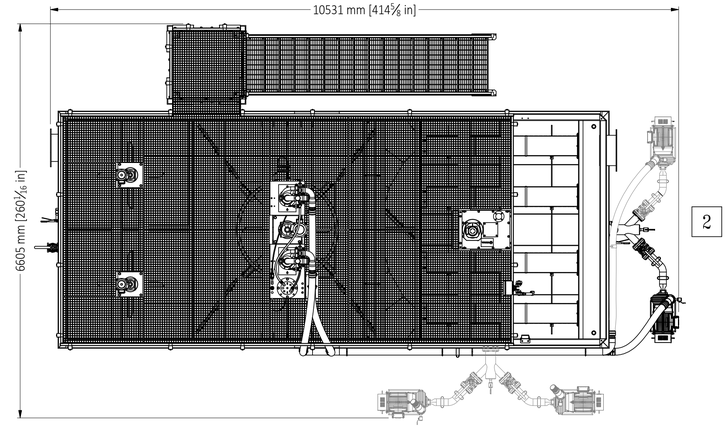
THE SELECTED CONFIGURATION CANNOT BE CHANGED AFTER DRAWINGS APPROVAL.



LADDER POSITION 1

PUMP(S) POSITION 1 OR 2 OR 3

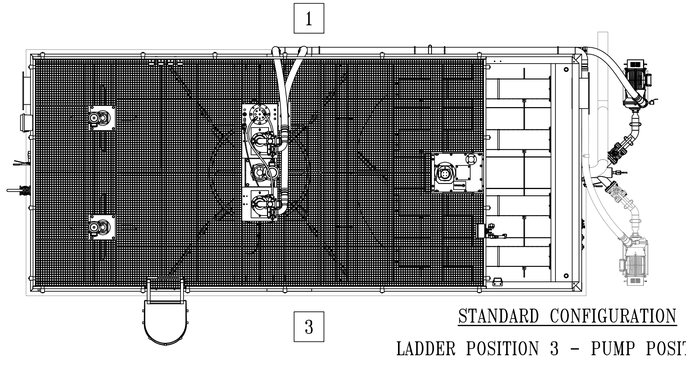
SCALE: 1:50



STAIRCASE POSITION 1

PUMP(S) POSITION 2 OR 3

SCALE: 1:50



STANDARD CONFIGURATION

LADDER POSITION 3 - PUMP POSITION 2

SCALE: 1:50

REV.	DESCRIPTION	DATE	RÉVISÉ REVISED	VÉRIFIÉ CHECKED	APPROUVÉ APPROVED
1	FOR INFORMATION	2020-12-21	M.M.	G.J.	G.P.

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- GA2015	ACP	2 /2	1

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REF: N/A

ANSI D

9 Start Up, Commissioning and Training Costs

The services of a Veolia Canada Field Service Representative will be provided to the customer for start up, troubleshooting, inspection, commissioning, training and equipment installation supervision services as follows:

RESPONSIBILITY:

Unless otherwise specifically authorized in writing, the Field Service Representative will act only in an advisory capacity interpreting drawings, recommending sequence of work in the erection and the installation of the equipment, its start up and repairs.

Veolia Representatives will not be responsible for any acts, omissions or workmanship of employees, subcontractors or agents of the owner or for their failure to follow his advice or instructions.

TRAVEL:

The Customer is billed for travel time at the same rate as working hours; however, travel time excesses due to airline delays, etc. will not be charged to the Customer.

The personnel performing these services are based in Veolia premises in Saint-Laurent, QC.

Travel arrangements to destination depend on availability of personnel, but will vary and shall be at Veolia's discretion.

Veolia personnel have the option of returning to their base Veolia Canada facility every two weeks.

RATES:

Veolia Representative rates apply in the manner set forth below.

Straight Time - Straight time is defined as twelve hours per day, Monday through Friday, exclusive of holidays.

Overtime - Overtime is defined as time worked in excess of the regular straight time schedule, including travel hours. Work or travel on Saturdays, Sundays and for overtime up to four (4) hours per day will be charged at one and one-half times straight time rates. Holiday work, travel, and overtime in excess of four hours will be charged at double straight time rates. A "holiday" is any day observed by Veolia Canada as a holiday.

Long Stay - The rates below are based on a stay that does not exceed five days. For longer stays the following premiums apply:

- For stay longer than 5 days, 15% premium applies on rates;
- For stay longer than 12 days, 20% premium applies on rates; and
- For stay longer than 18 days, 25% premium applies on rates.

As long as the Field Service Representative is retained by the customer, the minimum charge for weekdays will be the per diem rates as described below plus expenses whether requested to work or not. If a Field Service Representative is retained over a weekend but does not work, the charge for the

weekend will be limited to expenses incurred by the Field Service Representative. In cases of undue delay, Veolia Canada reserves the right to recall the Field Service Representative.

The straight time rates are as follows:

- Engineer: $190 per hour
- Technician: $165 per hour

EXPENSES:

Living expenses (hotel, cars and airplanes) are at cost plus 15% of administration fees.

For meals, a per diem will apply. For stays under 14 days is 75$/d, while for stays over 14 days it is 69$/d.

For mileage, a standard vehicle charge of $0.75/km applies.

10 Operation and Maintenance Manual's Table of Content

- Introduction
  - General information
  - Objectives of this manual
  - Standards
  - Warranty
- Safety
  - General recommendations
  - Material safety data sheets
- Process
  - Process flow diagrams (PFD)
  - Process and instrumentation diagrams (P&IDs)
  - General arrangement drawing (GAs)
  - Field installation drawing (FIs)
- Detailed technical documentation
  - Equipment list
  - Data sheets
  - Shop drawings
  - Performance test reports
  - List of suppliers
- Electricity and control
  - Functional description
  - Wiring diagrams
  - Input and output list
  - Exchange table
  - Single line diagram or motor load list
- Operation and maintenance
  - Process equipment no 1
  - ...
  - Chemical preparation system no 1
  - ...
  - Automatic sequences: start up and shut down, emergencies
  - Maintenance program and procedure
  - Operating and effluent quality data collection, analysis and review procedures
  - Calibration procedure for monitoring equipment
  - Description of automated systems, alarms and warning devices
- Spare parts
- Manufacturers' maintenance manuals
  - Manufacturer list
  - Manufacturers' installation, operation and maintenance manuals

11 General Terms and Conditions

GENERAL TERMS AND CONDITIONS FOR SALE

The present General Terms and Conditions of Sale of Products ('Terms and Conditions') govern the supply of Products and Services (collectively the "Products") by Veolia Water Technologies Canada Inc. herein defined as "Veolia Canada". These terms and Conditions shall prevail over the Customer's terms and conditions of purchase whether or not provided to Veolia Canada. Neither commencement of performance nor delivery by Veolia Canada shall be construed as or constitute acceptance of Customer's terms and conditions of purchase. The present Terms and Conditions shall not be amended without Veolia Canada's prior consent in writing.

1. Definition and interpretation

1.1 In the present Terms and Conditions:

'Customer' means a person to whom an Offer is made or to whom Products are supplied; Veolia Canada means Veolia Water Technologies Canada Inc. Veolia Canada and Customer shall be defined hereinafter individually or collectively as Party or Parties; 'Delivery Date' means the date set for delivery in the Offer or the Order, and if such Offer and Order conflict in such respect, then the date set out in the Offer unless agreed in writing by the parties; 'Intellectual Property' means all forms of intellectual property rights including patents, designs, drawings, copyright, trademarks, trade names, trade secrets or any other intellectual or industrial property right, whether registered or unregistered related to the Products; 'Offer' means an offer by Veolia Canada to supply Products; 'Order' means an effective contract to supply Products as per article 3 to which these Terms and Conditions apply; 'Products' means goods, spare parts, consumables, equipment or materials, and services as the case may be supplied by Veolia Canada to the Customer pursuant to an Order; 'Work' means the delivery of Products to the agreed point of delivery, and any installation or other related activities included in the Order. 1.2 In the present Terms and Conditions: a) clause headings and bold characters are for convenience only and shall not affect interpretation thereof; b) words importing the singular include the plural and vice versa; and c) words importing a gender include any gender.

2. Offer

2.1 Veolia Canada may vary the content of the Offer at any time before its acceptance.2.2 Unless otherwise stated in the Offer; the Offer remains open for acceptance for thirty (30) days after its date, but may be withdrawn by Veolia Canada at any time before acceptance.

3. Effective date

3.1 The Order shall become effective upon Veolia Canada's written acceptance of the Customer's Order, unless otherwise agreed between the Parties.

4. Cancellation

The Customer may not cancel any Order unless the Customer: a) obtains Veolia Canada's prior written approval; and b) pays Veolia Canada all costs incurred or damages suffered by Veolia Canada in connection with the cancellation of the Order (including without limitation any charges, termination costs, duties, taxes, expenses, design costs, expected profits, purchasing costs or other outgoings paid or incurred in expectation of the completion of the Order). Products returned without Veolia Canada prior written consent will not be accepted for credit.

5. Variations and Change in Law

5.1 If the Customer requests in writing a variation to an Order: a) Veolia Canada will use its reasonable efforts to comply with the request; and b) if Veolia Canada can comply with the request: i) the Customer shall pay Veolia Canada the costs reasonably invoiced for the variation; ii) Veolia Canada will advise the Customer of any delivery delay resulting from complying with the request; and iii) Veolia Canada will advise the Customer of any impact on the warranties given in respect of the Products. 5.2 Any attempt by the Customer to unilaterally vary the content of an Order (including these Terms and Conditions), whether orally or in writing, is void. Veolia Canada shall not begin work related to the Variation unless agreement is reached between the Parties. Veolia Canada shall be entitled to compensation for any change in law having effect on the performance of the Order.

6. Price and payment

6.1 The price of Products shall be specified in the Offer to the Customer. Except as may be otherwise provided in an Offer, the price does not include any goods and services or consumer sales tax, and/or other similar taxes, excise and custom duties, required by law in the jurisdiction of delivery of the Products or otherwise. The Customer shall bear sole responsibility for the payment of any such tax or duty. 6.2 The price shall be subject to adjustment upon an increase in the cost of raw materials and/or wages according to the formula determined by Veolia Canada in its sole discretion, and upon written notice to the Customer. 6.3 Unless specified otherwise in writing, terms of payment are 100%, net 30 days. 6.4 Customer shall be charged 2% interest per month (24% per year) of any unpaid balance, and Customer shall pay all of Veolia Canada's reasonable costs (including attorneys' fees) of collecting amounts due but unpaid. All orders are subject to credit approval. 6.5 All above prices are in Canadian Dollars; 6.6 Nothing in the provisions of clause 6.4 above shall limit any right Veolia Canada may otherwise have to recover payment of amounts due and/or damages.

7. Delivery and risks

7.1 Unless otherwise stated in an Order: a) Veolia Canada shall deliver the Products Ex Works – Veolia Canada factory; and b) the Customer must arrange to pick up the Products immediately upon the Delivery Date; and c) all risks including risk of loss or damage and care and custody to the Products shall pass to the Customer upon delivery as per a) above. Any use of the Products before acceptance other than at the time of the tests carried out in the presence of Veolia Canada shall be deemed to be Provisional Acceptance of the Work and shall automatically result in the immediate transfer of risk and the beginning of the warranty period.

8. Ownership of the products

8.1 Subject to clause 8.2 below, Veolia Canada shall provide full and unrestricted title to the Customer for the Products free and clear of all liens, restrictions, reservations, security interests and encumbrances (save as for the intellectual property rights associated with the Products). 8.2 Ownership of the Products only passes to the Customer when all of the Products under the said Order are paid for in full. Until then: a) ownership of the Products remains with Veolia Canada; b) the Customer holds the Products as bailer for Veolia Canada; and c) the Customer shall maintain Veolia Canada's identification property signs on the Products.

9. Warranty

9.1 Unless otherwise stated in the Offer: Veolia Canada Products shall be guaranteed to be free from faulty materials, workmanship or defects for a fixed period of eighteen (18) months from the Delivery Date or (12) months from the date of substantial performance, whichever period expires the earliest. 9.2 The present warranty is subject to prior notification by the Customer to Veolia Canada within ten (10) business days after the discovery of the defect. 9.3 During the warranty period Veolia Canada will, at its sole discretion, either: a) repair or replace Ex-Works – Veolia Canada factory, or b) pay to the Customer the cost of replacing or repairing, at Customer's risk, that part or all of the Products which are reasonably found to be defective. Repair and/or replacement of Products shall not constitute an extension of the warranty period. 9.4 Customer's failure to notify Veolia Canada pursuant to clause 9.2 above shall constitute acknowledgement of compliance of the Products with the Order and the Customer shall then be deemed to have waived any such claim in relation to the Products. 9.5 Save and except for warranties expressly stated in the Offer, THE WARRANTIES EXPRESSLY SET FORTH IN THESE TERMS AND CONDITIONS ARE THE SOLE AND EXCLUSIVE WARRANTIES OF VEOLIA CANADA. VEOLIA CANADA MAKES NO OTHER WARRANTIES OF ANY KIND WHATSOEVER, EXPRESS, IMPLIED, ORAL, WRITTEN, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTIES ARISING BY CUSTOM, TRADE USAGE, PROMISE, EXAMPLE OR DESCRIPTION, ALL OF WHICH WARRANTIES ARE EXPRESSLY DISCLAIMED BY VEOLIA CANADA AND WAIVED BY THE CUSTOMER. The warranty provided for in the present clause shall not be extended, altered or varied except by a written instrument signed by Veolia Canada and the Customer.

10. Exclusions from warranty

10.1 The foregoing warranty shall only apply in respect of claims as a result of defects in the Products or parts thereof which become apparent within the applicable warranty period. 10.2 Veolia Canada shall not be liable in any way, whether in contract, tort, under statute or otherwise, for any failure of the Products to comply with the warranties given under clause 9 and, (if applicable) under the express terms of the Offer: a) unless the Customer can prove, to Veolia Canada' satisfaction, that the Customer stored, installed, used and operated the Products strictly in accordance with Veolia Canada' instructions (which the Customer will receive, or must request and receive before installation –if not performed by Veolia Canada- and initial use of the Products); or b) if the failure is caused by: i) normal wear and tear, impact, improper use, or mishandling; or ii) repair, alteration or use beyond their specifications, iii) repair or modification in any way by any person other than Veolia Canada; iv) a force majeure event. For the purposes of clarification, the warranty provided by Veolia Canada in respect of the Products or the Work does not cover normal wear and tear. 10.3 The Customer acknowledges that: a) in order to comply with its warranty obligations, Veolia Canada shall not be obliged to make any change in the design and/or specifications of the delivered Product so as to render the said Product equivalent to any other new similar Product, or new model of the Product, supplied by Veolia Canada (but the Customer agrees to accept such new model of the Product or replacement for the Product if offered by Veolia Canada); and b) Veolia Canada shall not be responsible for the replacement of consumable and spare parts items used in operation of the Products.

11. Exclusions and limitation of liability

11.1. The total and aggregate liability of Veolia Canada to the Customer, whether in contract, tort (including negligence), statute or under any other legal theory whatsoever shall in no event exceed twenty-five percent (25%) of the Order price. 11.2 Veolia Canada shall in no event be held liable to Customer for any indirect, special, punitive or consequential damages whatsoever arising under the Order, including any loss of profits, loss of revenues, loss of opportunities, loss of use, loss of production, loss of contracts.. 11.3 The present clause 11 shall apply notwithstanding any other provision of any Order.

12. Purpose of products

12.1 The Customer acknowledges it relies solely on its own skill and judgment in all respects and in particular: a) in its decision to purchase the Products; and b) that the Products are fit for the purpose for which they are being acquired. 12.2 It is the Customer's sole responsibility to ensure that the Products are used for the purposes for which they were intended to be used.

13. Force Majeure

13.1 Veolia Canada shall not be held liable for any delay or failure in performance of any part of the Order to the extent that such delay or failure is caused by an event of force majeure, being an occurrence (other than in respect of the financial capability of a party) which prevents or delays a party from performing its obligations and which is beyond the reasonable control of such party; and which shall include, without limitation: accidental damage to its equipment or machinery; acts of God or of public enemy; blockade, rebellion, insurrection, riot or other civil unrest or violence or sabotage; weather conditions, fire, storm, flood, earthquake, or other natural disaster; terrorism, bomb or explosion; war; illness, epidemic or pandemic, including COVID-19; quarantine restrictions; industrial or labor dispute, labor shortage; transportation embargo; act or omission (including laws, regulations, disapprovals or failures to approve) of any other person (including a government, government agency, a supplier or a sub-contractor). 13.2 If any such event occurs, and Veolia Canada is delayed or unable to perform, Veolia Canada shall give notice to the Customer, and shall be automatically relieved from performance of the Order for the entire duration of such event. 13.3 If the said event lasts for more than thirty (30) days, Veolia Canada shall have the right to terminate the Order with immediate effect by giving written notice to the Customer. 13.4 If Veolia Canada terminates an Order under this clause 13.3 due to a Force Majeure event as described in 13.1 affecting the Customer; the Customer shall pay Veolia Canada all costs incurred or damages suffered by Veolia Canada in connection with the Order (including without limitation any charges, duties, taxes, expenses, design costs, purchasing costs or other outgoings paid or incurred in the expectancy of completion of the Order).

14. Export control

Unless otherwise agreed by the parties in writing, and to the extent applicable to the Work, the Customer is responsible for compliance with all laws and regulations applicable to the storage, use, handling, installation, maintenance, removal, registration and labeling of all Products from and after Customer's receipt of the Products, as well as for the proper management and disposal of all wastes and residues associated with the Products (including but not limited to containers, excess or off-spec product, testing wastes, e.g., spent or expired lab reagents and test kits). Customer agrees to ensure that all Products provided to Customer for export are exported only in compliance with applicable export control laws and regulations. Any permits and licenses which are required to operate or to use the Products shall be procured by Customer at Customer's sole expense.

15. Intellectual property

The Customer acknowledges that Veolia Canada preserves all the Intellectual Property rights on all Products of the Order. Accordingly, the plans, technical drawings and specifications supplied by Veolia Canada and more generally any documents or information communicated in conformance with the Order remain the full and whole property of Veolia Canada and can in no way be used by the Customer for any other purpose other than that set out in the Order. As such, Veolia Canada grants to the Customer a non-exclusive license to use such documents exclusively for the purpose of installing, maintaining and repairing the Products. During the execution and for five years following the termination date of the Order, the Customer commits not to reveal to any third party, officially or not, directly or indirectly, in writing or by other means, all or any of the information which would have been communicated to the Customer by Veolia Canada within the framework of the Order, except if the Customer obtains Veolia Canada' prior written approval. The term "information" includes, without limitation, the knowledge, the plans and the worksheets, and generally, all the technical, financial or commercial information that was exchanged or communicated in relation to the Order.

16. Customer's default

16.1 If: a) the Customer fails to make any payment required under the Order, including interests and any other amount owing to Veolia Canada, on the date or dates due; b) the Customer breaches any other provision of the Order, Offer or of the present Terms and Conditions and fails to remedy the breach within seven (7) days after receiving a written notice requiring it to do so; or c) any step is taken to appoint a receiver, a receiver and manager, a trustee in bankruptcy, a liquidator, a provisional liquidator, an administrator or other like person in respect of part or all of the Customer's assets or business, Veolia Canada may: i) declare the entire sum remaining unpaid under the Order to immediately become due and payable; or ii) require the Customer to pay in advance of delivery or completion; or ii) suspend or cease performance until all amounts owing to Veolia Canada are paid in full; or iii) request the Customer to immediately return to Veolia Canada any Product for which full payment has not been received by Veolia Canada; or iv) enter the premises in which the Products are stored and retake possession of them; and/or v) resell all or part of the Products without notice. 16.2 This clause shall not limit any other right Veolia Canada may have to recover damages for breach of contract or any other claim under statute or at common law. For greater certainty, no failure or partial exercise of any remedy or delay in exercising any remedy, shall operate as a waiver thereof; the rights and remedies herein provided are cumulative and may be exercised singly or concurrently, and are not exclusive of any rights or remedies provided by law. 16.3 Further to the foregoing, in the event of any one of the occurrences described in 16.1a) to c), Veolia Canada may also elect to terminate the contract in relation to the Order without prejudice to its right to claim all payment owed under the Order and under the present terms and conditions.

17. Early Termination

The Customer shall pay Veolia Canada, at the latest within 30 calendar days following the effective date of termination of the Order, the value of the Work conducted, performed or delivered on the Site in accordance with the Order and all the amounts remaining due to Veolia Canada on the date of termination and any early termination costs incurred or expected by Veolia Canada.

GENERAL TERMS AND CONDITIONS FOR SALE

18. Applicable law

Veolia Canada and the Customer agree that the Offer, the Order and these Terms and Conditions shall be governed in accordance with Canadian federal laws and the applicable provincial laws in which delivery occurs (the "Province"). For any delivery outside of Canada, the laws of the province of Ontario shall apply. All disputes arising between the parties in respect of such Offer, Order or Terms and Conditions shall be settled by arbitration, in the city of Montreal, Québec unless otherwise agreed to by the Parties.

19. Notices

19.1 All notices required to be given under the Order must be sent to the address of the recipient as set out in the Order (or any other address notified in writing by the recipient in accordance with the present clause). 19.2 Any notice will be deemed to have been duly given, if sent by mail, five (5) business days after posting, if delivered by hand, on signature of receipt acknowledging delivery and, if sent by facsimile transmission, on generation of an acknowledgment that the transmission has been successfully completed.

12 REFERENCES

A selection of case studies

June 2023

AGNICO EAGLE Meliadine Gold Mine Nunavut (2016)

APPLICATION

- TSS Removal
- Sludge thickening
- Operation assistance

CAPACITY

- 28,000 m^3/d

CHALLENGES

- Very high chloride concentration
- Actiflo were moved from another mine site and refurbished
- Performance
  - Raw water: TSS up to 500 ppm
  - Effluent water: TSS less than 15 ppm

TECHNOLOGIES

- Actiflo and Multiflo
- Chemical preparation and distribution

EQUINOX GOLD
Greenstone Gold Mine
Ontario (2020)

APPLICATION
- Mobile Water Services (MWS) for TSS and Metals removal

CAPACITY
- 3,600 m^3/d

CHALLENGES
- Support for permitting with extensive testing
- Process guarantee
- Water conditions changes rapidly depending on construction activities and contained more TOC than expected
- Temporary system while permanent plant is constructed
- Consistently meet criteria, including
  - 600 µg/L Fe
  - 15 mg/L TSS

TECHNOLOGIES
- Two stage ACTIFLO
- DiscFilter
- Sludge Management
- Chemical preparation and distribution

FIRST QUANTUM
Troilus Mine
Northwest Quebec (1997)

APPLICATION
- TSS removal

CAPACITY
- 19,000 m^3/d

CHALLENGE
- Unit was in use through operation and mine closure

TECHNOLOGY
- Actiflo

Formerly Inmet Mining

PUREGOLD MINING
Madsen Mine
Ontario (2020)

APPLICATION
- Mobile Water Services (MWS) for TSS and Metals removal
- Permanent MBBR for toxicity reduction

CAPACITY
- 5,760 m^3/d

CHALLENGES
- Water conditions changed and treatment system was updated rapidly
- Hubgrade enables remote monitoring and assistance
- Consistently meet criteria, including
  - 50 µg/L total P
  - 8 µg/L total Cu
  - 55 µg/L total Ni

TECHNOLOGIES
- Reactors and Actiflo
- Tracer™ MBBR
- Chemical preparation and distribution

YUKON GOVERNMENT
Faro Mine
Yukon (2017)

APPLICATION

- Emergency TSS Removal from water from Cross Valley Pond
- Can be upgraded to Metal Removal and Toxicity Reduction if required

CAPACITY

- 5,500 m^3/d

CHALLENGES

- Water contains high concentration of ferrous iron
- System oxidize ferrous to ferric iron, which act as the system's coagulant

TECHNOLOGIES

- Reactor
- Mobile Actiflo
- Chemicals

ALAMOS GOLD INC
Young-Davidson Mine
Ontario (2015)

APPLICATION
- Ammonia and TSS removal

CAPACITY
- 1,500 m^3/d

CHALLENGES
- System was piloted at the site
- System designed to works on unheated mine effluent
- Results:
  - Influent: 30 to 50 mg N/L
  - Effluent: 0.6 to 3 mg/N/L

TECHNOLOGIES
- MBBR followed by Actiflo
- Chemical preparation and distribution systems

PRETIUM RESOURCES
Brucejack Mine
British Columbia (2015)

APPLICATION
- Low level metal removal
- Support for permitting

CAPACITY
- 10,500 m^3/d

CHALLENGES
- Permanent installation
- Very remote site, logistics are challenging
- Two stage treatment
- Very low metal levels
- Flow through installation (no storage of raw water)
- Extensive modelling and piloting

TECHNOLOGIES
- Reactors and Actiflo
- Sludge thickening using a centrifuge
- Chemical preparation and distribution

PRETIUM RESOURCES
Brucejack Mine
British Columbia (2014)

APPLICATION
- Temporary treatment during exploration and construction
- Metal removal at low concentration

CAPACITY
- 6,000 m^3/d

CHALLENGES
- Remote site
- Fast schedule
- Very high TSS in the raw water

TECHNOLOGIES
- Actiflo® clarifier
- Hydrotech™ Discfilter
- GAC filters
- Sludge management
- Chemicals
- Operations

Construction Plant Performance	Raw Water	Actiflo Outlet	Filter Outlet
Total Suspended Solids (mg/L)	1110	4.5	3.2
Turbidity	2330	1.9	0.9
Total Arsenic (mg/L)	0.0487	0.0009	0.0008
Total Copper (mg/L)	0.01750	<0.00050	<0.00050
Total Iron (mg/L)	6.62	0.12	0.06
Total Manganese (mg/L)	0.693	0.028	0.017
Total Silver (mg/L)	0.00216	0.00001	<0.000010
Total Zinc (mg/L)	0.0648	<0.0030	<0.0030

NEWMONT Éléonore Mine Quebec (2014)

APPLICATION

- Low level metal and arsenic removal
- Sludge management
- Chemical preparation and distribution

CAPACITY

- 26,000 m^3/d

CHALLENGES

- Two stages: each stage has two parallel lines designed to handle 50% of the flow
- Complete process turnkey
- Phased treatment (metals first, then arsenic)
- Provision for future Tracer™ MBBR
- High chloride concentration

TECHNOLOGIES

- Reactors and Actiflo
- Geotextile tubes

DE BEERS CANADA
Snap Lake Mine
Northwest Territories (2014)

APPLICATION
- TSS removal

CAPACITY
- 5,000 m^3/d

CHALLENGES
- Equipment was shipped by plane
- Results:
  - Raw water: 100-3000 NTU
  - Actiflo effluent: 1.5-2.5 NTU
  - Discfilter effluent: 7 ppm TSS

TECHNOLOGIES
- Actiflo and Discfilter

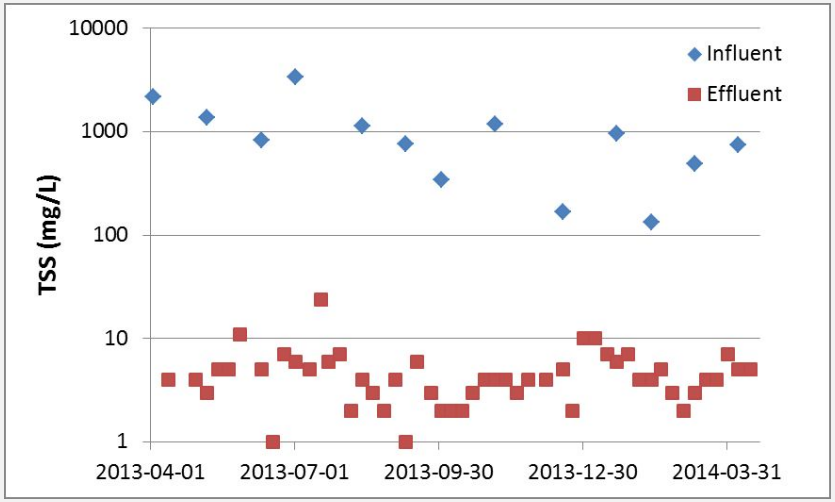
NORTH AMERICAN TUNGSTEN CORPORATION
Cantung Mine Site
Northwest Territories (2013)

APPLICATION
- Mobile Water Services including operation
- TSS removal for discharge to environment

CAPACITY
- 3,000 m^3/d

CHALLENGES
- The Cantung deposits, consisting of the Open Pit resource near surface, and underground workings
- The physical plant site includes an underground mine, a small open pit, process plant, diesel power plant
- Client was ready to mine but water treatment issues were a major hurdle for mine to overcome before full blown production can begin
- Veolia had major impact in assisting NATC in the permitting process
- Consistently met the TSS criteria while the influent exceeded at times 3,000 mg/L (see graph at right)

TECHNOLOGY
- Actiflo



TECK RESOURCES LTD
Coal Mountain Operation
British Columbia (2013)

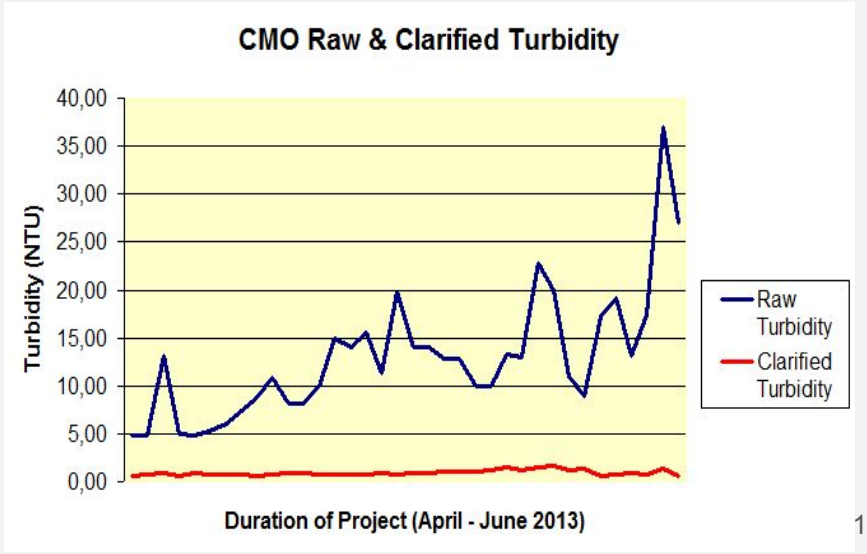
Parameters	Units	Treated Water Limits	Aquamove System Water Quality Results
pH	--	6,5 - 9,0	7,2
Total Aluminum (Al)	mg/L	0,1	0,0264
Total Beryllium (Be)	mg/L	0,0053	0,00215
Total Cadmium (Cd)	mg/L	0,00018	0,00015
Total Cobalt (Co)	mg/L	0,004	0,00011
Total Copper (Cu)	mg/L	0,011	0,00075
Total Iron (Fe)	mg/L	1	0,345
Total Nickel (Ni)	mg/L	0,15	0,0064
Total Zinc (Zn)	mg/L	0,14	0,0106

APPLICATION
- Mobile Water Services with operation
- Metals and TSS removal
- Pit dewatering

CAPACITY
- 10,000 m^3/d

CHALLENGE
- Very quick mobilization and demobilization

TECHNOLOGY
- Actiflo



IAMGOLD CORPORATION
Niobec Mine
Quebec (2010)

APPLICATION
- TSS removal
- Algae blooms

CAPACITY
- 10,000 - 13,000 m^3/d

CHALLENGE
- Mobile treatment application that was mobilized in approximately 8 weeks
- A permanent plant is now installed
- The project included complete operation of the plant

TECHNOLOGIES
- Actiflo

AGNICO EAGLE
Meadowbank Gold Mine
Nunavut (2009)

APPLICATION
- TSS removal

CAPACITY
- 50,000 m^3/d

CHALLENGE
- 2 prefabricated units installed under a dome
- Units were moved as mine operation progressed
- Performances:
  - Raw water: 100 ppm
  - Effluent water: < 15 ppm

TECHNOLOGY
- 2 Actiflo

CAPSTONE MINING CORP
Minto Mine
Yukon (2009)

APPLICATION
- Mine water & site runoff
- Removal TSS
- Removal copper & nickel

CAPACITY
- 6,000 m^3/d

CHALLENGE
- Remote site

TECHNOLOGY
- Actiflo

BARRICK
Williams Mine
Ontario (2009)

APPLICATION
- Removal TSS
- Removal antimony & molybdenum
- Sludge recirculation option

CAPACITY
- 2,000 m^3/d

CHALLENGE
- Tailings treatment for re-use

TECHNOLOGY
- Single train Actiflo packaged plant

Williams Mine - Barrick

Golden Giant Mine (Care & Mtce.)

David Bell Mine-Barrick

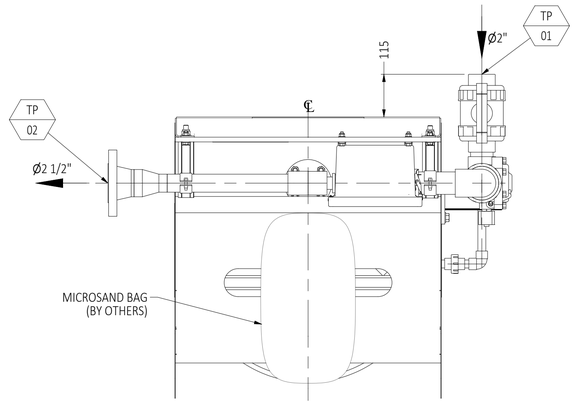
("TIE-IN") TABLE		
TIE-POINT #	DESCRIPTION	DIMENSION / TYPE
TP-01	INLET SERVICE WATER	Ø2" SOCKET | PVC
TP-02	OUTLET	Ø2 1/2" - #150 FLANGE- R.F. | 316 SS

MATERIAL:

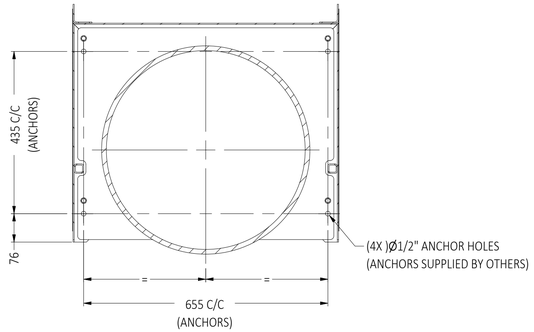
- STRUCTURE: 304 SS
- INLET PIPE: PVC SCH. 80
- OUTLET PIPE: SS316
- TANK: HDPE, VOLUME 200 L
- WEIGHT: 109 KG (240 Lbs).(EMPTY)

NOTES:

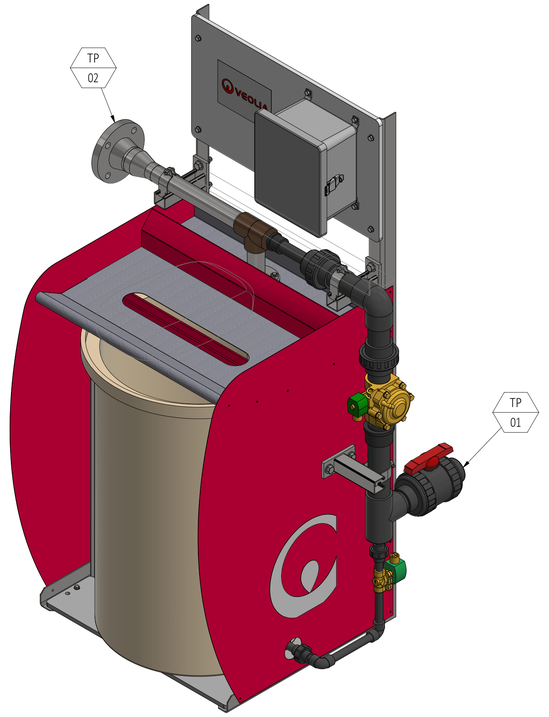
1. REQUIRED INLET FLOWRATE: Q=9.8 m³/hr @ 85 PSIG
   PRESSURE DISCHARGE AT THE OUTLET ELEVATION: 20 PSIG
2. IF THE DISCHARGE LINE IS ABOVE THE HYDRASAND MINI, ADD A
   CHECK VALVE TO AVOID A BACK FLOW TOWARDS THE HYDRASAND MINI TANK.
3. UNIT FUNCTION : TO POUR 23 kg MICROSAND BAG ONE AFTER THE OTHER.



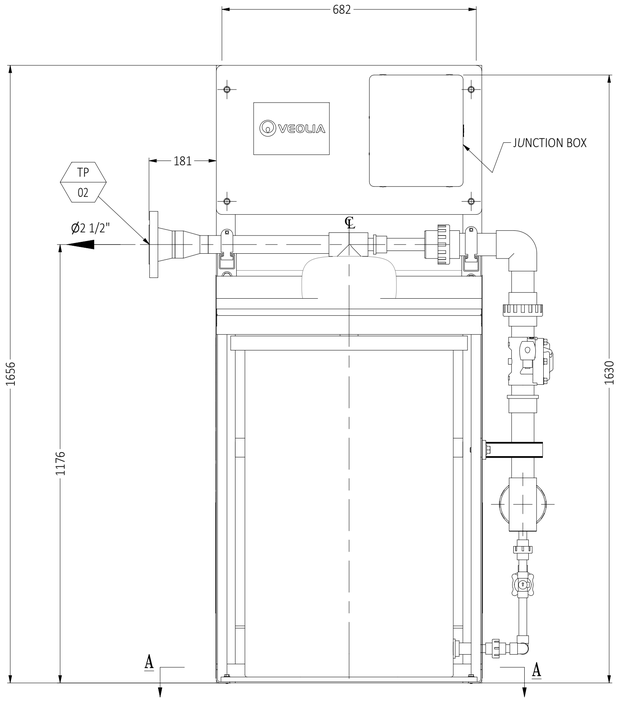
PLAN VIEW



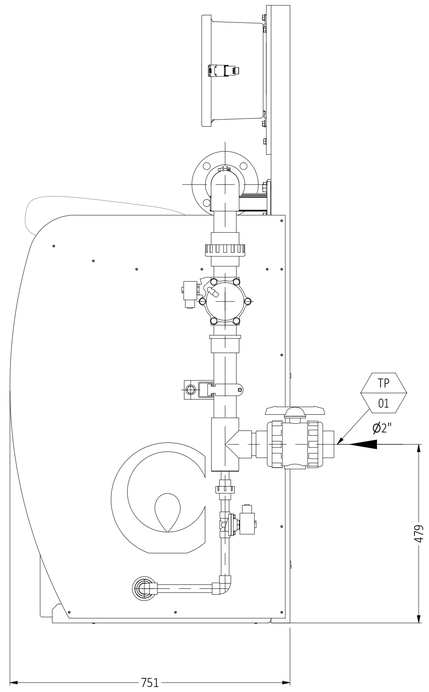
SECTION A-A



ISOMETRIC VIEW



FRONT VIEW



RIGHT SIDE VIEW

RÉV. / REV.	DESCRIPTION	DATE	DESSINÉ PAR/ DRAWN BY	PRÉPARÉ PAR/ PREPARED BY	VÉRIFIÉ PAR/ CHECKED BY
2	FOR INFORMATION	2022-12-01	H.H.	G.P.	G.P.
1	FOR INFORMATION	2022-09-09	V.T.	S.M.	S.M.

DESSINÉ PAR/DRAWN BY: V.T. DATE: 2022-09-09
PRÉPARÉ PAR/PREPARED BY: GUILLAUME PÉRIN, P.Eng. M.Sc. DATE: 2022-09-09
VÉRIFIÉ PAR/CHECKED BY: GUILLAUME PÉRIN, P.Eng. M.Sc. DATE: 2022-09-09

CLIENT

VEOLIA WATER TECHNOLOGIES

TITRE / TITLE

HYDRASAND MINI
MICROSAND SLURRY EDUCTOR
GENERAL ARRANGEMENT

ÉCHELLE / SCALE: 1 : 10

PROJET / PROJECT - DESSIN No / DRAWING No	INTERNE / INTERNAL	FEUILLET / SHEET	RÉV/REV
5000XXXXXX - GA6350		1 / 1	2

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REF: ANSI D

("TIE-IN") TABLE

TIE-POINT #	DESCRIPTION	MATL.
TP-01	SERVICE WATER INLET	FLANGE 150#| RF | PVC SCH.80
TP-02	EDUCTOR OUTLET	FLANGE 150#| RF | PVC SCH.80
TP-03	MATURATION TANK INLET	SOCKET | PVC SCH.80
TP-04	MATURATION TANK OVERFLOW	FNPT | AISI 304L
TP-05	MATURATION TANK DRAIN	SOCKET | PVC SCH.80
TP-06	STORAGE TANK OVERFLOW	FNPT | AISI 304L
TP-07	STORAGE TANK DRAIN	SOCKET | PVC SCH.80
TP-08	STORAGE TANK OUTLET	SOCKET | PVC SCH.80

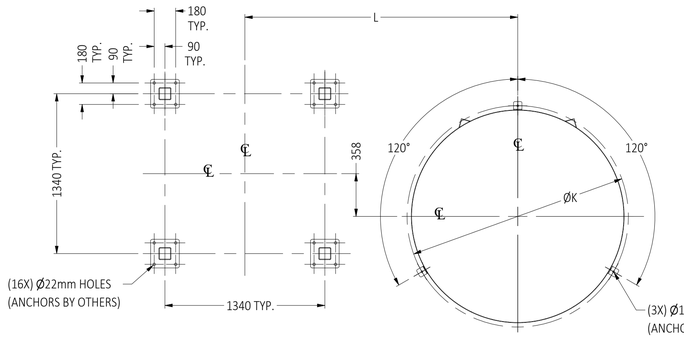
WEIGHTS

STACKED TANKS			DOSING SKID	
MODEL	EMPTY	FULL	EMPTY	FULL
HP 2000 L	669 KG (1475 Lbs)	5185 KG (2355 Lbs)	1788 KG (3943 Lbs)	2546 KG (5614 Lbs)
HP 3000 L	891 KG (1963 Lbs)	7643 KG (3470 Lbs)	1788 KG (3943 Lbs)	2546 KG (5614 Lbs)
HP 4000 L	1038 KG (2287 Lbs)	9866 KG (4480 Lbs)	1788 KG (3943 Lbs)	2546 KG (5614 Lbs)

	DIMENSIONS (mm)											("TIE-IN") POINT DIAMETERS (mm/in)							
MODEL	A	B	C	D	E	F	G	H	J	K	L	TP-01	TP-02	TP-03	TP-04	TP-05	TP-06	TP-07	TP-08
HP 2000 L	374	1428	5450	2099	993	1353	2157	1199	881	1428	2084	40 (1 1/2)	50 (2)	50 (2)	80 (3)	50 (2)	50 (2)	50 (2)	50 (2)
HP 3000 L	386	1623	5774	2472	1181	1557	3165	1325	1040	1702	2211	40 (1 1/2)	50 (2)	50 (2)	80 (3)	80 (3)	50 (2)	80 (3)	80 (3)
HP 4000 L	386	1784	5926	2681	1638	1709	3469	1477	1116	1854	2287	40 (1 1/2)	50 (2)	50 (2)	80 (3)	80 (3)	50 (2)	80 (3)	80 (3)

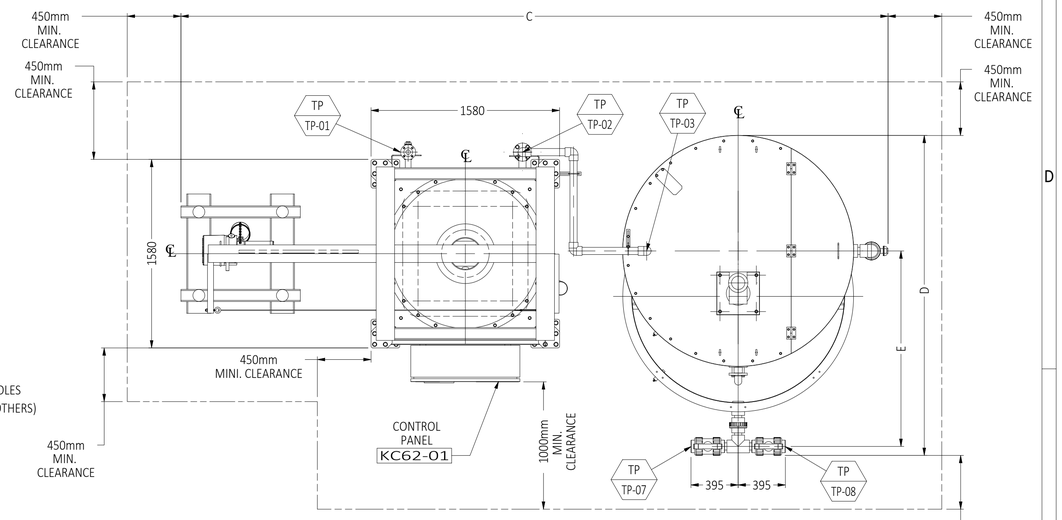
NOTES:

1. HYDRAPOL FLEX L UNIT IS PREASSEMBLED IN SHOP BUT FOR FREIGHT PURPOSE SOME OF IT'S COMPONENTS MUST BE INSTALLED ON SITE BY A CONTRACTOR (STACKED TANKS, PIPING CONNECTION BETWEEN BIG BAG FRAME & TANKS, ...). REFER TO FIELD INSTALLATION DRAWINGS FOR DETAILS.



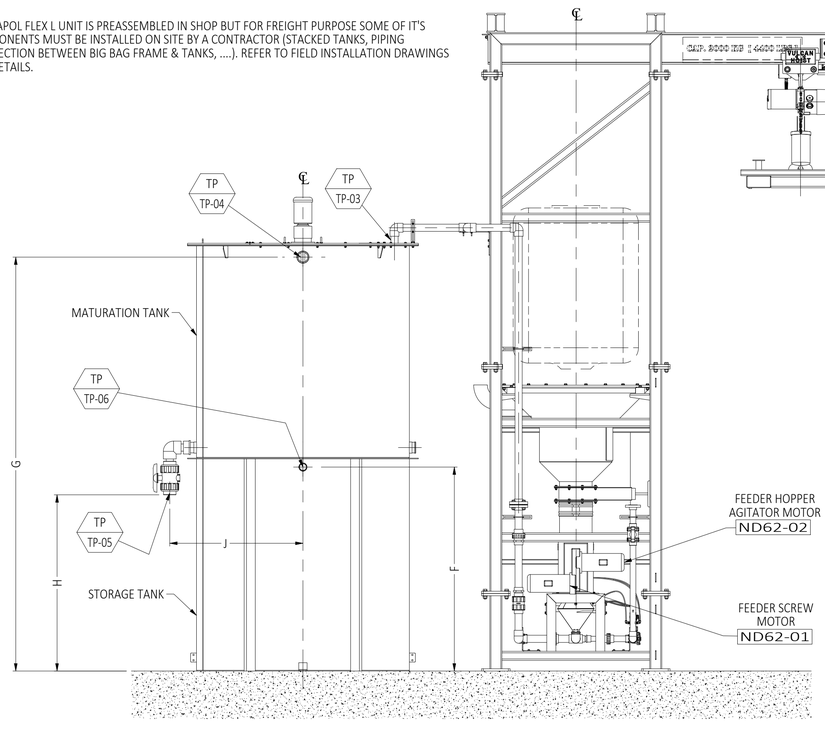
SECTION A-A

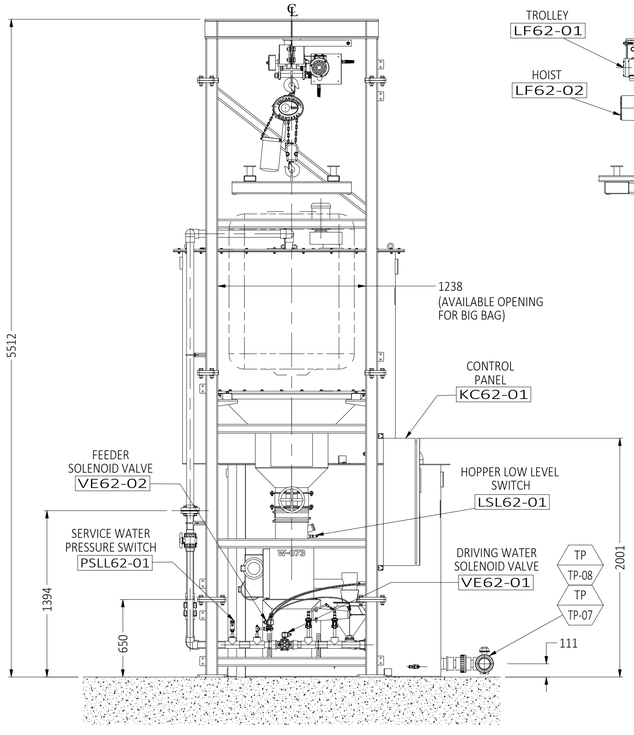
SCALE: 1:25

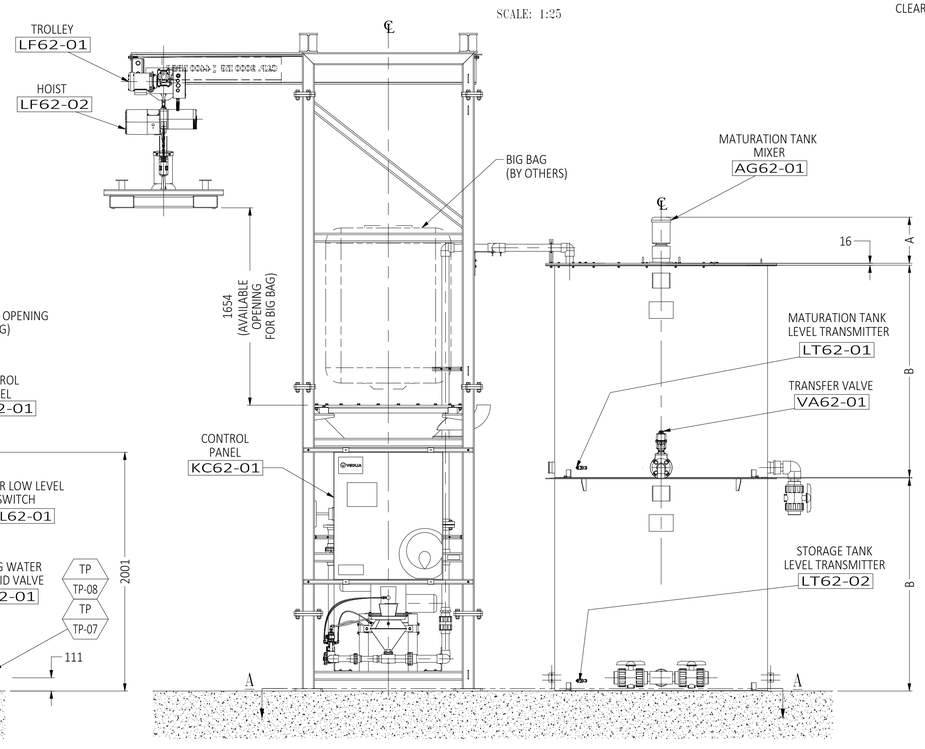


TOP VIEW

SCALE: 1:25







TOUTES LES DIMENSIONS SONT EN / ALL DIMENSIONS ARE IN: mm

TOLÉRANCES GÉNÉRALES:

DIMENSIONS EN POUCES:
O @ 24 : ± 1/32 [± .03]
24 @ 160 : ± 1/16 [± .05]
> 160 : ± 1/8 [± .1]

DIMENSIONS EN mm:
0 @ 600 : ± 0.5
600 @ 4000 : ± 1.0
> 4000 : ± 3.0

ANGLES: ± 0° 10'
BRISER TOUTES LES ARÊTES
TOUTES LES SURFACES USINÉES: 250

PROJECTION ORTHOGONALE

BARRE = 1" À L'ÉCHELLE D'IMPRESSION
BAR = 1" AT PLOT SCALE

STD: "D" 22 X 34

REF:

RÉV. REV.	DESCRIPTION	DATE	RÉVISÉ REVISED	VÉRIFIÉ CHECKED	APPROUVÉ APPROVED	ECN
1	FOR INFORMATION	2020-08-07	H.H.	S.M.	G.P.	N/A

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DESSINÉ PAR DRAWN BY	N.L.
DATE	2020-08-07
VÉRIFIÉ PAR CHECKED BY	S.M.
DATE	2020-08-07
INGÉNIERIE PAR ENGINEERING BY	G.P.
DATE	2020-08-07
ÉCHELLE: SCALE:	1:25

TITRE / TITLE: POLYMER PREPARATION SYSTEM
HYDRAPOL FLEX 2000L/3000L/4000L
GENERAL ARRANGEMENT

CLIENT

VEOLIA

VEOLIA WATER TECHNOLOGIES CANADA INC. 4105 Sartelon, Saint-Laurent, Qc, Canada Tel: (514) 334-7230

PROJET / PROJECT	DESSIN / DRAWING	NUMÉRO INTERNE / INTERNAL NUMBER	FEUILLETS / PAGES	RÉV. / REV.
-	GA_6250_HYDP		1 / 1	1

ATTACHMENT D

Technology Description and Comparison

1.0 WATER TREATMENT CORE TECHNOLOGY COMPARISON AND SELECTION

WSP compared four different water treatment technologies for removal of TSS as indicated by the design basis. The four technologies are based on two solid-liquid separation principles:

Gravity separation:

- Lamella clarifier
- Ballasted-flocculation lamella clarifier

Filter Separation:

- Disc Filter
- Ultrafiltration

Each technology, their merits, and their relative suitability to the Troilus Gold project are described herein.

The comparison and selection task of Attachment D was performed prior to the FS design study, and the design, consumptions, costs, and other values may be slightly different in Section 5.0, than in Attachment D.

2.0 GRAVITY SEPARATION

Gravity separation relies on the density difference between the TSS solids particle to pull particles to the bottom of a solid-liquid separation vessel. The majority of clear water rises to a collection point at the top of the same vessel.

2.1 Lamella clarifier

The lamella clarifier is a compact version of conventional wide tank and rake clarifier, relying on inclined plates or tubes (lamellas) to increase the surface area (decreasing the fluid rise rate) for solids settling. The TSS-bearing influent water is introduced to the lamellas, where the TSS solids settle at the bottom of the tank, allowing clarified water to overflow. The settled solids densify and are pumped to discharge as waste sludge. Figure D1 is a demonstration of lamella clarifier technology with major parts and water flow directions labelled provided with the vendor's quote.

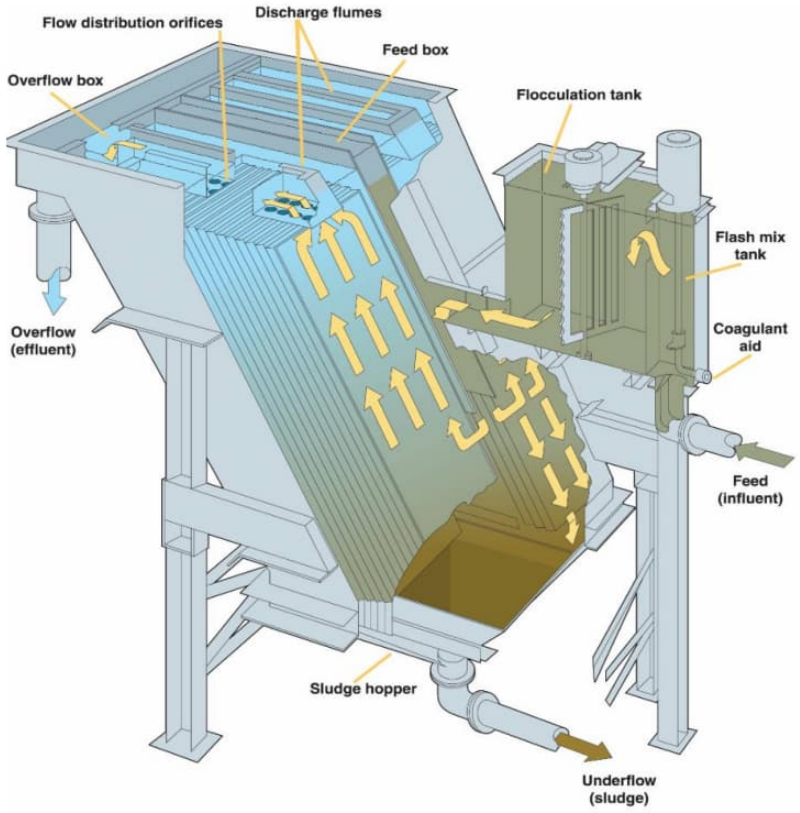

Figure D1: 3D model for Lamella clarifier from Vendor's quote (Parkson, 2023)

Table D1: Process descriptions and pros and cons for lamella clarifier

Process description	Advantages	Disadvantages
Addition of flocculant and coagulant.	Smaller footprints than conventional clarifiers.	More complex fabrication due to settling plates/tubes.
Influent containing suspended solids enters one end of the clarifier and is introduced to the bottom of a set of inclined plates or inclined tubes.	Often do not involve moving mechanical parts (such as sludge rake mechanism), which results in a less complex and lower maintenance process.	Greater risk of solids escaping the process, particularly smaller colloidal particles, due to short retention times.
As water flows upwards, suspended solids settle onto the surfaces of the inclined structures.	Available as modular units with rectangular footprints that allow multiple units to be installed adjacent to each other (e.g., Graver®).	Scaling on plates/tubes can negatively impact performance
Solids collected on the inclined structures slide downward to the sludge collection chamber at the bottom of the clarifier.		Performance is less tolerant of inadequate flocculation.
Sludge exits the sludge collection chamber by gravity or is removed by a pump.		
Clarified water overflows a discharge weir into a collection trough.		

2.2 Ballasted-flocculation with lamella clarifier.

The ballasted flocculation lamella clarifier technology applies coagulant and flocculant, along with a ballast material like micro-sand, to facilitate settling of suspended solids in the lamella clarifier. The solids are separated from the liquid phase at the bottom of the clarifier, and are then pumped to a hydrocyclone, to separate and recycle the heavier micro-sand ballast to the process while discharging the lower-SG TSS slurry-stream as waste sludge.

Figure D2 is a demonstration of an ACTIFLO system provided by Veolia.

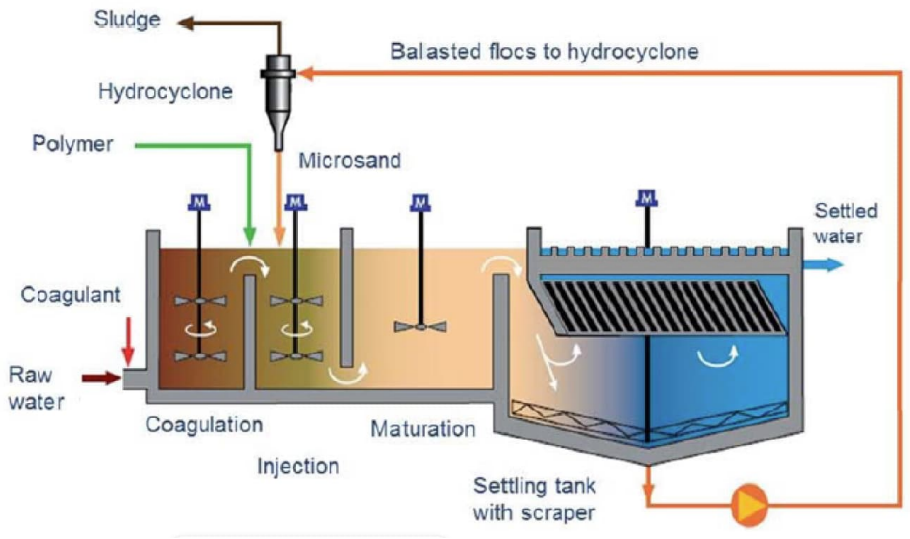

Figure D2: Demonstration of ballasted flocculation from vendor (Veolia, 2023)

Table D2: Process descriptions and pros and cons for ballasted flocculation

Process Description	Advantages	Disadvantages
Addition of a coagulant, such as FeCl3.	Use of ballast material increases the density and settling velocity of the flocculated particles, which reduces the footprint of the solid-liquid separator.	Complex process that can be more challenging to operate.
Influent enters a rapidly mixed tank to facilitate coagulation.	Available as pre-engineered/packaged units that can be less expensive and mobilized more quickly, particularly when a lamella type clarifier is used (e.g., ACTIFLO®, RapidSandTM).	Additional operating cost associated with ballast (typically proprietary micro-sand).
Addition of a flocculant and recovered ballast material, typically micro-sand, to a second rapidly mixed tank.	Works well for less dense sludges.	Additional capital cost over bare lamella clarifier option
Slow mixed tank to facilitate flocculation and the binding of suspended solids, flocculant, and ballast material.		Due to the shorter process retention times, more prone to process upsets when influent characteristics change.
Solid-liquid separator, typically a lamella type clarifier.		
Clarified water overflows the discharge weir and into collection troughs, while solids settle to the bottom to form a sludge.		
Sludge is collected from the solid-liquid separator and pumped to a hydrocyclone.		
Hydrocyclone separates the heavier ballast particles from the rest of the sludge, which are returned to the second rapidly mixed tank.		
The less dense sludge exits the hydrocyclone from the overflow and is conveyed (wasted) away for disposal.		

Note: Other types of solid-liquid separators can be used, such as a conventional clarifier.

3.0 FILTER SEPARATION

Filter separation relies on the physical capture of TSS solid particles in a fibre mesh that allows clean water to pass through. The pore size of the mesh determines the size of the maximum particle to pass through the medium. The pore size also determines clear water throughput.

3.1 Disc Filter

In a disc filter, TSS-bearing influent passes through submerged rotating discs covered in filter cloth. The solid particles are captured on the cloth surface while water passes through as clean effluent. The rotating filter cloth face is continuously scraped to remove accumulation of solid particles. However, over time fine particles will accumulate deep in the fibre, resulting in chronic high-pressure loss across the filter cloth. In this event, backwashing cycles are triggered to remove accumulated solids and maintain filtration efficiency.

Table D3: Process descriptions and pros and cons for disc filter

Process Description	Advantages	Disadvantages
Addition of a flocculant.	Low footprint process compared to conventional clarifiers (high filtration area per equipment footprint area).	Typically requires a periodic disinfection to prevent biofouling.
Influent enters the disk filter tank, where the filter cloth is mounted on a rotating face	Highly automated unit that requires minimum operator input.	Filter discs must be periodically replaced.
Influent water passes through the filter cloth	Various filter cloth types are available that can target different types of solids.	Backwash wastewater requires management.
Clarified water is collected from inside the discs to a central collection pipe.	Filter remains in operation during a backwash.	
Solids build-up is removed continuously by blade scraper. Fine particles deep in the cloth cause the pressure loss across the clothe to rise with time. The fine particles are removed by backwashing or pressure washing.	Separate backwash water tank is not required.	
	Having multiple sets of disks provides redundancy within each unit.	

3.2 Ultrafiltration

In ultrafiltration (UF), influent water is pumped through semi-permeable membranes, allowing clean permeate through while particles are retained on the membrane surface. Periodic or continuous backwashing and cleaning are performed to restore membrane performance.

Table D4: Process descriptions and pros and cons for ultrafiltration

Process Description	Advantages	Disadvantages
Influent is pumped into a tank or vessel containing semi-permeable membranes.	Typically does not require coagulation or flocculation of influent water.	A relatively expensive and energy intensive process.
A portion of the influent (permeate) passes through the membranes due to a pressure differential. The pressure differential can be achieved by pressurizing the feed side of the membrane with influent pumps, or by using a vacuum pump to on the permeate side of the membranes.	Low footprint process (high filtration area per equipment footprint area).	Requires regular and complex cleaning processes to maintain membranes, which typically involves aggressive chemicals.
Based on the membrane's pore size, particles are rejected and accumulate against the membrane, which causes the transmembrane pressure to rise.	Robust process, as effluent water quality is not dependent on influent water quality.	Membranes have to be periodically replaced.
Backwash water is used to flush away the accumulated particles. Often, air is introduced into the tank/vessel during a backwash to help dislodge particles from the membranes.	No ripening time upon start-up.	Identify breaks in the membranes can be challenging and requires testing.
Clean-in-place cycles periodically conducted to restore fouled membranes.		

Note: Membranes replaced with ceramic based microfiltration modules

4.0 CORE TECHNOLOGY SUPPLIER OPTIONS

The Tables below summarize the core technology proposals from multiple potential suppliers. Table D5 shows quotes for sedimentation processes and Table D6 shows filtration processes.

Table D5: Summary of core gravity separation technology proposals for Troilus Gold WTP

Company	Parkson	Veolia	
Options		1 X 100% of the flow: 306 m^3 /h to 1 200 m^3 /h of treated water	2 X 50% of the flow: 171 m^3 /h to 1 300 m^3 /h of treated water
Technology	Flash/floc + lamella clarifier	ACTIFLO Ballasted Flocculation	ACTIFLO Ballasted Flocculation
Flowrate (m^3/h)	1200	1200	1300
Design	Two (2) LGS 3900/55	One ACTIFLO ACP2-75	Two ACTIFLO ACP2-60
TSS treatment capacity (mg/L)	250	920	920
Redundancy	No	Yes	Yes
Backwash system	Not included	No need	No need
Chemical requirement		Ferric sulfate (coagulant), anionic polymer (polymer), microsand (media) 25kg bag need to added once or twice per week	
Cost including	- Lamella Tank - Flocculator Tanks - Settling Plates with Stiffeners - Effluent Flumes - Internal Hardware and External - Hydro/Leak Test - Holiday Test - Platform, Ladder, & Handrail by others	The ACTIFLO package plant including: - sludge extraction pumps - microsand recirculation system - lamella cleaning system - coagulant storage and dosing system - dry polymer preparation and dosing system including: - manual microsand feed system.	
Additional cost not included	Controls, Disconnects, Instrumentation, Isolation Valves, Sludge Removal system, Chem Feed System, Anchors, Pumps, Interconnecting Piping, Installation, Concrete Design		
Cost (USD)	1,380,400		
Cost (CAD)	1,822,128	1,889,100	2,495,300

Table D6: Summary of core filter separation technology proposals for Troilus Gold WTP

Company	Koch	Waste'n watertech Aqua Aerobic	
Options		Design 171818	Design 171824
Technology	Ultrafiltration	Cloth Media Filter, with sixteen (16) disks	Cloth Media Filter, with sixteen (16) disks
Flowrate (m3/h)	1666.829427	1200	1200
Design	(5) MP80/77 skids (80 pressure cartridge capacity partially loaded with 77 cartridges)	one (1) concrete AquaStorm®, Model 108	two (2) concrete AquaStorm®, Model 54
TSS treatment capacity (mg/L)	1000	Average 100, max 250	average 100, max 250
Redundancy	Yes	Not included	not included
Membrane pore size(micron)	0.03	5	5
Backwash system	Included	Included	Included
Chemical requirement	For maintenance cleans and recovery cleans NaOCl: 100 gallon/month, 12.5% concentration citric acid: 50% concentration sulfuric acid: 96% concentration citric acid and sulfuric acid combined for 1300 gallon/year		
Cost including	- Membranes - Membrane Rack - Cartridge Pass Kits - Process Manifolds - Membrane Blowers - Backflush Pump - Valves - Instrumentation - CIP System - Controls	freight to jobsite and our standard start-up supervision services	freight to jobsite and our standard start-up supervision services

Table D6: Summary of core filter separation technology proposals for Troilus Gold WTP

Company	Koch	Waste'n watertech Aqua Aerobic	
Additional cost not included	• Interconnecting piping • Feed Pump(s) • VFD(s) • Tanks for feed, permeate, concentrate (if required) • Equalization tank (if required) • Transfer pumps (if required) • Chemical storage tanks • Installation labor and materials • Operation labor and materials • Any additional items not specifically called out above Need to be indoor, construction of building not included.		
Cost (USD)	2,900,000	1,620,000	2,080,000
Cost (CAD)	3,828,000	2,138,400	2,745,600

5.0 TECHNOLOGY SCORING

The four technologies are analyzed based on 5 categories:

1) Treatment efficiency:
   - How well can the technology reduce the wastewater TSS?
     - The main indicator for treatment efficiency is the maximum inlet TSS to achieve desirable outlet water quality.
2) Reliability:
   - How long can the plant run with minimal unplanned downtime?
   - Is it a commercially tested technology?
   - Can it accommodate cold weather/ rapid condition change?
3) Complexity:
   - How many parts are in the equipment;
   - Quantity of moving part that can fail;
   - How many chemical addition is required;
   - Operator skill level needed.
4) Maintenance requirements:
   - If additional chemical is needed for maintenance;
   - How frequently should the equipment be cleaned;
   - If replacement for part is needed for the plant operation period
5) Tolerance to changing influent water quality/concentration:
   - If active operator intervention when the influent changes;
   - If increase in TSS need higher maintenance;
   - How much redundancy is included in the design.

The first 4 categories are the based on the scope of work defined by the proposal, while the 5th is added to accommodate the unknown water quality.

Each category is evaluated in a 1-5 scoring system, while 1 is the least desirable and 5 is the best options. The scoring is based on data from vendor's quote and WSP experience from previous projects. The summary of the WTP core technology evaluation and scoring is shown in Table D7.

Table D7: WTP Core Technology Evaluation and Scoring

	LAMELLA CLARIFIER		BALLASTED FLOCCULATION + LAMELLA CLARIFIER		DISC FILTERS		ULTRAFILTRATION	
Criteria	**Score (1 to 5)**	**Comments**	**Score (1 to 5)**	**Comments**	**Score (1 to 5)**	**Comments**	**Score (1 to 5)**	**Comments**
Treatment Efficiency	3	Efficient TSS removal, but sensitive to inadequate flocculation.	5	Efficient TSS removal using coagulant, flocculant, and ballast material.	5	Efficient TSS removal with various filter cloth options.	5	Robust TSS removal, independent of influent quality.
Reliability	5	Simpler operation, less maintenance for mechanical equipment. Relies on mixing and flocculation. Less reliable to finer solids.	5	Basic Lamella has no moving parts, only point of potential failure is ballast circulation - can be turned off.	5	Minimum operator input. Filter cloths must be periodically replaced. Risk of fouling. Requires backwash circuit plumbing and operating steps, complexity	3	Highly automated. UF modules must be periodically replaced. Risk of fouling. Requires backwash circuit plumbing and operating steps, complexity. Sensitive to influent TSS load.
Complexity	5	Less complex, no mechanical moving parts.	4	More complex than lamella only, but simple controls and broad operating window	4	Involves submerged filter discs, rotating equipment, and periodic backwashing but is generally simple to operate.	2	Automated but highly complex, requires skilled operators.
Maintenance Requirements	5	Basic maintance only, core equipment (lamella) has no moving parts and only requires periodic inspection and cleaning	5	Has additional maintanance requirements associated with ballast circulation	4	Backwash cycles, manage backwash wastewater add maintance requirements Periodic cleaning and cloth replacment is added maintance	2	Complex clean-in-place procedures, periodic membrane replacement.

Table D7: WTP Core Technology Evaluation and Scoring

	LAMELLA CLARIFIER		BALLASTED FLOCCULATION + LAMELLA CLARIFIER		DISC FILTERS		ULTRAFILTRATION	
Criteria	**Score (1 to 5)**	**Comments**	**Score (1 to 5)**	**Comments**	**Score (1 to 5)**	**Comments**	**Score (1 to 5)**	**Comments**
Tolerance to changing influent water quality/concentration	3	Requires active operator intervention to respond to influent changes	5	Microsand opens operating window	4	Can handle rapid changes in TSS with backwash. Limited by maximum TSS treatment range.	2	Defined pore size results in sensitivity to initial TSS loading. May require increased backwash frequency - automated with UF differential pressure. Minimal intervention required.
TOTAL SCORE	*21*		*24*		*22*		*14*	

Notes:

The total score is the sum of the scores of all the criteria.

The criteria are all weighted equally.

6.0 COST ESTIMATES

For the process technology selection analysis, the capital and operating costs are presented as guiding estimates only, to support recommendations towards or against a given technology in the analysis.

6.1 Capital Costs

Preliminary capital cost estimates (CAPEX) are calculated by the sum of direct cost and indirect cost. All costs are converted to 2023 CAD$.

Direct cost is the sum of:

- Equipment purchase cost as quoted by suppliers, estimated from WSP internal database, or scaled from a different source of data.
- Installation cost, estimated roughly as a fraction of the equipment purchase cost:
  - For equipment that comes with a packaged tank and only need to be simply connected to other equipment with no moving part (i.e. the lamella clarifier and the ballasted flocculation), the installation cost is assumed to be 0.5 times the equipment cost.
  - For equipment that come with packaged tank but with moving part (i.e., disc filter), the installation cost is assumed to be 0.85 times the equipment cost.
  - For equipment that needed to be installed on site (i.e., the ultrafiltration), installation cost is assumed to be equal to the equipment cost (i.e., factor of 1).
- Building cost and concrete cost
  - Both costs are dependent on the size of the plant needed.
  - Based on design and equipment sizing, supplier information, assumed additional ancillary equipment, and clearance area requirement, the length and width of the plant footprint can be estimated.
  - From the footprint, the foundation and building are sized.
  - The height of the building is assumed to be 10 m (for cost and heating purposes).
  - The foundation is conservatively assumed to be 1m thick concrete.
  - Building cost is calculated by the footprint of each site. Based on WSP experience, building cost is estimated as $1,960 CAD/$m^2$, including electricity, internal structure, insulation, HVAC, and storage
  - Concrete cost includes concrete for the base and for the containment wall, which is calculated as perimeter, uniform thickness and height. Concrete cost is estimated as $1500 CAD/$m^3$.
- Piping and structural costs are estimated as 10% of the total installed equipment cost.
- Electrical and instrumentation costs are estimated as 20% of the total installed equipment cost.

Indirect cost is the sum of:

- EPCM, owner, contractors, and freight. These are assumed to be 40% of the direct costs.
- Contingency, which is assumed to be 25% of the direct costs.

Total installed cost is calculated as the sum of direct costs and indirect costs.

Table D8: CAPEX for technology proposals for Troilus Gold WTP

	LAMELLA CLARIFIER	BALLASTED FLOCCULATION + LAMELLA CLARIFIER		DISC FILTERS		ULTRAFILTRATION
Company	**Parkson**	**Veolia**		**Waste'n watertech Aqua Aerobic**		**Koch**
Options	1 Unit	1 Unit	2 Units	1 Unit	2 Units	1 Unit
Equipment cost	$1,822,128	$1,889,100	$2,495,300	$2,138,400	$2,745,600	$3,828,000
Installation cost	$911,064	$944,550	$1,247,650	$1,817,640	$2,333,760	$3,828,000
Total installed equipment cost	**$2,733,200**	**$2,833,700**	**$3,743,000**	**$3,956,100**	**$5,079,400**	**$7,656,000**
footprint total site (m^2)	232	189	243	166	227	461
perimeter for site (m)	61	55	63	52	60	87
Building cost	$348,500	$282,900	$364,900	$248,500	$339,800	$691,400
concrete for base (m^3)	93	75	97	66	91	184
concrete in containment wall (m^3)	18	17	19	16	18	26
total concrete volume (m3)	111	92	116	82	109	210
Concrete cost	$166,900	$138,000	$174,500	$122,900	$163,100	$315,600
Piping and structural	$273,320	$283,370	$374,300	$395,610	$507,940	$765,600
Electrical and Instrumentation	$546,640	$566,740	$748,600	$791,220	$1,015,880	$1,531,200
Sum of direct cost	**$1,335,400**	**$1,271,100**	**$1,662,300**	**$1,558,300**	**$2,026,800**	**$3,303,800**
Indirect Costs (EPCM, Owner, Contractors, Freight)	$1,627,440	$1,641,920	$2,162,120	$2,205,760	$2,842,480	$4,383,920
Contingency	$1,146,000	$1,131,425	$1,486,175	$1,471,450	$1,902,275	$2,991,700
Sum of indirect cost	**$2,773,500**	**$2,773,400**	**$3,648,300**	**$3,677,300**	**$4,744,800**	**$7,375,700**
Total Installed Cost (TIC)	**$6,842,100**	**$6,878,200**	**$9,053,600**	**$9,191,700**	**$11,851,000**	**$18,335,500**

Note: all costs are in 2023 CAD.

6.2 Operating Costs

The operating costs (OPEX) are the sum of chemical costs, power, labour, and maintenance on an on-going basis. OPEX depends on the water quality and may subject to change with more detail of the Troilus project. However, a preliminary OPEX analysis is conducted on the given water quality to allow comparison of the four processes. Since the WTP does not operate year-round, the monthly flowrates and operating hours in Table D9 are assumed to approximate the annual volume of TSF water to the WTP.

Table D9: WTP operation phases

Phase	Hours of operation per day (h/d)	Flowrate per hour (m3/h)	Number of days	Total flow (m3)	Total hours (h)
No flow	0	0	120	0	0
Low flow	12	600	120	864000	1440
Medium flow	24	600	60	864000	1440
High flow	24	1200	60	1728000	1440
Total Annual			360	3,456,000	4320

Utility cost including energy consumption for the WTP equipment and the heating cost to maintain the building temperature.

- Equipment energy consumption is calculated based on the total annual hours of operation calculated above.
- Hourly energy consumption calculation is either based on the sum of energy consumption of major equipment provided by the vendors or scaled from similar equipment from previous WSP project.
- The unit price for energy is assumed to be 0.3 CAD/kWh.
- For building heating, assume the building needs to be heated 200 days per year; no heating is required during summer.
- The average outdoor temperature is assumed to be -15°C and the indoor temperature is required to be 10°C.
- Annual heating cost is calculated by the heating requirement, assumption of 80% HVAC efficiency, and 0.09 CAD/kWh equivalent propane price.

Chemicals used in the system include:

- Coagulant, assumed ferric sulphate. Used by both Lamella clarifier and ballasted flocculation processes;
- Polymer, used as a flocculant by both Lamella clarifier and ballasted flocculation processes;
- Microsand, a special requirement by ballasted flocculation process to enhance the solid settling;
- Sodium hydroxide and sulphuric acid, used as acid and base for pH adjustment as well as membrane clearance by ultrafiltration. They may also be required by disc filters;
- CIP chemical and antiscalant. They are required by ultrafiltration process.

The prices of chemicals are estimated from quotes from previous WSP projects. The consumption is calculated either through communication with vendors or estimated from engineering principles.

Labour cost is calculated by operator full-time-equivalent (FTE) estimation. For simpler process like the lamella clarifier and the ballasted flocculation process, assume 1 operator is required to work full time; more complicated disc filter requires 1.5 full time operators; and ultrafiltration requires 2 full time operators. The loaded hourly rate is assumed to be 150 CAD/h, including all costs to employ the operator plus overhead cost.

Maintenance cost including regular maintenance cost of the WTP which is assumed to be 2% of the equipment cost, and additional membrane replacement cost for disc filter and ultrafiltration with the frequency and price suggested by vendors.

OPEX items, units per year, and costs are shown in Table D10.

Table D10: OPEX for technology proposals for Troilus Gold WTP

Type	LAMELLA CLARIFIER	BALLASTED FLOCCULATION + LAMELLA CLARIFIER		DISC FILTERS		ULTRAFILTRATION
Options	1 Unit	1 Unit	2 Units	1 Unit	2 Units	1 Unit
Annual energy consumption (kw)	6,445	162,652	162,652	50,400	50,400	1,122,550
Annual Energy Cost for WTP	**2,000**	**48,800**	**48,800**	**15,200**	**15,200**	**336,800**
Width (ft)	50	41	61	36	49	81
Annual heating requirement (kWh)	147,708	121,120	154,975	106,350	144,754	291,930
Annual heating requirement with efficiency accounted (kWh)	184,635	151,401	193,719	132,937	180,942	364,912
Annual cost of propane for building heating	**$16,700**	**$13,700**	**$17,500**	**$12,000**	**$16,300**	**$32,900**
Coagulant	$219,510	$219,510	$219,510			
Polymer	$66,286	$66,286	$66,286			
Microsand		$40,145	$40,145			
Sodium Hydroxide						$592
CIP chemical						$14,370
Antiscalant						$33,143
Sulphuric Acid						$720
Subtotal Reagents	**$285,800**	**$326,000**	**$326,000**	**$10,000**	**$10,000**	**$48,900**
Number of Operators	1	1	1	1.5	2	2
Labour hours per year	2,080	2,080	2,080	3,120	4,160	4,160
Subtotal Labour	**$312,000**	**$312,000**	**$312,000**	**$468,000**	**$624,000**	**$624,000**
Filter replacement				$12,913	$13,215	$29,040
Maintenance Costs (2% of equipment cost, 2023 CAD$)	$36,443	$37,782	$49,906	$42,768	$54,912	$76,560
Subtotal Maintenance	**$36,500**	**$37,800**	**$50,000**	**$55,700**	**$68,200**	**$105,600**
Total Annual OPEX	**$653,000**	**$738,300**	**$754,300**	**$560,900**	**$733,700**	**$1,148,200**

Note: all costs are in 2023 CAD.

6.2.1 20 Year Life Cycle Cost

After the CAPEX and OPEX for each process is calculated, we estimated the cost for the plant in its lifetime. The WTP is assumed to last for 20 years and will generate no revenue during this time. Therefore, the life cycle cost is estimated simply as the CAPEX plus 20 times the annual OPEX, without any cashflow, inflation, or depreciation numbers.

Table D11: 20 year life cycle cost for technology proposals for Troilus Gold WTP

	LAMELLA CLARIFIER	BALLASTED FLOCCULATION LAMELLA CLARIFIER		DISC FILTERS		ULTRAFILTRATION
	Parkson	Veolia		Waste'n watertech Aqua Aerobic		Koch
Options	1 Unit	1 Unit	2 Units	1 Unit	2 Units	1 Unit
Estimated installed capital cost	$6,842,100	$6,878,200	$9,053,600	$9,191,700	$11,851,000	$18,335,500
Estimated annual operating cost	$653,000	$738,300	$754,300	$560,900	$733,700	$1,148,200
Estimated unit treatment cost (CAD/m3)	$0	$0	$0	$0	$0	$0
20-year total operating cost	$13,060,000	$14,766,000	$15,086,000	$11,218,000	$14,674,000	$22,964,000
20-year total lifecycle cost	**$19,902,100**	**$21,644,200**	**$24,139,600**	**$20,409,700**	**$26,525,000**	**$41,299,500**

Note: all costs are in 2023 CAD.

7.0 RECOMMENDATION

From the above technology selection analysis, WSP recommends that Troilus purchase and install a water treatment plant based around the ballasted-flocculation lamella clarifier core technology for removal of TSS.

ATTACHMENT E

Mass Balance

MASS BALANCE LINE LIST FOR TROILUS GOLD CORPORATION

Project	Troilus Gold Coorporation
Created by	Max Nodwell
Date	15-Nov-23

Attachement E: Mass Balance

LINE LIST					Solids			Water	Slurry				Line size	Line schedule	ID	Pipe X-area	Pipe velocity	Notes
Line #	Description	Source	Destination	Fluid	Mass (tonne/h)	SG	Volume (m^3/h)	m^3/h	Solids %w/w	SG	Mass (tonne/h)	Volume (m^3/h)	mm	SDR	mm	m2	m/s	
104	Tailings water influent	TSF	WTP inlet TI	Raw influent	0.36	2.6	0.14	1,200	0.03%	1.0	1,200	1,200	400	17	376	0.45	0.75	
301	Polymer dosing line	Polymer stock tank	Flocculation chamber in ACTIFLO unit	Viscous polymer solution	0.00024	1.00	0.00024	0.12	0.20%	1.00	0.12	0.12	15	15	14	0.00062	0.054	
302	Microsand addition line	Microsand handler	Flocculation chamber in ACTIFLO unit	Slurried microsand	0.0017	2.3	0.00072	0.0025	40%	1.3	0.0042	0.0032	15	13	14	0.00060	0.0015	
303	Coagulant addition line	Coagulant stock tanks	Coagulation chamber on ACTIFLO unit	Coagulant solution	0.012	3.1	0.0039	0.015	44%	1.4	0.027	0.015	15	13	14	0.00060	0.007	
201	Clarifier U/F line	Clarifier U/F cone	Cylone inlet	Thickened underflow sludge	7.4	2.3	3.2	29	20%	1.1	37	33	50	17	47	0.0070	1.3	
204	Clarifier O/F line	Clarifier O/F weir	Treated water tank/standpipe	Clarified effluent	0.0060	2.6	0.0023	1,199	0%	1.0	1,199	1,199	100	17	94	0.028	0.3	
202	Cyclone U/F line	Cyclone U/F port	Flocculation chamber in ACTIFLO unit	Microsand recycle to ACTIFLO	7.0	2.3	3.0	28	20%	1.1	35	31	500	17	471	0.70	0.48	
203	Cyclone O/F line (sludge waste)	Cyclone O/F port	Sludge settling pond	Thin sludge and microsand waste	0.37	2.6	0.14	1.5	20%	1.1	1.8	1.6	40	17	38	0.0045	1.934	
***	Sludge compaction in pond	Sludge settling pond inlet	Bottom of pond	Thickened sludge	0.37	2.6	0.14	0.86	30%	1.2	1.2	1.00						
***	Sludge pond decant	Sludge settling pond surface	Environment or plant recirculation	Clarified supernatant		20		0.61	0%	1.00	0.61	0.61	25	17	24	0.0017	0.160	

	Flocculant make-up	Source	Destination	Fluid	Value	Units
***	Dry flocculant	50 lb bags	Polymer make-up tank	Dry flocculant polymer	2.9	kg/batch
107	Make-up water	Treated water tank	Polymer make-up tank	Water	1.4	m^3/batch
					1.2	m^3/h fill rate
108	Floc transfer line	Make-up floc	Flocculant stock tank	Flocculant solution	1.9	m^3/h transfer rate
109	Water to microsand eductor	Treated water tank	Microsand eductor	Slurried microsand	0.0025	m^3/h transfer rate

ATTACHMENT F

P&IDs

POLYMER
PID-200 | 1
FROM POLYMER METERING PUMP

MICROSAND
PID-200 | 1
FROM MICROSAND SLURRY EDUCTOR

COAGULANT
PID-200 | 1
FROM COAGULANT METERING PUMP

DECANTED WATER
PID-200 | 1
FROM SLUDGE HOLDING POND

INFLUENT FLOW TRANSMITTER
FT 103

VFD
M
TAILINGS STORAGE FACILITY
NOT IN SCOPE

ACTIFLO UNIT AND ANCILLARIES EQ-101

COAGULATION CHAMBER AGITATOR AG-101
FLOCCULATION CHAMBER AGITATOR AG-102
MATURATION CHAMBER AGITATOR AG-103
COAGULATION CHAMBER TK-101
FLOCCULATION CHAMBER TK-102
MATURATION CHAMBER TK-103

CLARIFIER UNDERFLOW PRESSURE TRANSMITTER
PT 101
HYDROCYCLONE CY-101
CLARIFIER TANK MOTOR MT-101
CLARIFIER TK-104

TANK SCRAPER SC-101

RECIRCULATION PUMP PU-101 A/B

AIR SCOUR AC-101
AIR RECEIVER TK-106

EFFLUENT TURBIDITY ANALYZER TRANSMITTER
AT 101

EFFLUENT STORAGE TANK TK-105
LT 102
EFFLUENT STORAGE TANK LEVEL TRANSMITTER

EFFLUENT RECYCLE PUMP PU-103

WATER TREATMENT PLANT SLUDGE
PID-200 | 1
TO SLUDGE HOLDING POND

CHEMICAL MAKE-UP WATER PUMP PU-102

CLEAN WATER
PID-200 | 1
TO HEATER FOR POLYMER MAKE-UP WATER AND MICROSAND EDUCTOR

TREATED WATER DISCHARGE FLOW TRANSMITTER
FT 102

TREATED WATER DISCHARGE TO ENVIRONMENT

LEGEND

- NORMALLY OPEN VALVE
- NORMALLY CLOSED VALVE
- MOTOR
- AGITATOR
- PUMP
- TANK
- EQUIPMENT PACKAGE

NOTES

1. AT - ANALYZER TRANSMITTER
2. LT - LEVEL TRANSMITTER
3. FT - FLOW TRANSMITTER
4. VFD - VARIABLE FREQUENCY DRIVE
5. PT - PRESSURE TRANSMITTER

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CLIENT
TROILUS

CONSULTANT
wsp

VANCOUVER OFFICE
840 HOWE STREET, SUITE 1000
VANCOUVER, B.C.
V6Z 2M1, CANADA
1 604 296 4200
www.wsp.com

PROJECT
TROILUS GOLD WASTEWATER TREATMENT PLANT REPLACEMENT AND RELOCATION PROJECT

TITLE
PIPING & INSTRUMENTATION DIAGRAM MAIN TREATMENT PROCESS

PROJECT NO.	PHASE/TASK	REV.		DRAWING
2257554004	5000/50001	0	1 of 3	P-100

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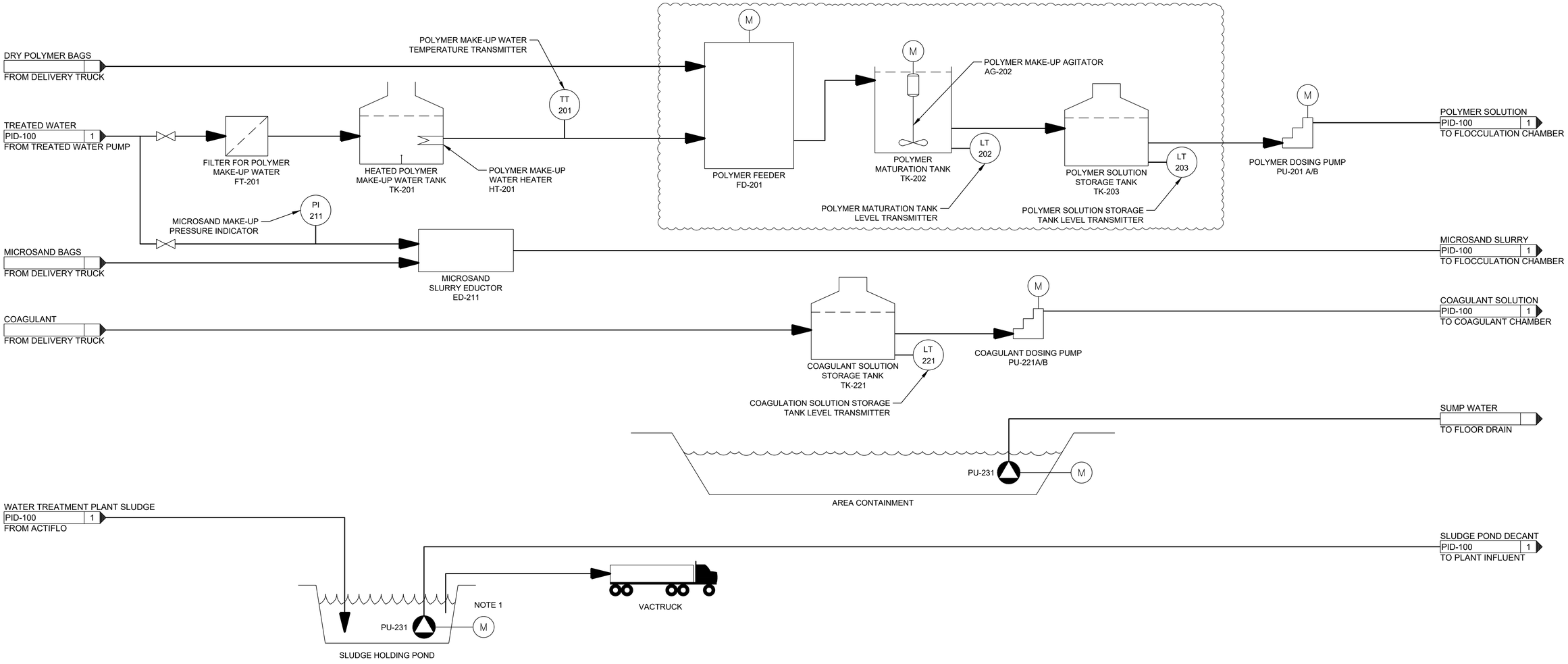

LEGEND

- NORMALLY OPEN VALVE
- NORMALLY CLOSED VALVE
- MOTOR
- AGITATOR
- METERING PUMP
- PUMP
- SUBMERSIBLE PUMP
- TANK
- EQUIPMENT PACKAGE

NOTES

1. DRY POLYMER, MICROSAND AND COAGULANT ARE INCLUDED IN THE VEOLIA VENDOR PACKAGE.
2. SLUDGE REMOVAL BY VACTRUCK FOR DISPOSAL IN TAILINGS STORAGE FACILITY.
3. LT - LEVEL TRANSMITTER
4. TT - TEMPERATURE TRANSMITTER
5. PI - PRESSURE INDICATOR

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TROILUS

CONSULTANT
wsp

VANCOUVER OFFICE
840 HOWE STREET, SUITE 1000
VANCOUVER, B.C.
V6Z 2M1, CANADA
1 604 296 4200
www.wsp.com

PROJECT
TROILUS GOLD WASTEWATER TREATMENT PLANT
REPLACEMENT AND RELOCATION PROJECT

TITLE
PIPING & INSTRUMENTATION DIAGRAM
CHEMICAL ADDITION

PROJECT NO.	PHASE/TASK	REV.		DRAWING
2257554004	5000/50001	0	2 of 3	P-200

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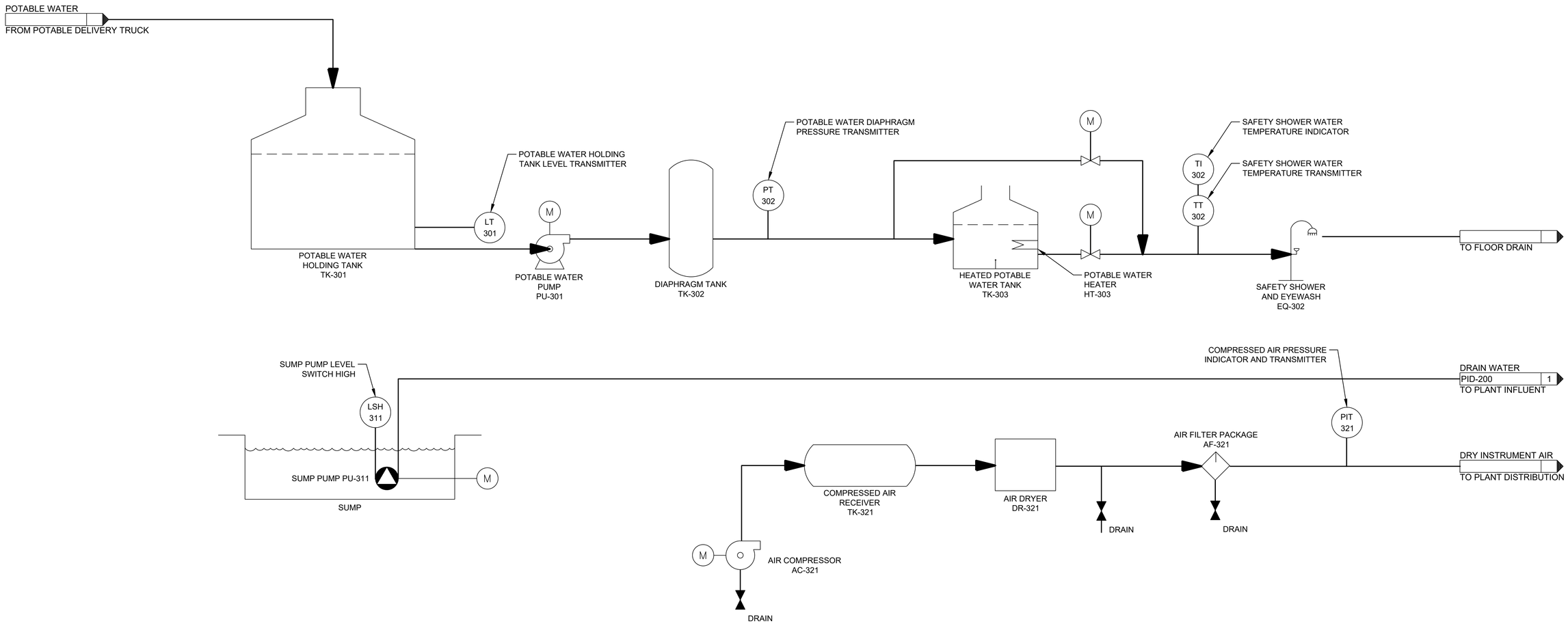

LEGEND

- NORMALLY OPEN VALVE
- NORMALLY CLOSED VALVE
- MOTOR
- TANK
- PUMP
- BLOWER
- SUBMERSIBLE PUMP
- SAFETY SHOWER AND EYEWASH

NOTES

1. PT - PRESSURE TRANSMITTER
2. LSH - LEVEL SWITCH HIGH
3. PIT - PRESSURE INDICATOR AND TRANSMITTER
4. TI - TEMPERATURE INDICATOR
5. TT - TEMPERATURE TRANSMITTER

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CLIENT

TROILUS

CONSULTANT

VANCOUVER OFFICE
840 HOWE STREET, SUITE 1000
VANCOUVER, B.C.
V6Z 2M1, CANADA
1 604 296 4200
www.wsp.com

PROJECT

TROILUS GOLD WASTEWATER TREATMENT PLANT
REPLACEMENT AND RELOCATION PROJECT

TITLE

PIPING & INSTRUMENTATION DIAGRAM
POTABLE WATER, SLUDGE AND UTILITIES

PROJECT NO.	PHASE/TASK	REV.		DRAWING
2257554004	5000/50001	0	3 of 3	P-300

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ATTACHMENT G

Equipment List

MAJOR EQUIPMENT LIST FOR TROILUS GOLD CORPRATION

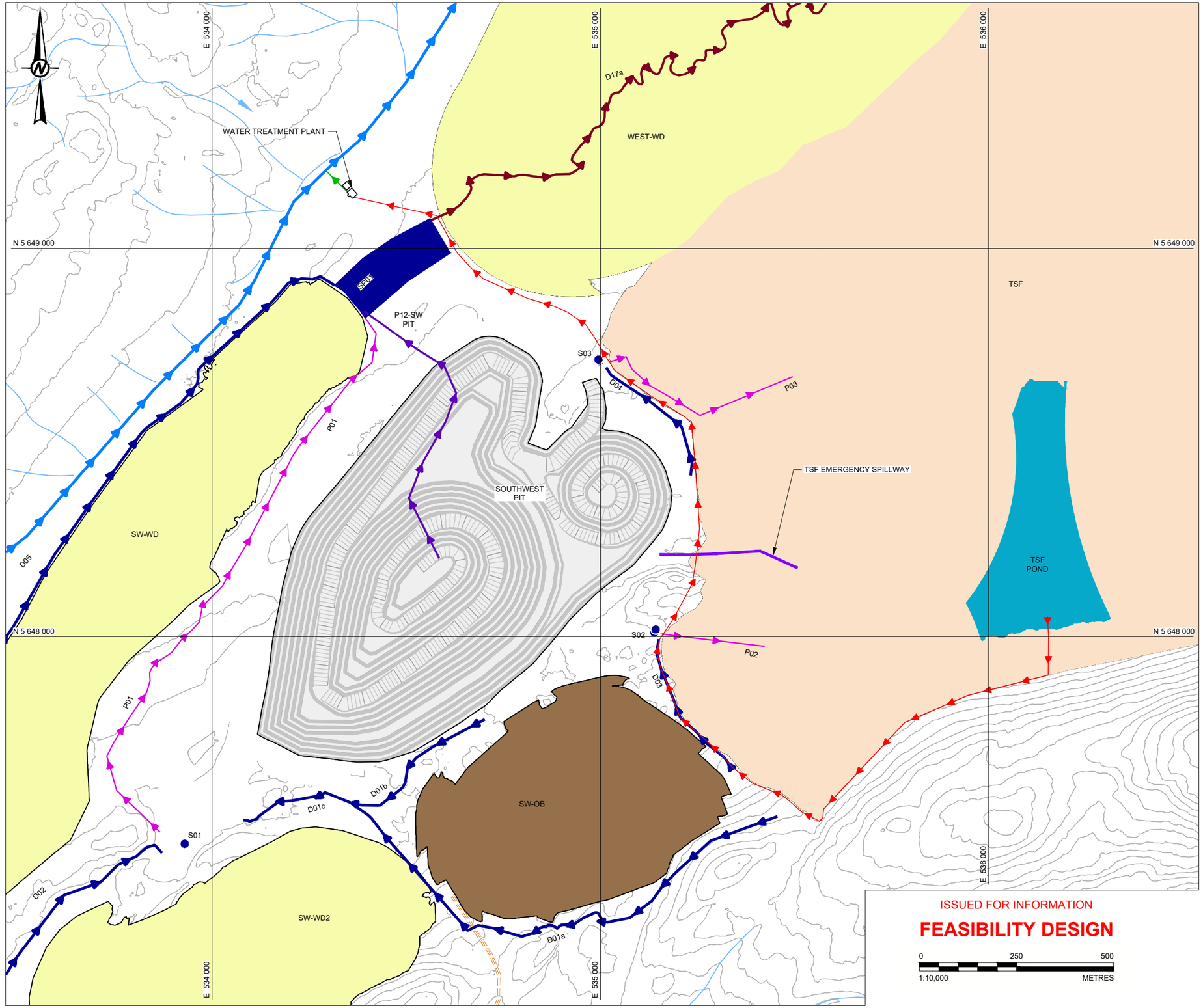
Client:	Troilus Gold Coorporation
Document No. and Name:	Water Treatment Plant
Prepared by :	Congxiao He
Verified by :	Rushmeet Kaur
Approved by :	
Date :	2023-11-15
Revision :	A - Issued for Client review

Area Name	Area	Equipment Number	Equipment Name	Quantity	Process / Condition / Fluid	Capacity (Selected)	Unit	Other Specification (notes)	Dimensions (m) (LxWxH) or (DxH)	Power Installed (kW)	Voltage (V, p, Hz)	Starter (DOL/VFD)	PFD Reference	Model	Unit Cost (CAD)	Estimated Cost (CAD)	Cost Source	Comment
Services	0	BLDG	Process Building	1	Houses all equipement, tanks, pumps, chemical handling stations,	500	m2	$650 CAD/m2 + 120K for OH crane	22m X 22m	n/a	n/	n/a			$ 650.00	$ 846,050	WSP internal database, unit costs from recent projects	
Main treatment	**100**																	
ACTIFLO system	100	EQ-101	ACTIFLO unit and ancilliaries	1	Chemical handling, mixing, dosing, water blending, solids settling, sludge re ciruclation, and solids selection	1,200	m^3/h	Per Veolia's specification	12 x 4.6 x 5.3	66	575, 3, 60	Branch service	CATR-XXXX-100	Veolia ACTIFLO Model ACP2-75	$ 1,889,100	$ 1,889,100	Veolia budget proposal CA_06_23_511783 JUNE 21, 2023, REVISION 0	Includes all of the connected items below:
ACTIFLO system	100	AG-101	Coagulation chamber agitator	1	Tailing water, coagulant								CATR-XXXX-100	-		$ -		
ACTIFLO system	100	TK-101	Coagulation chamber	1	Tailing water, coagulant								CATR-XXXX-100	-		$ -		
ACTIFLO system	100	AG-102	Flocculation chamber agitator	1	Water, coagulant, flocculant, microsand								CATR-XXXX-100	-		$ -		
ACTIFLO system	100	TK-102	Flocculation chamber	1	Water, coagulant, flocculant, microsand								CATR-XXXX-100	-		$ -		
ACTIFLO system	100	AG-103	Maturation chamber agitator	1	Water, coagulant, flocculant, microsand								CATR-XXXX-100	-		$ -		
ACTIFLO system	100	TK-103	Maturation chamber	1	Water, coagulant, flocculant, microsand								CATR-XXXX-100	-		$ -		
ACTIFLO system	100	SC-101	Tank scraper	1	Water, coagulant, flocculant, microsand								CATR-XXXX-100	-		$ -		
ACTIFLO system	100	MT-101	Clarifier tank motor	1	Water, coagulant, flocculant, microsand								CATR-XXXX-100	-		$ -		
ACTIFLO system	100	TK-104	Clarifier	1	Water, coagulant, flocculant, microsand								CATR-XXXX-100	-		$ -		
ACTIFLO system	100	CY-101	Hydrocyclone	1	Per Veolia design								CATR-XXXX-100			$ -		
ACTIFLO system	100	PU-101 A/B	Recirculation pump	2	Water, coagulant, flocculant, microsand								CATR-XXXX-100	-		$ -		
ACTIFLO system	100	AC-101	Air scour air compressor	1	Lamella clarifier cleaning								CATR-XXXX-100	-		$ -		-
ACTIFLO system	100	TK-106	Air reciever	1	Air								CATR-XXXX-100					
Effluent handling	100	TK-105	Effluent storage tank	1	Treated water	11	m^3	Prefabricated HDPE tank	2.3 x 3.4				CATR-XXXX-100	CT-2455-R1	$ 4,713	$ 4,713	ACO Container Systems 2023	-
Effluent handling	100	PU-102	Chemical make-up water pump	1	Treated water	5	m^3/h	Low flow for chemical make-up		0.25	120, 1, 60	DOL	CATR-XXXX-100	GGM2ZWN9	$ 443	$ 443	Grainger.ca	Centrifugal pump
Effluent handling	100	PU-103	Effluent recycle pump	1	Treated water	10	m^3/h	Recirculating back to plant, low head, high volume	-	0.37	120, 1, 60	VFD	CATR-XXXX-100	WWG1N542	$ 1,876	$ 1,876	Grainger.ca	Centrifugal pump
Chemical preparation and sludge treatment	**200**																	
Polymer preparation	200	FT-201	Filter for polymer make-up water	1	Treated water								CATR-XXXX-200		$ 4,713	$ 4,713	Estimate only	Not in current Veolia scope, to be quoted. Indicated cost is placeholder estimate
Polymer preparation	200	TK-201	Heated polymer make-up water tank	1	Treated water								CATR-XXXX-200			$ -		
Polymer preparation	200	HT-201	Heater for polymer make-up water	1	Treated water								CATR-XXXX-200		$ 4,714	$ 4,714	Estimate only	Not in current Veolia scope, to be quoted. Indicated cost is placeholder estimate
Polymer preparation	200	FD-201	Polymer feeder	1	High viscosity polymer-in-solution								CATR-XXXX-200			$ -		
Polymer preparation	200	TK-202	Polymer maturation tank	1	High viscosity polymer-in-solution								CATR-XXXX-200	HP2000L		$ -		-
Polymer preparation	200	AG-202	Polymer make-up agitator	1	Water, coagulant, flocculant, microsand							-	CATR-XXXX-200	-		$ -		-
Polymer preparation	200	TK-203	Polymer solution storage tank	1	High viscosity polymer-in-solution								CATR-XXXX-200	HP2000L		$ -		-
Polymer preparation	200	PU-201 A/B	Polymer dosing pump	2	High viscosity polymer-in-solution								CATR-XXXX-200	-		$ -		-
Microsand preparation	200	ED-211	Microsand slurry eductor	1	Microsand				0.68 x 0.75 x 1.6				CATR-XXXX-200	HydraSand Mini		$ -		-
Coagulant preparation	200	TK-221	Coagulant solution storage tank	1	Ferric sulphate	60	m^3						CATR-XXXX-200			$ -		
Coagulant preparation	200	PU-221 A/B	Coagulant dosing pump	2	Ferric sulphate								CATR-XXXX-200	-		$ -		-
Sludge	200	PU-231	Sludge pump	1	Sludge								CATR-XXXX-200			$ -		
Safety, sump, and utility	**300**																	
Safety	300	TK-301	Potable water holding tank	1	Potable water	11	m^3		2.3 x 3.4				CATR-XXXX-300	CT-2455-R1	$ 4,713	$ 4,713	ACO Container Systems 2023	
Safety	300	PU-301	Potable water pump	1	Potable water	16	m^3/h	16 m^3/h @ 5 m TDH		0.37	120, 1, 60	DOL	CATR-XXXX-300	WWG1N502	$ 1,897	$ 1,897	Grainger.ca	Centrifugal pump
Safety	300	TK-302	Diaphragm Tank	2	Potable water	5.0	m^3	hold pressure for 10 minutes of shower use					CATR-XXXX-300		$ 2,800	$ 5,600	Estimate only	
Safety	300	HT-303	Potable water heater	1	Potable water					0.013	110, 1, 60	DOL	CATR-XXXX-300	Rheem medium duty commercial water heater Model # 562094				
Safety	300	TK-303	Heated potable water tank	1	Potable water	375	L	24 kW natural gas	0.75 X 1.8				CATR-XXXX-300	Rheem medium duty commercial water heater Model # 562094	$ 4,050	$ 4,050	Home Depot.ca	Assume can find similar unit, similar cost with propane connection
Safety	300	EQ-302	Safety shower and eyewash	3	Potable water	6.0	m^3/h	Flow rate is per shower 1.25" NMPT inlet pipe	2.4 x 0.66	-		-	CATR-XXXX-300	Bradley Combi eyewash shower with SS eyewash bowl head	$ 1,571	$ 4,713	Grainger.ca	Budget eye-wash shower
Sump	300	PU-311	Sump pump	1	Water with solids up to 1/4" diameter	1.0	kW	Stock sump pump with specs 25.9 m^3/h @ 6.1 m TDH	0.51 x 0.33 x 0.28	1.0	230, 1, 60	DOL	CATR-XXXX-300	Dayton Plug-in Utility Pump, 1-1/4 HP 240VAC Item# WWG4LA44 approximately 40lbs weight 2" discharge line c/w 50ft cord w/o float switch (include in instrument list)	$ 4,359	$ 4,359	Grainger.ca	Large sump pump
Utility	300	AC-321	Air compressor	1	Location 51°N, 74°28'W, subarctic seasonal conditions, installed in industrial building.	20	CFM	115 PSIG	0.61 x 0.64 x 0.97	3.8	575, 3, 60	DOL	CATR-XXXX-300	Atlas Copco model 8152103716 G4FF TM Air Compressor 5 hp air-cooled, oil-injected rotary screw compressor with integrated refrigerant dryer providing pressure dew point of +5°C at reference conditions Built on 60 gallon air vessel.	$ 6,420	$ 6,420	Atlas Copco July 2021	-
Utility	300	TK-321	Compressed air receiver	1	Air	60	gal	Integrated to AC unit	-			-	CATR-XXXX-300	-		$ -	With AC	-
Utility	300	DR-321	Air dryer	1	Air	5.0	°C dewpoint	Integrated to AC unit	-			-	CATR-XXXX-300	-		$ -	With AC	-
Utility	300	AF-321	Air filter package	1	Air								CATR-XXXX-300			$ -		
Total									**Nominal connected load**	**71**	**kW**				**Total equipment purchase cost**	**$ 48,212**		

Note: - = to be determined.
All costs are in $CAD.

ATTACHMENT H

General Arrangement Drawings and Site Plan



WATER MANAGEMENT

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- DIVERSION CHANNEL (NON-CONTACT WATER)
- D## — CONTACT WATER DITCH
- D## — DRAINAGE THROUGH WASTE ROCK
- PIT DEWATERING
- P## — CONTACT WATER PIPELINE (PUMPING)
- FLOW DIRECTION
- NATURAL WATERCOURSES
- APPROXIMATE WTP INFLUENT 500 mm Ø HDPE DR17 PIPELINE
- APPROXIMATE WTP EFFLUENT 600 mm Ø HDPE DR17 PIPELINE
- TSF POND
- SP## — SEDIMENT POND
- S## — SUMPS / PUMP STATION

MINE INFRASTRUCTURE

- WATER CONTAINMENT BERM
- EMERGENCY SPILLWAYS
- OVERBURDEN PILE
- WASTE DUMP
- MINE PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- EXISTING ROADS (2023)
- FUTURE ROAD

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, MAY 9, 2023.
3. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25 2022.
4. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. THE DRAWING IS A SCHEMATIC REPRESENTATION OF THE END-OF-MINE-LIFE SURFACE WATER MANAGEMENT PLAN.

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ISSUED FOR INFORMATION

FEASIBILITY DESIGN

0 250 500
1:10,000 METRES

CLIENT

TROILUS

PROJECT

TROILUS GOLD WASTEWATER TREATMENT PLANT REPLACEMENT AND RELOCATION PROJECT

TITLE

WASTEWATER TREATMENT PLANT SITE PLAN

CONSULTANT

wsp

YYYY-MM-DD	2024-04-29
DESIGNED	CH
PREPARED	RM
REVIEWED	PP
APPROVED	VR

PROJECT NO.	PHASE/TASK	REV.	DRAWING
2257554004	5000/50001	0	1

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25 mm

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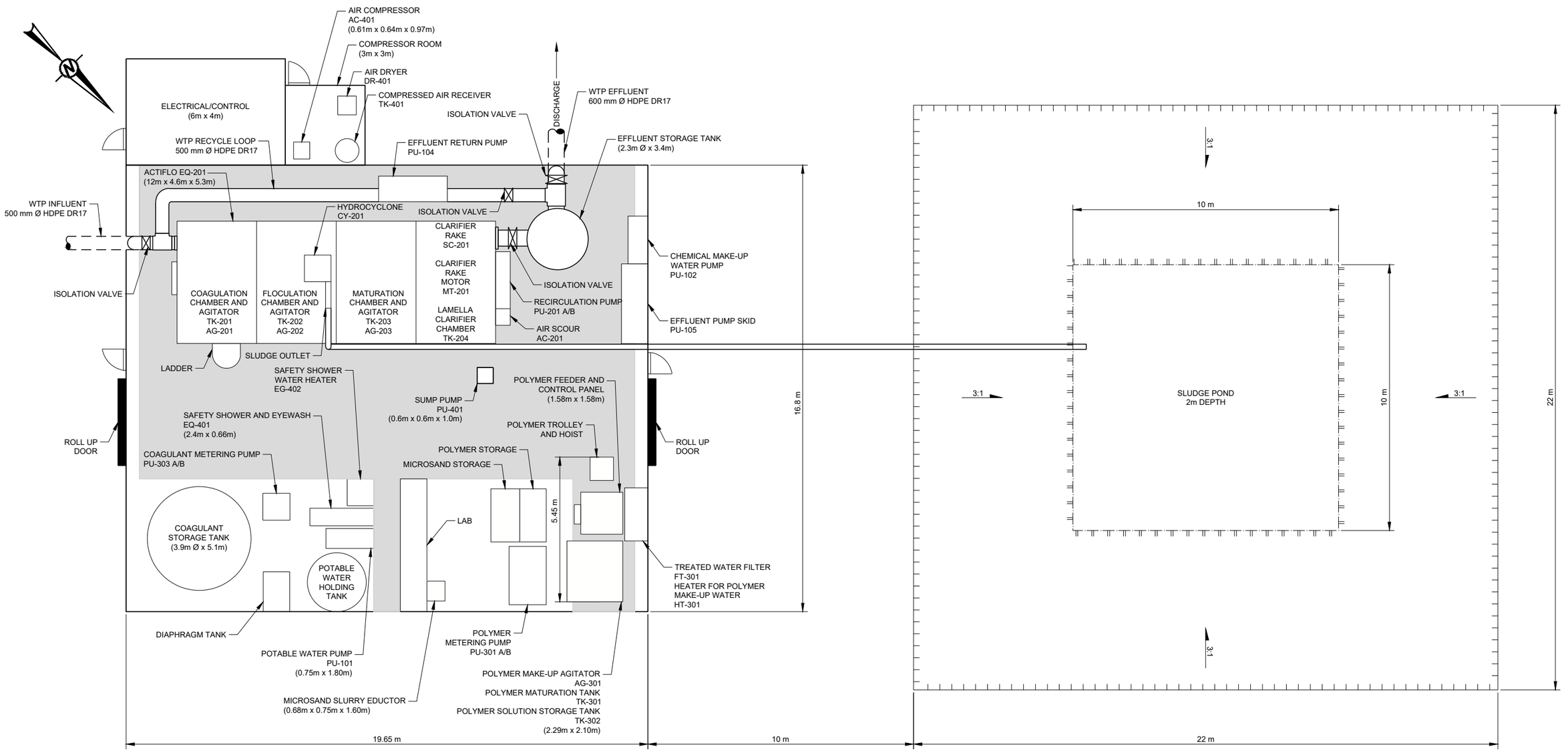

LEGEND

- CLEARANCE AREA
- UNDERGROUND EQUIPMENT
- UNDERGROUND PIPING
- CREST OF SLOPE
- TOE OF SLOPE
- PERSONNEL DOOR

NOTE(S)

1. ALL UNITS IN METRES UNLESS OTHERWISE NOTED.
2. PRECISE LOCATION OF WASTEWATER TREATMENT EQUIPMENT MAY CHANGE.

ISSUED FOR INFORMATION

FEASIBILITY DESIGN

0 2.5 5

1:150 METRES

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CLIENT

TROILUS

PROJECT

TROILUS GOLD WASTEWATER TREATMENT PLANT
REPLACEMENT AND RELOCATION PROJECT

TITLE

WASTEWATER TREATMENT PLANT LAYOUT

CONSULTANT

wsp

YYYY-MM-DD	2024-04-29
DESIGNED	CH
PREPARED	RM
REVIEWED	PP
APPROVED	VR

PROJECT NO.	PHASE/TASK	REV.	DRAWING
2257554004	5000/50001	0	2

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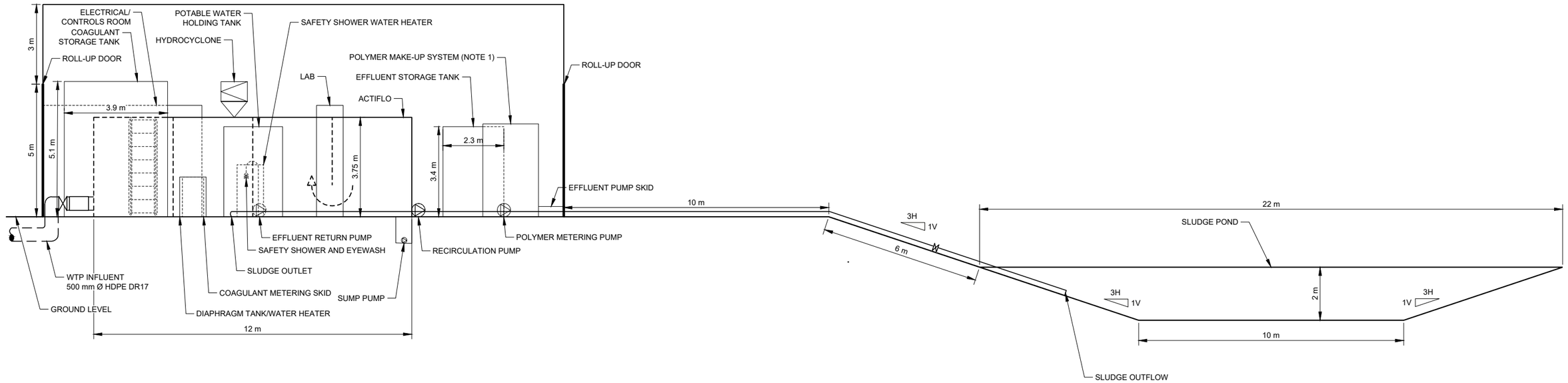

LEGEND

- UNDERGROUND PIPING
- EQUIPMENT - HIDDEN
- ACTIFLO - HIDDEN
- ISOLATION VALVE

NOTE(S)

1. POLYMER MAKEUP SYSTEM INCLUDES:
   - POLYMER MATURATION TANK
   - POLYMER SOLUTION TANK
   - POLYMER FEEDER
2. MINOR COMPONENTS NOT SHOW IN SECTION LAYOUT:
   - AIR SCOUR
   - MICROSAND STORAGE
   - COMPRESSOR ROOM
   - HEATER FOR POLYMER MAKEUP WATER
   - POLYMER TROLLEY AND HOIST
   - POLYMER STORAGE TANK

ISSUED FOR INFORMATION

FEASIBILITY DESIGN

0 2.5 5

1:150 METRES

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CLIENT

TROILUS

PROJECT

TROILUS GOLD WASTEWATER TREATMENT PLANT
REPLACEMENT AND RELOCATION PROJECT

TITLE

WASTEWATER TREATMENT PLANT SECTION

CONSULTANT

wsp

YYYY-MM-DD	2024-04-29
DESIGNED	CH
PREPARED	RM
REVIEWED	PP
APPROVED	VR

PROJECT NO.	PHASE/TASK	REV.	DRAWING
2257554004	5000/50001	0	3

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ATTACHMENT I

MTO and CAPEX

Attachement I: Detailed material take-off (MTO) list and unit costs

/ATER TREATMENT PLANT MATERIAL TAKE OFF DETAIL ESTIMA

Item #	Discipline	Item	Description	Qty	Unit	Labour Cost -	Labour	Labour	Labour	Labour Total Cost	Material	Material	Equipment	Equipment	Direct Unit Cost	Direct	Direct Contigency	Direct Contigency	Indirect	Indirect Cost	Indirect	Indirect	Total Unit Cost	Total Cost
1	Civil and	Pad - 22 m x 22 m	Overburden	581	M3	$ -	0.05	29	$ 150	$ 4,356	$ 20	$ 11,616	$ -	$ -	$ 28	$ 15,972	20%	$ 3,194	0%	$ -	0%	$ -	$ 33	$ 19,166
2	Civil and	Pad - 22 m x 22 m	Crush & screen - 0-	484	M3	$ -	0.05	24	$ 150	$ 3,630	$ 11	$ 5,082	$ -	$ -	$ 18	$ 8,712	20%	$ 1,742	0%	$ -	0%	$ -	$ 22	$ 10,454
3	Civil and	Pad - 22 m x 22 m	Crush & screen - 0-	97	M3	$ -	0.05	5	$ 150	$ 726	$ 13	$ 1,220	$ -	$ -	$ 20	$ 1,946	20%	$ 389	0%	$ -	0%	$ -	$ 24	$ 2,335
4	Civil and	Pad - 22 m x 22 m	Excavation hauling	581	M3	$ -	0.10	58	$ 150	$ 8,712	$ 5	$ 2,904	$ -	$ -	$ 20	$ 11,616	20%	$ 2,323	0%	$ -	0%	$ -	$ 24	$ 13,939
5	Civil and	Pad - 22 m x 22 m	Granular fill - 0-	484	M3	$ -	0.10	48	$ 150	$ 7,260	$ 12	$ 5,808	$ -	$ -	$ 27	$ 13,068	20%	$ 2,614	0%	$ -	0%	$ -	$ 32	$ 15,682
6	Civil and	Pad - 22 m x 22 m	Granular fill - 0-	97	M3	$ -	0.10	10	$ 150	$ 1,452	$ 13	$ 1,210	$ -	$ -	$ 28	$ 2,662	20%	$ 532	0%	$ -	0%	$ -	$ 33	$ 3,194
7	Civil and	Piling	Drilled ø324mm x		EA	$ -	10.00	-	$ 150	$ -	$ 1,000	$ -	$ -	$ -	$ -	$ -	20%	$ -	0%	$ -	0%	$ -	$ -	$ -
8	Civil and	Labour	Civil and	1	EA	$ 26,136	-	-	$ -	$ 26,136		$ -	$ -	$ -	$ 26,136	$ 26,136	20%	$ 5,227	0%	$ -	0%	$ -	$ 31,363	$ 31,363
Subtotal																**$ 80,112**		**$ 16,022**		**$ -**		**$ -**		**$ 96,134**
9	Concrete	Concrete	Concrete	164	M3	$ -	5.00	818	$ 150	$ 122,663	$ 400	$ 65,420	$ -	$ -	$ 1,150	$ 188,083	20%	$ 37,617	0%	$ -	0%	$ -	$ 1,380	$ 225,699
10	Concrete	Footing	Concrete - footing	51	M3	$ -	1.00	51	$ 150	$ 7,613	$ 250	$ 12,688	$ -	$ -	$ 400	$ 20,300	20%	$ 4,060	0%	$ -	0%	$ -	$ 480	$ 24,360
11	Concrete	Slab	Concrete - slab	71	M3	$ -	2.00	143	$ 150	$ 21,420	$ 250	$ 17,850	$ -	$ -	$ 550	$ 39,270	20%	$ 7,854	0%	$ -	0%	$ -	$ 660	$ 47,124
12	Concrete	Pedestal	Concrete -	41	M3	$ -	2.00	83	$ 150	$ 12,420	$ 250	$ 10,350	$ -	$ -	$ 550	$ 22,770	20%	$ 4,554	0%	$ -	0%	$ -	$ 660	$ 27,324
13	Concrete	Labour	Concrete -	1	LOT	$ 16,412	-	-	$ -	$ 16,412		$ -	$ -	$ -	$ 16,412	$ 16,412	20%	$ 3,282	0%	$ -	0%	$ -	$ 19,694	$ 19,694
Subtotal																**$ 286,834**		**$ 57,367**		**$ -**		**$ -**		**$ 344,201**
14	Building and	Pre-fab building	Pre-fab building	1	LOT	$ 338,420	-	-		$ 338,420	$ 846,050	$ 846,050	$ -	$ -	$ 1,184,470	$ 1,184,470	20%	$ 236,894	0%	$ -	0%	$ -	$ 1,421,364	$ 1,421,364
15	Equipment and	Process	Water treatment	1	LOT	$ -	1,000	1,000	$ 150	$ 150,000			$ 1,889,100	$ 1,889,100	$ 2,039,100	$ 2,039,100	5.0%	$ 101,955	0%	$ -	0%	$ -	$ 2,141,055	$ 2,141,055
16	Equipment and	Process	Water treatment	1	EA	$ -	1,500	1,500	$ 150	$ 225,000	$ -	$ -	$ 42,612	$ 42,612	$ 267,612	$ 267,612	20%	$ 53,522	0%	$ -	0%	$ -	$ 321,134	$ 321,134
Subtotal																**$ 2,306,712**		**$ 155,477**		**$ -**		**$ -**	**$ 2,462,189**	**$ 2,462,189**
17	Piping	Water return line	400mm HDPE	30	M	$ -	3.00	90	$ 150	$ 13,500	$ 150	$ 4,500	$ -	$ -	$ 600	$ 18,000	20%	$ 3,600	0%	$ -	0%	$ -	$ 720	$ 21,600
18	Piping	Water return	8" Steel I-beam	30	M	$ -	3.00	90	$ 150	$ 13,500	$ 150	$ 4,500	$ -	$ -	$ 600	$ 18,000	20%	$ 3,600	0%	$ -	0%	$ -	$ 720	$ 21,600
19	Piping	Polymer dosing line	1" Braided PP hose	80	M	$ -	0.50	40	$ 150	$ 6,000	$ 20	$ 1,600	$ -	$ -	$ 95	$ 7,600	20%	$ 1,520	0%	$ -	0%	$ -	$ 114	$ 9,120
20	Piping	Microsand addition	1" Braided PP hose	30	M	$ -	0.50	15	$ 150	$ 2,250	$ 20	$ 600	$ -	$ -	$ 95	$ 2,850	20%	$ 570	0%	$ -	0%	$ -	$ 114	$ 3,420
21	Piping	Coagulant addition	1" Braided PP hose	30	M	$ -	0.50	15	$ 150	$ 2,250	$ 20	$ 600	$ -	$ -	$ 95	$ 2,850	20%	$ 570	0%	$ -	0%	$ -	$ 114	$ 3,420
22	Piping	Clarifier U/F line	400mm HDPE	Veolia Scope													20%	$ -	0%	$ -	0%	$ -	$ -	$ -
23	Piping	Clarifier O/F line	500mm HDPE	Veolia Scope													20%	$ -	0%	$ -	0%	$ -	$ -	$ -
24	Piping	Cyclone U/F line	200mm HDPE	Veolia Scope													20%	$ -	0%	$ -	0%	$ -	$ -	$ -
25	Piping	Cyclone O/F line	50mm HDPE	50	M	$ -	1.50	75	$ 150	$ 11,250	$ 142	$ 7,100	$ 1	$ 50	$ 368	$ 18,400	20%	$ 3,680	0%	$ -	0%	$ -	$ 442	$ 22,080
26	Piping	Polymer make-up	1" Braided PP hose	30	M	$ -	1.00	30	$ 150	$ 4,500	$ 143	$ 4,290	$ 2	$ 60	$ 295	$ 8,850	20%	$ 1,770	0%	$ -	0%	$ -	$ 354	$ 10,620
27	Piping	Shower water	1.5" Black steel	20	M	$ -	2.50	50	$ 150	$ 7,500	$ 144	$ 2,880	$ 3	$ 60	$ 522	$ 10,440	20%	$ 2,088	0%	$ -	0%	$ -	$ 626	$ 12,528
28	Piping	Compressed air	1.5" Black steel	60	M	$ -	2.50	150	$ 150	$ 22,500	$ 145	$ 8,700	$ 4	$ 240	$ 524	$ 31,440	20%	$ 6,288	0%	$ -	0%	$ -	$ 629	$ 37,728
29	Piping	Valves	400 mm HDPE	4	EA	$ -	4.00	16	$ 150	$ 2,400	$ 2,683	$ 10,734	$ -	$ -	$ 3,283	$ 13,134	20%	$ 2,627	0%	$ -	0%	$ -	$ 3,940	$ 15,760
30	Piping	Valves	50 mm HDPE	4	EA	$ -	1.50	6	$ 150	$ 900	$ 12,696	$ 50,783	$ -	$ -	$ 12,921	$ 51,683	20%	$ 10,337	0%	$ -	0%	$ -	$ 15,505	$ 62,020
31	Piping	Valves	50 mm FCV	1	EA	$ -	1.50	2	$ 150	$ 225	$ 8,656	$ 8,656	$ -	$ -	$ 8,881	$ 8,881	20%	$ 1,776	0%	$ -	0%	$ -	$ 10,657	$ 10,657
32	Piping	Valves	50 mm Check	1	EA	$ -	1.50	2	$ 150	$ 225	$ 1,731	$ 1,731	$ -	$ -	$ 1,956	$ 1,956	20%	$ 391	0%	$ -	0%	$ -	$ 2,347	$ 2,347
33	Piping	Valves	25 mm FCV	1	EA	$ -	1.50	2	$ 150	$ 225	$ 6,925	$ 6,925	$ -	$ -	$ 7,150	$ 7,150	20%	$ 1,430	0%	$ -	0%	$ -	$ 8,580	$ 8,580
34	Piping	Valves	25 mm Check valve	1	EA	$ -	1.50	2	$ 150	$ 225	$ 6,926	$ 6,926	$ -	$ -	$ 7,151	$ 7,151	20%	$ 1,430	0%	$ -	0%	$ -	$ 8,581	$ 8,581
35	Piping	Hardware	Hardware budget	1	LOT	$ -	-	-	$ -	$ -	$ 42,878	$ 42,878	$ -	$ -	$ 42,878	$ 42,878	20%	$ 8,576	0%	$ -	0%	$ -	$ 51,453	$ 51,453
36	Piping	Labour	Piping -	1	LOT	$ 87,450	-	-	$ -	$ 87,450		$ -	$ -	$ -	$ 87,450	$ 87,450	20%	$ 17,490	0%	$ -	0%	$ -	$ 104,940	$ 104,940
Subtotal																**$ 338,713**		**$ 67,743**		**$ -**		**$ -**		**$ 406,455**
37	Power and	Cable	CABLE - 15 KV -	1	LOT	$ -	20.00	20	$ 150	$ 3,000	$ 75,000	$ 75,000	$ -	$ -	$ 78,000	$ 78,000	20%	$ 15,600	0%	$ -	0%	$ -	$ 93,600	$ 93,600
38	Power and	Transformer	13.8kV/600V	1	LOT	$ -	16.00	16	$ 150	$ 2,400	$ 70,000	$ 70,000		$ -	$ 72,400	$ 72,400	20%	$ 14,480	0%	$ -	0%	$ -	$ 86,880	$ 86,880
39	Power and	MCC	MCC, cabinets,	1	LOT	$ -	30.00	30	$ 150	$ 4,500	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 104,500	$ 104,500	20%	$ 20,900	0%	$ -	0%	$ -	$ 125,400	$ 125,400
40	Power and	Components	Circuit breaker - 75		EA	$ -	10.00	-	$ 150	$ -	$ 12,000	$ -	$ 5,000	$ -	$ -	$ -	20%	$ -	0%	$ -	0%	$ -	$ -	$ -
41	Power and	Components	VFD 5 kW for water		EA	$ -	5.00	-	$ 150	$ -	$ 5,000	$ -	$ 5,000	$ -	$ -	$ -	20%	$ -	0%	$ -	0%	$ -	$ -	$ -
42	Power and	Components	VFD - 2 kW pump		EA	$ -	5.00	-	$ 150	$ -	$ 2,000	$ -	$ 5,000	$ -	$ -	$ -	20%	$ -	0%	$ -	0%	$ -	$ -	$ -
43	Power and	Components	VFD - 1 kW for		EA	$ -	4.00	-	$ 150	$ -	$ 2,000	$ -	$ -	$ -	$ -	$ -	20%	$ -	0%	$ -	0%	$ -	$ -	$ -
44	Power and	Components	Contact starter - 2		EA	$ -	4.00	-	$ 150	$ -	$ 250	$ -	$ -	$ -	$ -	$ -	20%	$ -	0%	$ -	0%	$ -	$ -	$ -
45	Power and	Components	Contact starter - 10		EA	$ -	4.00	-	$ 150	$ -	$ 250	$ -	$ -	$ -	$ -	$ -	20%	$ -	0%	$ -	0%	$ -	$ -	$ -
46	Power and	Cable	18AWG twisted	200	M	$ -	0.25	50	$ 150	$ 7,500	$ 4	$ 800	$ -	$ -	$ 42	$ 8,300	20%	$ 1,660	0%	$ -	0%	$ -	$ 50	$ 9,960
47	Power and	Cable	#14 AWG 5C	200	M	$ -	0.25	50	$ 151	$ 7,550	$ 5	$ 1,000	$ 1	$ 200	$ 44	$ 8,750	120%	$ 10,500	100%	$ 8,750	100%	$ 8,750	$ 184	$ 36,750
48	Power and	Cable	#12 AWG 3C	200	M	$ -	0.25	50	$ 150	$ 7,500	$ 7	$ 1,300	$ -	$ -	$ 44	$ 8,800	20%	$ 1,760	0%	$ -	0%	$ -	$ 53	$ 10,560
49	Power and	Cable	#8 AWG 3C	100	M	$ -	0.50	50	$ 150	$ 7,500	$ 8	$ 800	$ -	$ -	$ 83	$ 8,300	20%	$ 1,660	0%	$ -	0%	$ -	$ 100	$ 9,960
50	Power and	Cable	#4 AWG 3C	20	M	$ -	0.75	15	$ 150	$ 2,250	$ 9	$ 180	$ -	$ -	$ 122	$ 2,430	20%	$ 486	0%	$ -	0%	$ -	$ 146	$ 2,916
51	Power and	Cable	#4 AWG bare	30	M	$ -	0.50	15	$ 150	$ 2,250	$ 10	$ 300	$ -	$ -	$ 85	$ 2,550	20%	$ 510	0%	$ -	0%	$ -	$ 102	$ 3,060
52	Power and	Hardware	Electrical tray - 24"	50	M	$ -	1.00	50	$ 150	$ 7,500	$ 200	$ 10,000	$ -	$ -	$ 350	$ 17,500	20%	$ 3,500	0%	$ -	0%	$ -	$ 420	$ 21,000
53	Power and	Hardware	General hardware -	1	LOT	$ -	-	-	$ -	$ -	$ 20,938	$ 20,938	$ -	$ -	$ 20,938	$ 20,938	20%	$ 4,188	0%	$ -	0%	$ -	$ 25,126	$ 25,126
54	Power and	Labour	Electrical -	1	LOT	$ 5,195	-	-	$ -	$ 5,195	$ -	$ -	$ -	$ -	$ 5,195	$ 5,195	20%	$ 1,039	0%	$ -	0%	$ -	$ 6,234	$ 6,234
Subtotal																**$ 337,663**		**$ 76,283**		**$ -**		**$ -**		**$ 431,446**
55	Instrumentation	PLC	PLC and cards -	1	LOT	$ -	400.00	400	$ 150	$ 60,000	$ 100,000	$ 100,000	$ 46,166	$ 46,166	$ 206,166	$ 206,166	20%	$ 41,233	0%	$ -	0%	$ -	$ 247,400	$ 247,400
56	Instrumentation	Instrument	200 mm diameter	2	EA	$ -	8.00	16	$ 150	$ 2,400	$ 10,000	$ 20,000	$ 5,771	$ 11,542	$ 16,971	$ 33,942	20%	$ 6,788	0%	$ -	0%	$ -	$ 20,365	$ 40,730
57	Instrumentation	Instrument	Level sensors	5	EA	$ -	4.00	20	$ 150	$ 3,000	$ 4,000	$ 20,000	$ 4,617	$ 23,083	$ 9,217	$ 46,083	20%	$ 9,217	0%	$ -	0%	$ -	$ 11,060	$ 55,300
58	Instrumentation	Instrument	Pressure sensors	2	EA	$ -	4.00	8	$ 150	$ 1,200	$ 4,000	$ 8,000	$ 4,617	$ 9,233	$ 9,217	$ 18,433	20%	$ 3,687	0%	$ -	0%	$ -	$ 11,060	$ 22,120
59	Instrumentation	Instrument	Turbidity sensors	2	EA	$ -	4.00	8	$ 150	$ 1,200	$ 6,000	$ 12,000	$ 2,020	$ 4,040	$ 8,620	$ 17,240	20%	$ 3,448	0%	$ -	0%	$ -	$ 10,344	$ 20,687
60	Instrumentation	Instrument	pH probes and	2	EA	$ -	4.00	8	$ 150	$ 1,200	$ 10,000	$ 20,000	$ 1,000	$ 2,000	$ 11,600	$ 23,200	20%	$ 4,640	0%	$ -	0%	$ -	$ 13,920	$ 27,840
61	Instrumentation	Instrument	Temperature	2	EA	$ -	1.00	2	$ 150	$ 300	$ 300	$ 600	$ 1,800	$ 3,600	$ 2,250	$ 4,500	20%	$ 900	0%	$ -	0%	$ -	$ 2,700	$ 5,400
62	Instrumentation	Instrument	Lead cell	2	EA	$ -	8.00	16	$ 150	$ 2,400	$ 5,000	$ 10,000	$ 3,462	$ 6,925	$ 9,662	$ 19,325	20%	$ 3,865	0%	$ -	0%	$ -	$ 11,595	$ 23,190
63	Instrumentation	Instrument	Level switch	2	EA	$ -	4.00	8	$ 150	$ 1,200	$ 1,000	$ 2,000	$ 1,000	$ 2,000	$ 2,600	$ 5,200	20%	$ 1,040	0%	$ -	0%	$ -	$ 3,120	$ 6,240
64	Instrumentation	Programming	Programming	1	LOT	$ -	250.00	250	$ 150	$ 37,500	$ -	$ -	$ -	$ -	$ 37,500	$ 37,500	20%	$ 7,500	0%	$ -	0%	$ -	$ 45,000	$ 45,000
65	Instrumentation	Hardware	General hardware -	1	LOT	$ -	-	-	$ -	$ -	$ 96,300	$ 96,300	$ -	$ -	$ 96,300	$ 96,300	20%	$ 19,260	0%	$ -	0%	$ -	$ 115,560	$ 115,560
66	Instrumentation	Labour	Instrumentation -	1	LOT	$ 110,400	-	-	$ -	$ 110,400	$ -	$ -	$ -	$ -	$ 110,400	$ 110,400	20%	$ 22,080	0%	$ -	0%	$ -	$ 132,480	$ 132,480
Subtotal																**$ 618,289**		**$ 123,658**		**$ -**		**$ -**		**$ 741,947**
67	Service electrical	Lighting and	Budget	0.04	Fraction equipment	$ -	5,433	217	$ 150	$ 32,600	$ 128,943	$ 128,943	$ -	$ -	$ 161,543	$ 161,543	20%	$ 32,309	0%	$ -	0%	$ -	$ 4,846,285	$ 193,851
68	Service electrical	Safety	Fire detection -	0.03	Fraction equipment	$ -	5,433	136	$ 150	$ 20,375	$ 87,280	$ 87,280	$ -	$ -	$ 107,655	$ 107,655	20%	$ 21,531	0%	$ -	0%	$ -	$ 5,167,420	$ 129,185
69	Service mechanical	Ventilation	HVAC, ducting,	0.05	Fraction equipment	$ -	5,433	272	$ 150	$ 40,750	$ 174,559	$ 174,559		$ -	$ 215,309	$ 215,309	20%	$ 43,062	0%	$ -	0%	$ -	$ 5,167,420	$ 258,371
Subtotal																**$ 484,507**		**$ 96,901**		**$ -**		**$ -**		**$ 581,408**
TOTALS							**6,058**			**$ 1,492,789**		**$ 2,053,599**		**$ 2,090,911**		**$ 5,637,299**		**$ 830,345**		**$ 8,750**		**$ 8,750**		**$ 6,485,144**

Note:
All costs are in $CAD.

CAPEX FOR TROILUS GOLD CORPORATION

Table 2: CAPEX SUMMARYd

WATER TREATMENT PLANT MATERIAL TAKE OFF SUMMARY CAPEX (-20% + 30%)			
DISCIPLINE	**Direct Costs**	**Direct Contingency (20%)**	**Total Direct Costs**
Building and architecture	$ 1,184,470	$ 236,894	$ 1,421,364
Civil and earthworks	$ 80,112	$ 16,022	$ 96,134
Concrete	$ 286,834	$ 57,367	$ 344,201
Equipment and mechanical	$ 2,306,712	$ 155,477	$ 2,462,189
Instrumentation and control	$ 618,289	$ 123,658	$ 741,947
Piping	$ 338,713	$ 67,743	$ 406,455
Power and electrical	$ 337,663	$ 76,283	$ 431,446
Service electrical	$ 269,197	$ 53,839	$ 323,037
Service mechanical	$ 215,309	$ 43,062	$ 258,371
Totals	**$ 5,637,299**	**$ 830,345**	**$ 6,485,144**

Assumptions

The MTO provides the estimated labour hours and material quantities, to be refined with further project development.

The unit costs/rates for excavation, fill, concrete, aggregate piping, etc. to be adjusted to reflect project rates.

The Direct contingency is based on prior projects and would need to be adjusted to reflect those of the mill.

ATTACHMENT J

OPEX

Project	**Troilus Gold Coorporation**
Created by	**Max Nodwell**
Date	**15-Nov-23**

Operating Expenditure (OPEX)

OPEX Design Criteria

Heating Values	Values	Units	Source		
Propane	25	GJ/m^3	Liquid basis - GC.ca		
Diesel	39	GJ/m^3	Liquid basis - GC.ca		
Building length	20	m			
Building width	17	m			
Building height	7.0	m			
Building volume	2,380	m^3			
Building volume	84,038	ft^3			
Outside temperature	-15	°C			
Required indoor temperature	10	°C			
Temperature difference	25	°C			
Temperature difference factor	0.70				
Insulation factor	2.0				
Building heating requirements	369,430	BTU/h			
Daily heat heating demand	2,598	kWh			
	9.4	GJ			

Installed Power Factor					
Parameter	**Value**	**Units**	**Source/Notes**		
Installed power	75	kW	from equipment list		
Operating power ratio	0.80	% of installed	Veolia ratio		
Operating power est.	60	kW	Calculation		
Troilus peak power/flow	**0.051**	**kWh/m^3**			

Operating Parameters	Value	Units	Source/Notes		
Annual volume - Average climate conditions	2,600,000	m3	VR email 2023-11-01		
Pumping capacity - Average climate conditions	0.33	m^3/s	VR email 2023-11-01		
	1,188	m^3/h			
Equivalent operating days	91	d	At peak capacity		

Parameter	Units	Units/day	Cost/unit	Cost/day	Cost/annum
Polymer	kg	5.8	$ 10	$ 59	$ 5,363
Microsand	kg	40	$ 1.3	$ 54	$ 4,888
Coagulant	kg	288	$ 3.4	$ 982	$ 89,556
Power	kWh	1,440	$ 0.30	$ 432	$ 39,394
Propane/LNG	L	374	$ 1.5	$ 561	$ 51,182

Maintenance	Units	Metric	Value	Cost/day	Cost/annum
Allowance	% equipment cost	Annual	5.0%	$ 0.04	$ 115,336

Labour	Units	Units/annum	Loaded Annual Cost	Total Annual Cost	
Manager	FTE	0.50	$ 125,000	$ 62,459	
Operators	FTE	1.00	$ 90,000	$ 89,941	
Maintenance	FTE	0.50	$ 90,000	$ 44,970	
			Total	**$ 504,000**	**CAD/annum**
			Unit cost	**$ 0.19**	**CAD/m^3 treated**

Note:
All costs are in Canadian dollars $CAD

OPEX FOR TROILUS GOLD CORPRATION

Project	**Troilus Gold Coorporation**
Created by	**Max Nodwell**
Date	**15-Nov-23**

Operating Expenditure (OPEX)

OPEX Design Criteria

Heating Values	Values	Units	Source		
Propane	25	GJ/m^3	Liquid basis - GC.ca		
Diesel	39	GJ/m^3	Liquid basis - GC.ca		
Building length	20	m			
Building width	17	m			
Building height	7.0	m			
Building volume	2,380	m^3			
Building volume	84,038	ft^3			
Outside temperature	-15	°C			
Required indoor temperature	10	°C			
Temperature difference	25	°C			
Temperature difference factor	0.70				
Insulation factor	2.0				
Building heating requirements	369,430	BTU/h			
Daily heat heating demand	2,598	kWh			
	9.4	GJ			

Installed Power Factor					
Parameter	**Value**	**Units**	**Source/Notes**		
Installed power	75	kW	from equipment list		
Operating power ratio	0.80	% of installed	Veolia ratio		
Operating power est.	60	kW	Calculation		
Troilus peak power/flow	**0.051**	**kWh/m^3**			

Operating Parameters	Value	Units	Source/Notes		
Annual volume - Average climate conditions	2,600,000	m3	VR email 2023-11-01		
Pumping capacity - Average climate conditions	0.33	m^3/s	VR email 2023-11-01		
	1,188	m^3/h			
Equivalent operating days	91	d	At peak capacity		

Parameter	Units	Units/day	Cost/unit	Cost/day	Cost/annum
Polymer	kg	5.8	$ 10	$ 59	$ 5,363
Microsand	kg	40	$ 1.3	$ 54	$ 4,888
Coagulant	kg	288	$ 3.4	$ 982	$ 89,556
Power	kWh	1,440	$ 0.30	$ 432	$ 39,394
Propane/LNG	L	374	$ 1.5	$ 561	$ 51,182

Maintenance	Units	Metric	Value	Cost/day	Cost/annum
Allowance	% equipment cost	Annual	6.0%	$ 0.05	$ 138,403

Labour	Units	Units/annum	Loaded Annual Cost	Total Annual Cost	
Manager	FTE	0.50	$ 125,000	$ 62,459	
Operators	FTE	1.00	$ 90,000	$ 89,941	
Maintenance	FTE	0.50	$ 90,000	$ 44,970	
			Total	**$ 527,000**	**CAD/annum**
			Unit cost	**$ 0.20**	**CAD/m^3 treated**

Note:
All costs are in Canadian dollars $CAD

ATTACHMENT K

Preliminary Instrument List

Instrument List							
Tag	Name	Function	Process Conditions	Input Specifications			Power
				Parameter	Signal	Range	Line (120VAC) or Loop (24VDC)
FT-103	Influent flow transmitter	Measure influent flowrate, totalize volume, and control feed pump speed	Raw TSF water, may contain up to 300 mg/L TSS	m3/h	4-20mA	0 - 1,500	Line
PT-101	Clarifier U/F pressure transmitter	Measure line pressure to hydrocyclone, control U/F pump	TSF water with high TSS and microsand density (up to 20% solids w/w)	psig	4-20mA	0 - 100	Loop
AT-101	Effluent turbidity analyzer transmitter	Evaluate water quality, divert off-spec water to plant inlet	Treated TSF water, potenial trace TSS. Neutral pH	NTU	4-20mA	TBD	Line
LT-102	Effluent storage tank level transmitter	Measure effluent standpipe level, control chemical make-up and recirculation pumps	Treated TSF water, potenial trace TSS. Neutral pH	m	4-20mA	0 - 5m	Loop
FT-102	Treated water discharge flow meter	Measure effluent flowrate, totalize volume to environment	Treated TSF water, potenial trace TSS. Neutral pH	m3/h	4-20mA	0 - 1,500	Line
TT-201	Polymer make-up water temperature transmitter	Measure polymer make-up water temperature, control water heater	Treated TSF water, potenial trace TSS. Neutral pH	°C	4-20mA	0 - 75	Line
LT-202	Polymer maturation tank level transmitter	Measure tank level, control fill valve	High-viscosity polymer solution	m	4-20mA	0 - 4	Line
LT-203	Polymer solution storage tank level transmitter	Measure tank level, control fill valve	High-viscosity polymer solution	m	4-20mA	0 - 4	Line
LT-221	Coagulation solution storage tank level transmitter	Measure coagulant tank level, control fill valve	Ferric sulphate coagulant, low pH, high viscosity	m	4-20mA	0-6.5m	Loop
LT-301	Potable water holding tank level transmitter	Measure potable water tank level, control potable water pump	Potable water. Non-corrosive	m	4-20mA	0 - 3m	Loop
PT-302	Potable water diaphragm pressure transmitter	Indicate sufficient water pressure, control potable water pump	Potable water. Non-corrosive	psig	4-20mA	0 - 100	Loop
TI/TT-302	Safety shower water temperature indicator	Measure safety shower water temperature, control mixing valves	Potable water. Non-corrosive	°C	4-20mA	0 - 75	Line
LSH-311	Sump pump level switch high	Indicate sump level, start/stop sump pump	dirty plant water	m	ON/OFF	3 m	Relay (dry) contact
PIT-321	Compressed air pressure indicator and transmitter	Measure air pressure, flag operators to low pressure	Dry compressed air, 150 PSIG	psig	4-20mA	50 - 150 PSIG	Loop

APPENDIX I

Tailings Storage Facility Water Management

1.0 OVERVIEW

The main report presents the Troilus TSF's water management plan and the applicable design criteria. WSP (2024b)[1] presents the feasibility study for the TSF and includes additional details. The current appendix provides information regarding some of the analyses undertaken regarding the TSF Pond operating levels and the emergency spillway design; the appendix complements the main report.

2.0 TSF POND CHARACTERISTICS

Figure 1 and Figure 2 below present the TSF Pond characteristics for the end of Year 1 (dyke raise 407 m) and for the last year of operation (final dyke raise 435 m):

- For the end of Year 1, the dyke crest is at the elevation 407.0 m, and the spillway invert at the elevation 405.5 m. The minimum operating water level, which is the level maintaining a minimum 3 m water depth near the intake pump location, is at approximately 397.8 m, or 7.7 m below the spillway invert. The maximum normal operating water level (or the level, on top of which the environmental design flood – the Directive 019 Project Flood – can be stored without discharging via the emergency spillway) is at 404.6 m. The 15.8 M m^3 of water that can be stored below the emergency spillway invert are equivalent to over three years of precipitation volume over the TSF's direct watershed; this underlines the large safety factor when it comes to water management inside the TSF.
- For the last year of operation, the dyke crest is at the elevation 435.0 m, the spillway invert at the elevation 433.5 m. The minimum operating water level is at approximately 428 m, or 7.0 m below the spillway invert. The maximum normal operating water level is at 432.6 m. The 9.9 M m^3 of water that can be stored below the emergency spillway invert are equivalent to two years of precipitation volume over the TSF's direct watershed.

[1] The current appendix uses the References section of the main report for all referenced documents.

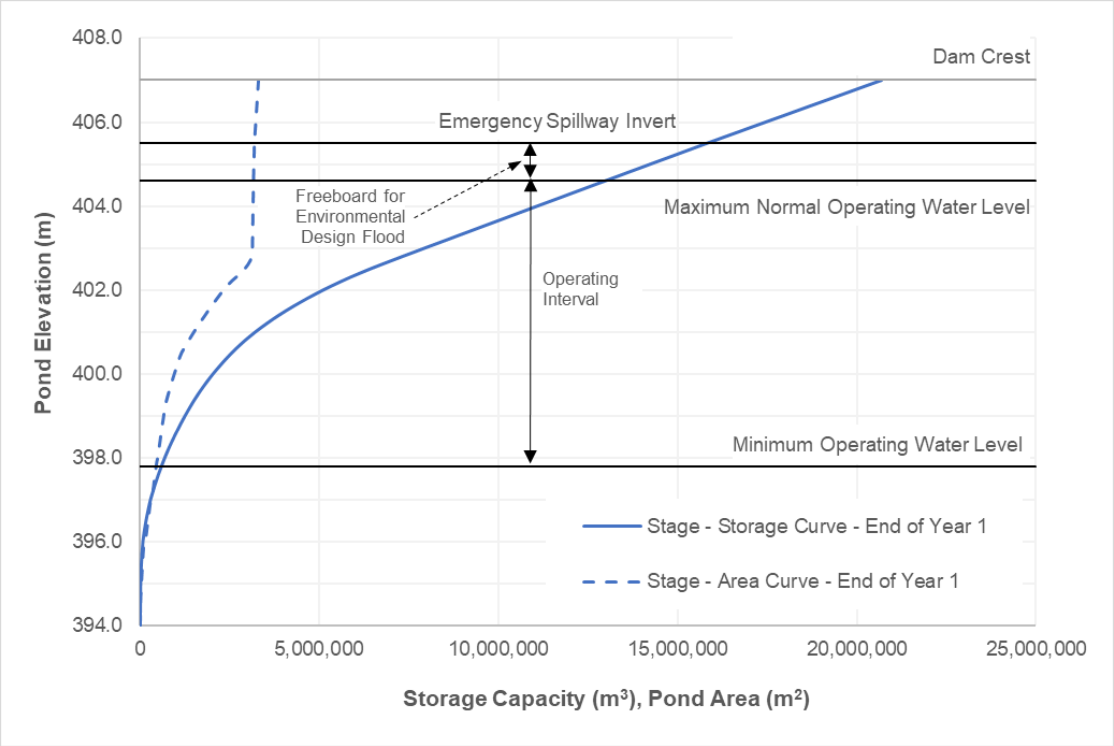


Figure 1: TSF Pond Stage / Storage / Area Curve – End of Year 1 of Operation

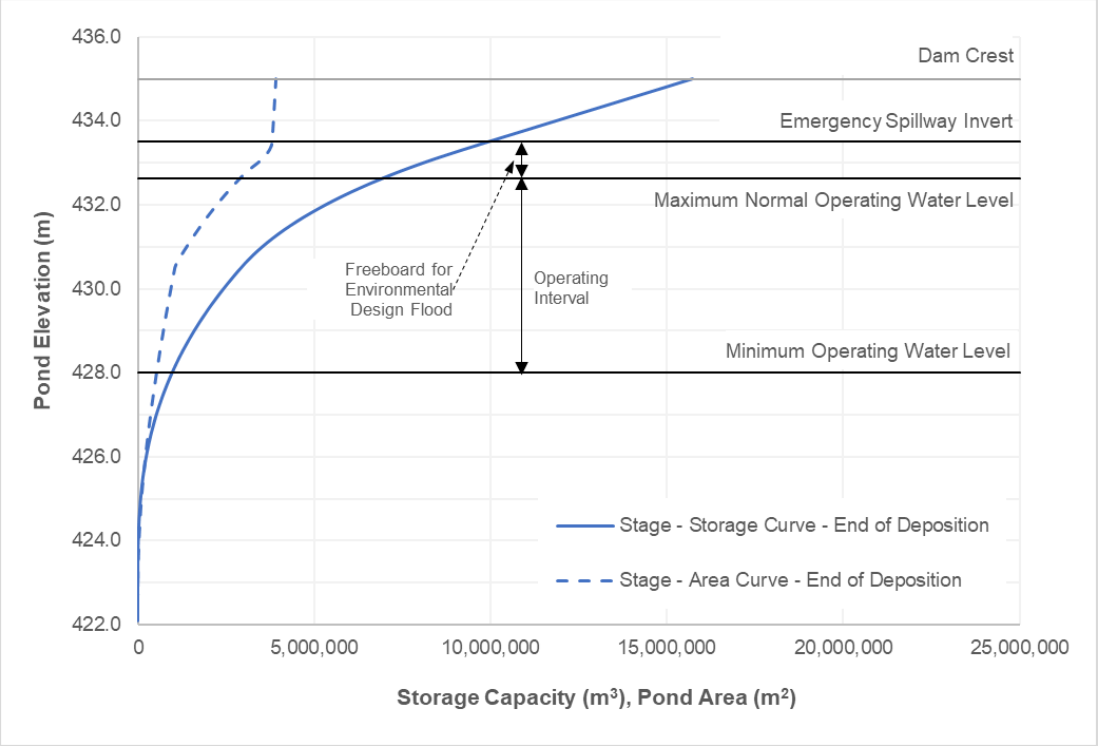


Figure 2: TSF Pond Stage / Storage / Area Curve – End of Last Year of Operation

3.0 ENVIRONMENTAL DESIGN FLOOD

The Directive 019 for the mining industry (MELCCFP, 2012) indicates that tailings storage facilities with water retention should be able to contain without uncontrolled discharge to the environment the “project flood event” consisting of the 100-year snow accumulation melting over 30 days superposed to the 1,000-year 24-hour rainfall event. The rainfall event’s return period is 2,000 years for high-risk tailings, which is not the case for the Troilus TSF (Troilus, 2024).

Based on the climate statistics presented in the main report, the project flood event has a total depth of 504 mm over 30 days. Cumulated over a 5.9 km^2 watershed and ignoring the losses, as infiltration and evaporation losses would be very small compared to the size of the event, the TSF Pond must contain a volume of 3.0 million cubic metres (M m^3) water above the maximum operating water level under normal climate conditions. The 5.9 km^2 watershed considers the return to the TSF Pond of water collected by the seepage sumps at the toe of the TSF dyke (S02 and S03 in the southwestern TSF corner and, after the East Dyke construction, S07).

Based on the stage-storage curves in the previous section, the maximum operating water level under normal conditions must be 404.6 m for the end of Year 1 TSF configuration and 432.6 m for the final TSF configurations. These two levels are 6.8 m and 4.6 m above the minimum operating water levels, respectively, which allows Troilus the flexibility required to manage the water pond.

4.0 INFLOW DESIGN FLOOD AND EMERGENCY SPILLWAY DESIGN

MELCCFP (2012) indicates that the TSF emergency spillway should be able to evacuate safely the PMF. Based on CDA (2013) and CDA (2019), the minimum freeboard above the PMF water level was compared to the 100-year wave runup.

The spillway configurations required over the TSF operating life were designed:

- The existing TSF has an emergency spillway in its southwestern corner. For the first dyke raise to the dyke crest elevation 403 m, the existing emergency spillway will be extended upstream, while maintaining its current cross-section (24 m wide, 3H:1V side slope) and a maximum 20% longitudinal slope. The raised spillway invert is 401.5 m.
- For the subsequent dyke raises up to the elevation 409 m, a new emergency spillway channel is constructed at the location of the existing emergency spillway, but under consideration for the dyke’s downstream raises. The cross-section geometry is maintained as well as the maximum 20% longitudinal slope. The spillway invert is, at all times, 1.5 m below the minimal dyke crest.
- For dyke raises between 411 m and 435 m, the emergency spillway is relocated slightly to the south to take advantage of a location where the natural terrain is at approximately 410 m, or around 30 m higher than the original location; also, the extension of the Southwest Pit footprint does not allow further spillway raises at the original location. The cross-sectional geometry is extended to 30 m base width and 4H:1V; the maximum slope is maintained at 20%.
- Finally, after the end of the deposition, the emergency spillway is relocated to accommodate the backfilling of Southwest Pit, which is immediately downstream of the previous spillway, and the placement of a waste dump that covers the spillway footprint. The new location is at the south-most corner of the TSF, at a location where the ultimate TSF dyke is less than 5 m high. This allows the spillway steep segment to be limited to a 4.2% slope. This location will be maintained until the TSF’s restoration.

Figure 3 presents the spillway's rating curves (TSF Pond water level as a function of the flow discharged from the pond), which considered that the most upstream segment of the spillway channel, along the dyke crest, would have a 1% slope. Due to the large width, flows as high as 21 to 26 m^3/s can be discharged within a 0.5 m water depth for the 24 m and 30 m widths, respectively.

Figure 4 and Figure 5 present the hydrological modelling results for the PMF event within the TSF watershed. The calculations were done using the HEC-HMS software, the SCS CN and Unit Hydrograph methods:

- To simulate PMF conditions, WSP made the following assumptions:
  - The initial water level was assumed at the spillway invert, which is extremely conservative when considering how large the storage capacity is before the spillway invert. This conservatism accounts for possible extreme wet antecedent questions, including potential record snowmelt before the extreme rainfall.
  - The summer-fall 72-hour PMP (see Section 4.4) was simulated to generate the PMF. The summer-fall PMP is a more intense short-term event than its spring counterparts, such that it results in higher short-term flows.
- The PMF pond attenuation in the TSF Pond was modelled using the pond's stage-storage curve and the spillway's stage-discharge curve.
- The results of the assessment are as follows:
  - For the end of Year 1 configuration, the maximum PMF water level is calculated to be 405.89 m, 1.11 m below the dyke crest. The maximum PMF spillway over the emergency spillway is calculated to be 14.1 m^3/s.
  - For the last year of operation, the maximum PMF water level is calculated to be 433.86 m, 1.14 m below the dyke crest. The maximum PMF spillway over the emergency spillway is calculated to be 15.5 m^3/s.

Wind effects on the water level against the TSF Dyke were calculated using USBR (USBR 2012) and extreme wind speeds as presented in Section 4.4. Maximum fetch lengths are around 2.9 km in the northeast-southwest direction. They correspond to 0.85 m, 0.95 m, 1.1 m, and 1.28 m increases in the water level against the TSF Dyke for the 2-year, 10 m, 100 m, and 1,000 year extreme wind speeds, respectively. The results are applicable only when the water is high enough for the waves to break against the upstream dyke slopes (1.5H:1V, rock covered upstream slopes were used in the analysis). Under normal operating conditions, the waves would break on the flat tailings slopes, and the wind-induced water level increases would be minimal.

The proposed spillway design respects the selected criteria of preventing overtopping during a PMF event superposed to a 100-year wind event.

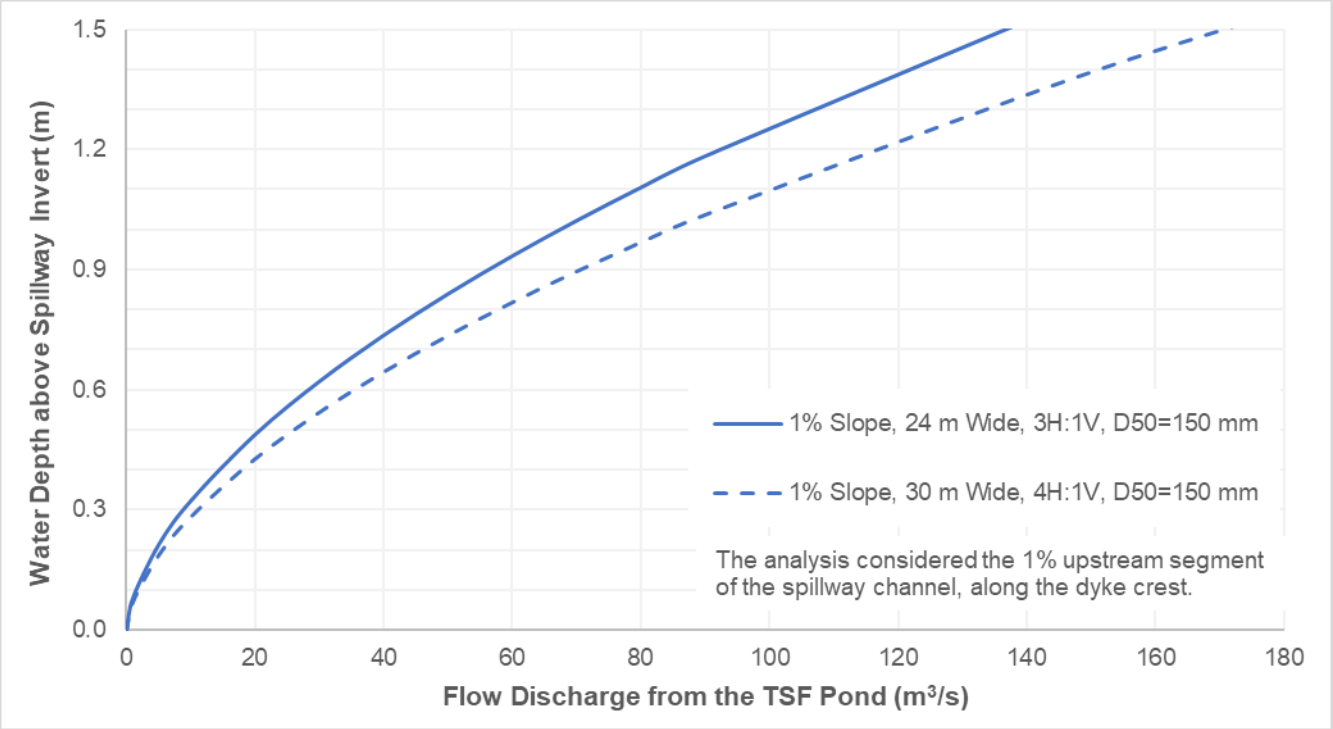


Figure 3: TSF Emergency Spillway Rating Curves

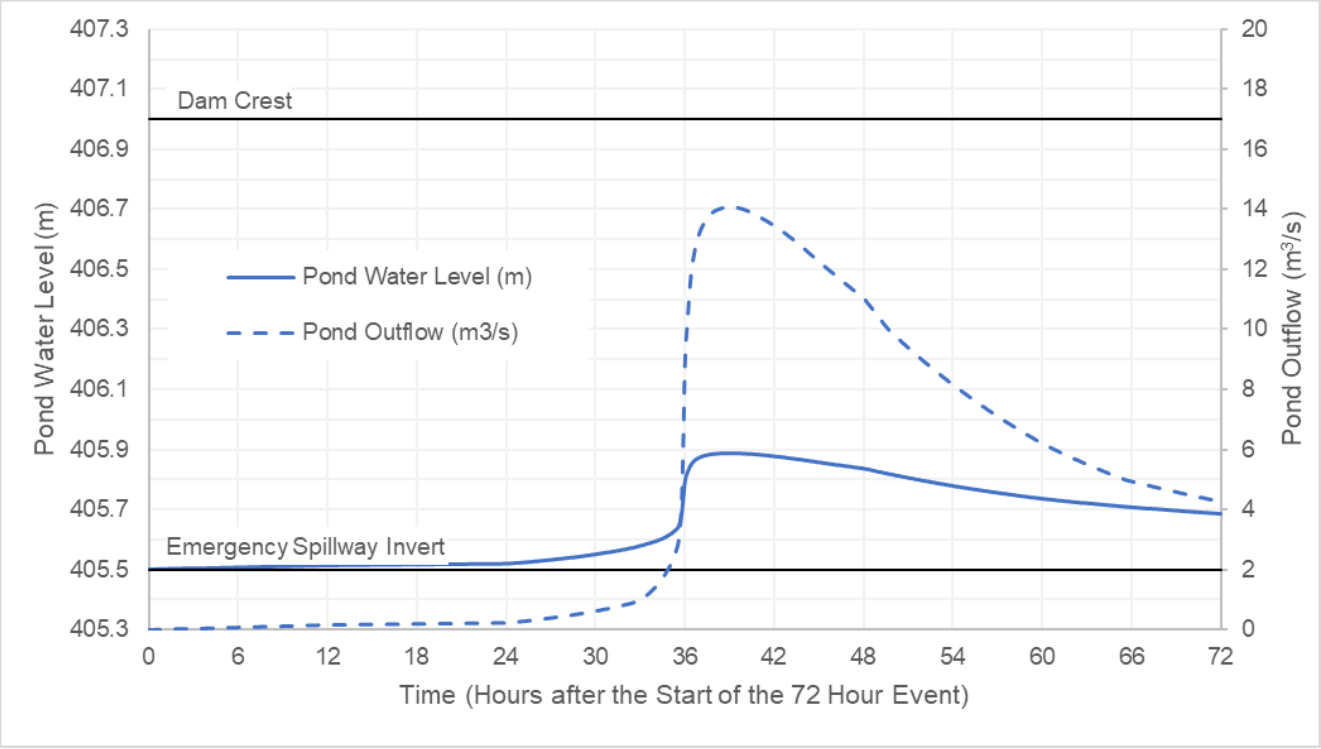


Figure 4: Simulating the Summer-Fall Probable Maximum Flood in the TSF – End of Year 1 of Operation

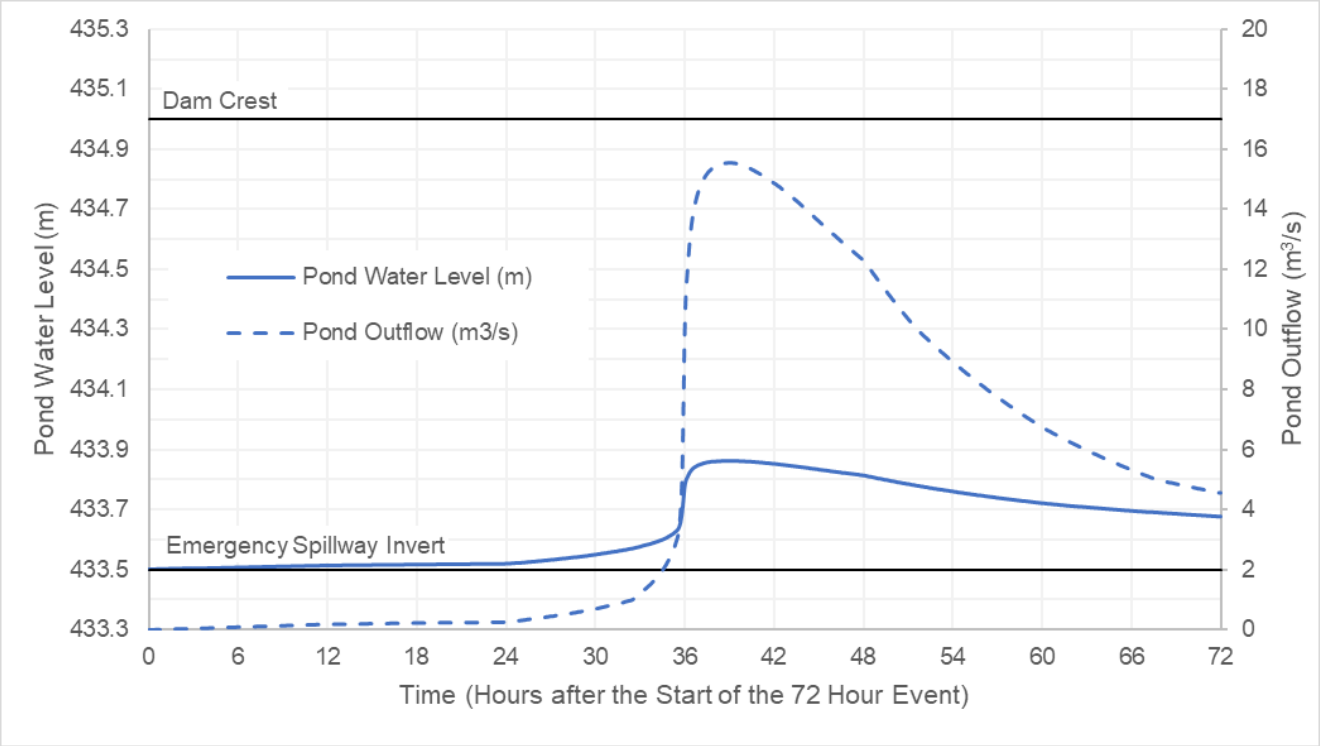


Figure 5: Simulating the Summer-Fall Probable Maximum Flood in the TSF – Last Year of Operation

The emergency spillway channel will consist of a 1% sloped segment near the dyke crest, followed by a 20% steep chute to the toe of the dyke; the chute slope is limited at 4.2% for the final relocation. Using USACE (1994), the riprap protection against erosion was calculated to be a D_{50} of a minimum of 400 mm for the 20% segments and 150 mm for the 1% and 4.2% segments.

The recommended minimum riprap thickness is 1.0 m for the 400 m riprap and 300 mm for the rest; additional transition (bedding) layers should not be required for the underlaying general waste rock. As an exception, for the final relocation, transition layers are recommended to limit infiltration into the dyke. The topography at the base of the dyke is perpendicular to the spillway axis. Spillway discharge would infiltrate the coarse rock and flow along and within the dyke body, where it may cause internal erosion. To mitigate these issues, WSP proposed placing a 0.3 m till layer surrounded on both sides by 0.3 m gravel as a transition to the underlaying waste rock and overlaying riprap.

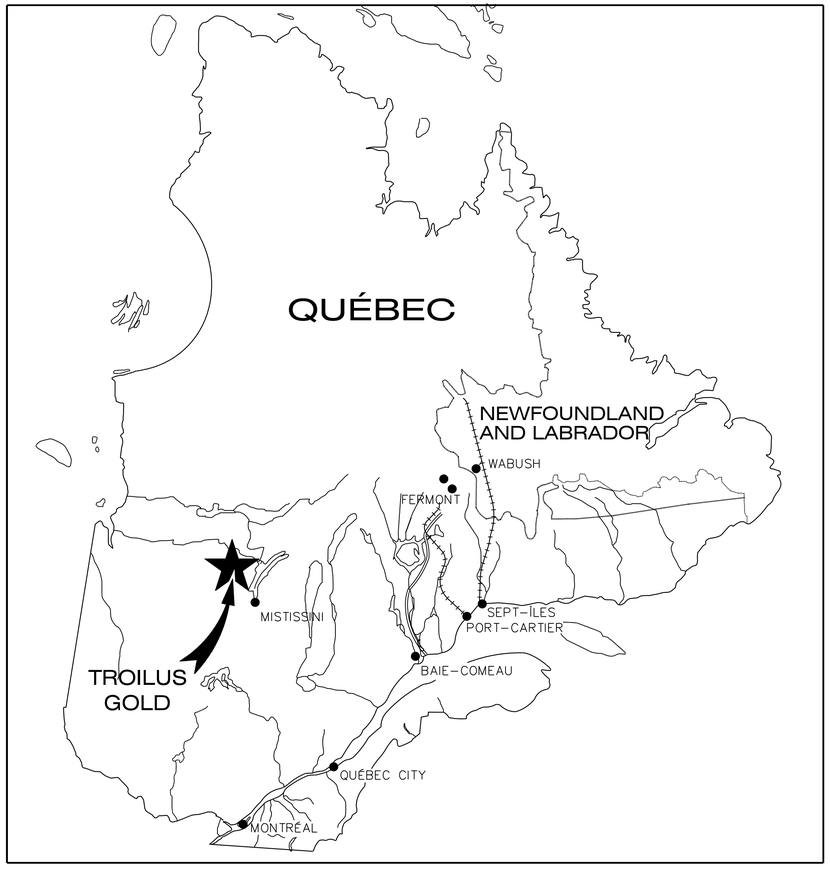
The initial spillway will be constructed as an upgrade of the upstream segment of the existing spillway. The existing spillway is, for its lower segment, a channel of similar geometry (24 m base width, 3H:1V side slopes) and is protected by a riprap layer with a D_{50} of approximately 1,050 m (Golder, 2010). No upgrades are required to the lower segment. A dissipation basin is in place as well.

20 m long dissipation ponds are included at the toe of 20% chutes to prevent scour for the remainder of the spillway configurations and alignments.

APPENDIX J

FS Design Drawings

TROILUS GOLD PROJECT
SITE-WIDE WATER MANAGEMENT PLAN
FEASIBILITY STUDY



PROJECT LOCATION PLAN
NOT TO SCALE

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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CONSULTANT
wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
COVER SHEET

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	1 of 75	G000

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0 25 mm

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DRAWING NUMBER	DRAWING TITLE	REV.	ISSUED FOR
G000	COVER SHEET	A	ISSUED FOR REVIEW
G001	DRAWING LIST	A	ISSUED FOR REVIEW
C100	OVERALL SITE PLAN EXISTING CONDITIONS	A	ISSUED FOR REVIEW
C101	GENERAL ARRANGEMENT	A	ISSUED FOR REVIEW
C200	OVERALL PLAN AND PROFILE - DIVERSION PLAN 1	A	ISSUED FOR REVIEW
C201	PLAN AND PROFILE - DIVERSION CHANNEL 1 (STA. 0+000 TO STA. 2+000)	A	ISSUED FOR REVIEW
C202	PLAN AND PROFILE - DIVERSION CHANNEL 1 (STA. 2+000 TO STA. 4+000)	A	ISSUED FOR REVIEW
C203	PLAN AND PROFILE - DIVERSION CHANNEL 1 (STA. 4+000 TO STA. 6+000)	A	ISSUED FOR REVIEW
C204	PLAN AND PROFILE - DIVERSION CHANNEL 1 (STA. 6+000 TO STA. 8+000)	A	ISSUED FOR REVIEW
C205	PLAN AND PROFILE - DIVERSION CHANNEL 1 (STA. 8+000 TO STA. 9+654)	A	ISSUED FOR REVIEW
C206	TYPICAL SECTIONS AND DETAILS DIVERSION CHANNEL 1 (1 OF 4)	A	ISSUED FOR REVIEW
C207	TYPICAL SECTIONS AND DETAILS DIVERSION CHANNEL 1 (2 OF 4)	A	ISSUED FOR REVIEW
C208	TYPICAL SECTIONS AND DETAILS DIVERSION CHANNEL 1 (3 OF 4)	A	ISSUED FOR REVIEW
C209	TYPICAL SECTIONS AND DETAILS DIVERSION CHANNEL 1 (4 OF 4)	A	ISSUED FOR REVIEW
C210	DIVERSION CHANNEL DETAIL TYPE 1 - GENTLE MEANDER	A	ISSUED FOR REVIEW
C211	DIVERSION CHANNEL DETAIL TYPE 2 - WEIRS	A	ISSUED FOR REVIEW
C212	DIVERSION CHANNEL DETAIL TYPE 3 - ROCK RAMP	A	ISSUED FOR REVIEW
C300	PLAN AND PROFILE - DIVERSION CHANNEL 2A	A	ISSUED FOR REVIEW
C301	PLAN AND PROFILE - DIVERSION CHANNEL 2B	A	ISSUED FOR REVIEW
C400	PLAN – SETTLING POND SP01	A	ISSUED FOR REVIEW
C401	SECTIONS AND DETAILS – SETTLING POND SP01	A	ISSUED FOR REVIEW
C402	PLAN – SETTLING POND SP02	A	ISSUED FOR REVIEW
C403	SECTIONS AND DETAILS – SETTLING POND SP02	A	ISSUED FOR REVIEW
C404	PLAN – SETTLING POND SP03	A	ISSUED FOR REVIEW
C405	SECTIONS AND DETAILS – SETTLING POND SP03	A	ISSUED FOR REVIEW
C406	PLAN – SETTLING POND SP04	A	ISSUED FOR REVIEW
C407	SECTIONS AND DETAILS – SETTLING POND SP04	A	ISSUED FOR REVIEW
C408	PLAN – SUMP S01	A	ISSUED FOR REVIEW
C409	SECTIONS AND DETAILS – SUMP S01	A	ISSUED FOR REVIEW
C410	PLAN – SUMP S01B	A	ISSUED FOR REVIEW
C411	SECTIONS AND DETAILS – SUMP S01B	A	ISSUED FOR REVIEW
C412	PLAN – SUMP S02	A	ISSUED FOR REVIEW
C413	SECTIONS AND DETAILS – SUMP S02	A	ISSUED FOR REVIEW
C414	PLAN – SUMP S03	A	ISSUED FOR REVIEW
C415	SECTIONS AND DETAILS – SUMP S03	A	ISSUED FOR REVIEW
C416	PLAN – SUMP S05	A	ISSUED FOR REVIEW
C417	SECTIONS AND DETAILS – SUMP S05	A	ISSUED FOR REVIEW
C418	PLAN – SUMP S06	A	ISSUED FOR REVIEW
C419	SECTIONS AND DETAILS – SUMP S06	A	ISSUED FOR REVIEW
C420	PLAN – SUMP S07	A	ISSUED FOR REVIEW
C421	SECTIONS AND DETAILS – SUMP S07	A	ISSUED FOR REVIEW
C422	PLAN – SUMP S09	A	ISSUED FOR REVIEW
C423	SECTIONS AND DETAILS – SUMP S09	A	ISSUED FOR REVIEW
C500	PLAN AND PROFILE – CONTACT WATER DITCH D01A	A	ISSUED FOR REVIEW
C501	PLAN AND PROFILE – CONTACT WATER DITCH D01B	A	ISSUED FOR REVIEW
C502	PLAN AND PROFILE – CONTACT WATER DITCH D01C	A	ISSUED FOR REVIEW
C503	PLAN AND PROFILE – CONTACT WATER DITCH D02	A	ISSUED FOR REVIEW
C504	PLAN AND PROFILE – CONTACT WATER DITCH D03	A	ISSUED FOR REVIEW
C505	PLAN AND PROFILE – CONTACT WATER DITCH D04	A	ISSUED FOR REVIEW
C506	PLAN AND PROFILE – CONTACT WATER DITCH D05	A	ISSUED FOR REVIEW
C507	PLAN AND PROFILE – CONTACT WATER DITCH D06A	A	ISSUED FOR REVIEW
C508	PLAN AND PROFILE – CONTACT WATER DITCH D06B	A	ISSUED FOR REVIEW
C509	PLAN AND PROFILE – CONTACT WATER DITCH D06C	A	ISSUED FOR REVIEW
C510	PLAN AND PROFILE – CONTACT WATER DITCH D07B	A	ISSUED FOR REVIEW
C511	PLAN AND PROFILE – CONTACT WATER DITCH D07C	A	ISSUED FOR REVIEW
C512	PLAN AND PROFILE – CONTACT WATER DITCH D08	A	ISSUED FOR REVIEW
C513	PLAN AND PROFILE – CONTACT WATER DITCH D09	A	ISSUED FOR REVIEW
C514	PLAN AND PROFILE – CONTACT WATER DITCH D10A	A	ISSUED FOR REVIEW
C515	PLAN AND PROFILE – CONTACT WATER DITCH D10B	A	ISSUED FOR REVIEW
C516	PLAN AND PROFILE – CONTACT WATER DITCH D11	A	ISSUED FOR REVIEW
C517	PLAN AND PROFILE – CONTACT WATER DITCH D12	A	ISSUED FOR REVIEW
C518	PLAN AND PROFILE – CONTACT WATER DITCH D14A	A	ISSUED FOR REVIEW
C519	PLAN AND PROFILE – CONTACT WATER DITCH D14B	A	ISSUED FOR REVIEW
C520	PLAN AND PROFILE – CONTACT WATER DITCH D14C	A	ISSUED FOR REVIEW
C521	PLAN AND PROFILE – CONTACT WATER DITCH D15	A	ISSUED FOR REVIEW
C522	PLAN AND PROFILE – CONTACT WATER DITCH DCB	A	ISSUED FOR REVIEW
C530	TYPICAL SECTIONS AND DETAILS – CONTACT WATER DITCH (1 OF 4)	A	ISSUED FOR REVIEW
C531	TYPICAL SECTIONS AND DETAILS – CONTACT WATER DITCH (2 OF 4)	A	ISSUED FOR REVIEW
C532	TYPICAL SECTIONS AND DETAILS – CONTACT WATER DITCH (3 OF 4)	A	ISSUED FOR REVIEW
C533	TYPICAL SECTIONS AND DETAILS – CONTACT WATER DITCH (4 OF 4)	A	ISSUED FOR REVIEW
C600	PLAN AND PROFILE – DC1 FLOOD PROTECTION BERM	A	ISSUED FOR REVIEW
C601	SECTIONS AND DETAILS – DC1 FLOOD PROTECTION BERM	A	ISSUED FOR REVIEW
C602	PLAN - DC2B FLOOD PROTECTION BERM AND SPILLWAY	A	ISSUED FOR REVIEW
C603	SECTIONS - DC2B FLOOD PROTECTION BERM AND SPILLWAY (1 OF 2)	A	ISSUED FOR REVIEW
C604	SECTIONS - DC2B FLOOD PROTECTION BERM AND SPILLWAY (2 OF 2)	A	ISSUED FOR REVIEW

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REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

DRAWING LIST

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	2 of 75	G001

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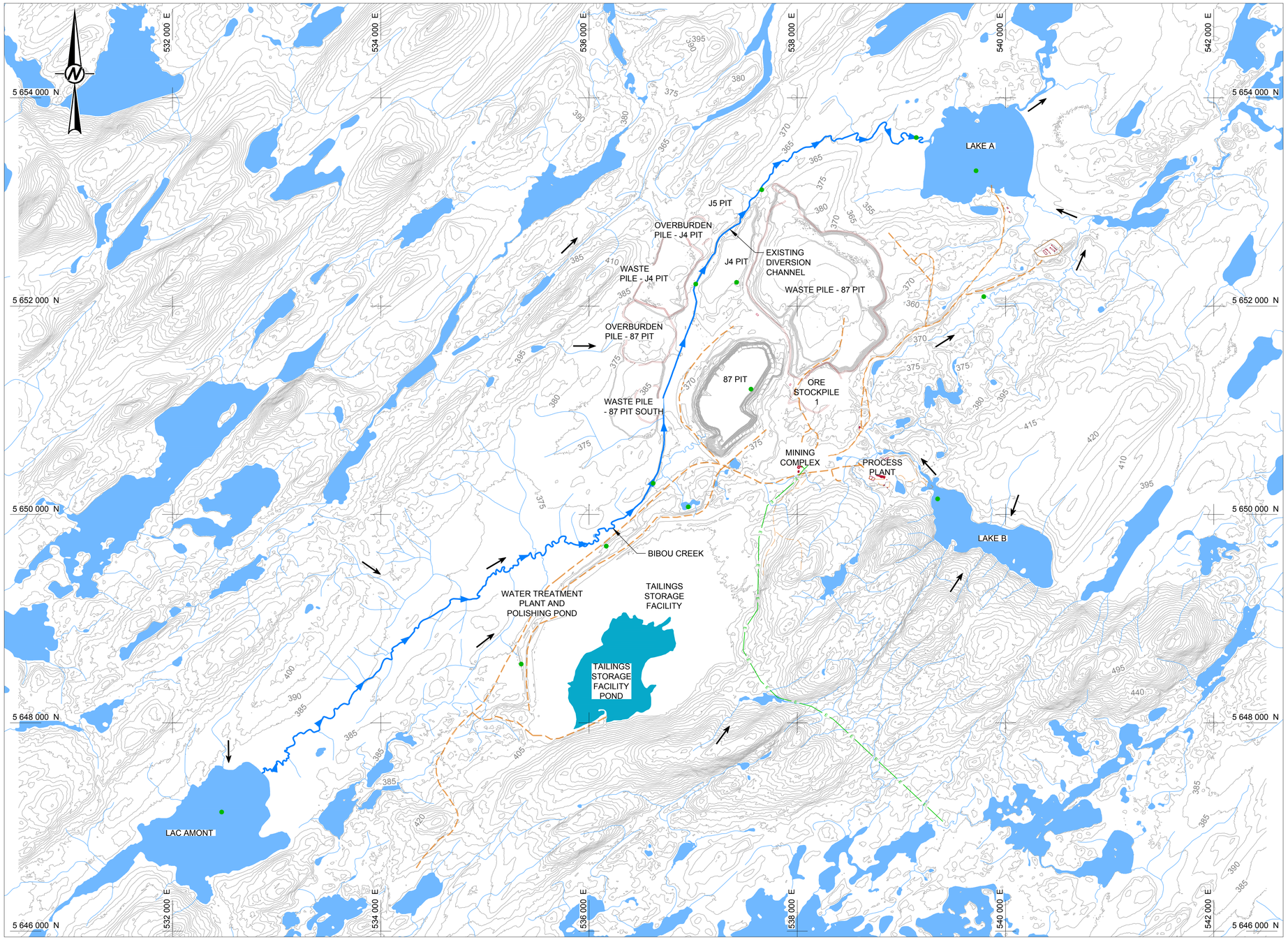

WATER MANAGEMENT

- TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- DIVERSION CHANNEL (NON-CONTACT WATER)
- EXISTING OVERBURDEN, WASTE AND ORE PILES
- NATURAL WATERCOURSES
- PROCESS PLANT
- POLISHING POND
- ELECTRICITY TRANSMISSION LINE (2023)
- FLOW DIRECTION
- EXISTING ROAD (2023)
- NATURAL LAKES
- TSF POND (ASSUMED - TO BE CONFIRMED DURING FS)
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, MAY 9, 2023.
3. PROCESS PLANT LAYOUT FROM LYCOPODIUM, JUNE 13, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25 2022.
5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).
6. COORDINATE SYSTEM: UTM NAD 83 ZONE 18.

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1:20,000 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

OVERALL SITE PLAN EXISTING CONDITIONS

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	3 of 75	C100

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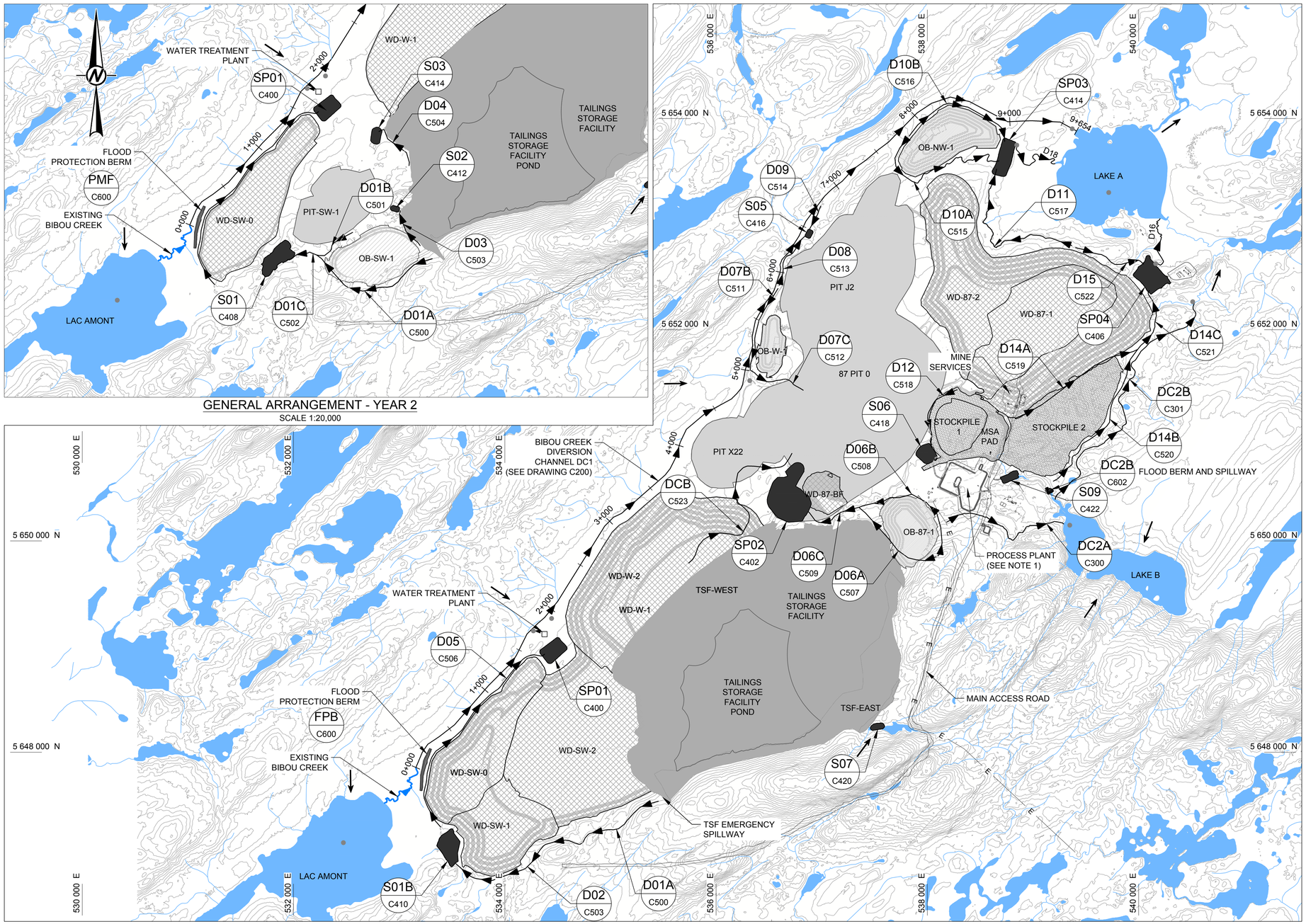

GENERAL ARRANGEMENT - YEAR 2
SCALE 1:20,000

GENERAL ARRANGEMENT - END OF MINE
SCALE 1:20,000

LEGEND

- TOPOGRAPHIC CONTOUR (5 m INTERVAL) — 560
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- FEATURE ID — D09 / C514
- DRAWING NUMBER
- ELECTRICITY TRANSMISSION LINE (2023) (TO BE RELOCATED) — E
- EXISTING ROADS (2023)
- SUMPS AND SETTLING PONDS
- DIVERSION DITCH

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.
6. ALL DATA SHOWN IN UTM NAD 83, ZONE 18.

NOTE(S)

1. ADDITIONAL DRAINAGE FEATURE AROUND THE PROCESS PLANT WILL BE DEFINED, IF REQUIRED, AFTER THE CONFIRMATION OF THE PLANT LAYOUT.
2. THE DRAWING IS A SCHEMATIC REPRESENTATION OF THE END-OF-MINE-LIFE SURFACE WATER MANAGEMENT PLAN.
3. THE EXTENT OF THE SUMP AND POND POLYGONS AND THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
4. THE DRAWING DOES NOT INCLUDE:
   - -TSF POND AND PIPELINES FROM THE TSF POND TO THE PROCESS PLANT;
   - -WATER TREATMENT PLANT FOR THE TSF POND SURPLUS WATER AND PIPELINES FROM THE TSF POND TO THE PLANT AND FROM THE PLANT TO EFFLUENT POINT.
5. ELEVATIONS, STATIONS AND COORDINATES ARE IN METRES, DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.

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0 1,000 2,000
1:20,000 METRES

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TROILUS

CONSULTANT
wsp
CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
GENERAL ARRANGEMENT

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	4 of 75	C101

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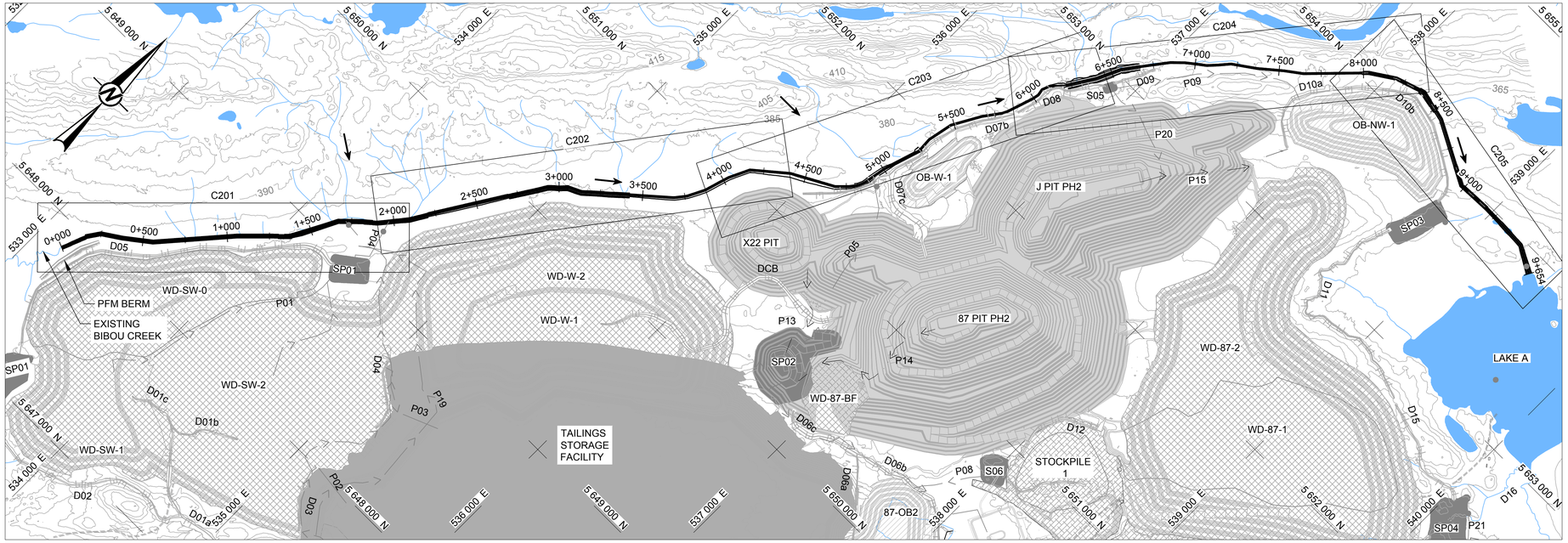
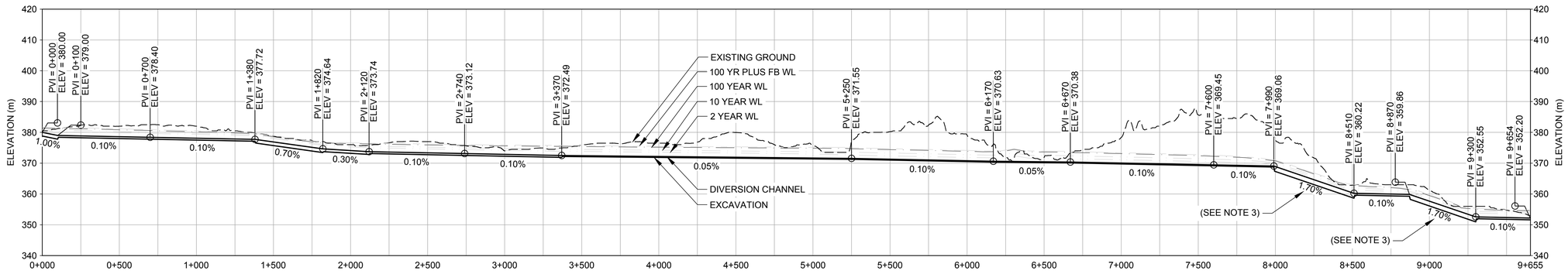


PLAN - BIBOU CREEK DIVERSION CHANNEL DC1

SCALE 1:15,000



PROFILE - BIBOU CREEK DIVERSION CHANNEL DC1

SCALE 1:15,000

VERTICAL SCALE 1:750

LEGEND

- TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
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4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
3. THE 1.70% SLOPE REPRESENTS AN AVERAGE SLOPE THROUGH THE SEGMENT, FOR HYDRAULIC MODELLING OF FLOOD FLOWS. THE COMPOUND SLOPE IN THESE SEGMENTS, WHICH INCORPORATES ADDITIONAL DETAILS FOR FISH PASSAGE, IS REPRESENTED BY THE DETAILED SCHEMATICS SHOWN IN DRAWING C212.

NOT FOR CONSTRUCTION

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0 25 50
1:750 METRES

0 500 1,000
1:15,000 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

OVERALL PLAN AND PROFILE - DIVERSION PLAN 1

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	5 of 75	C200

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

0 25 mm

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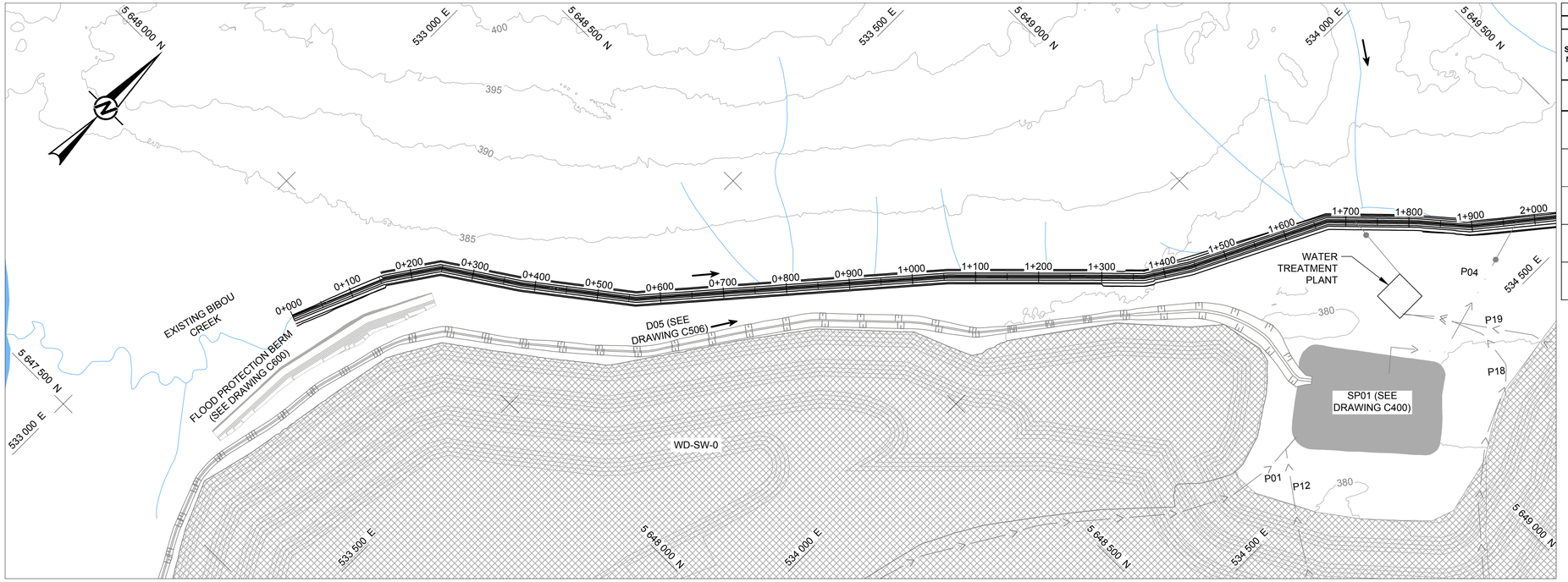
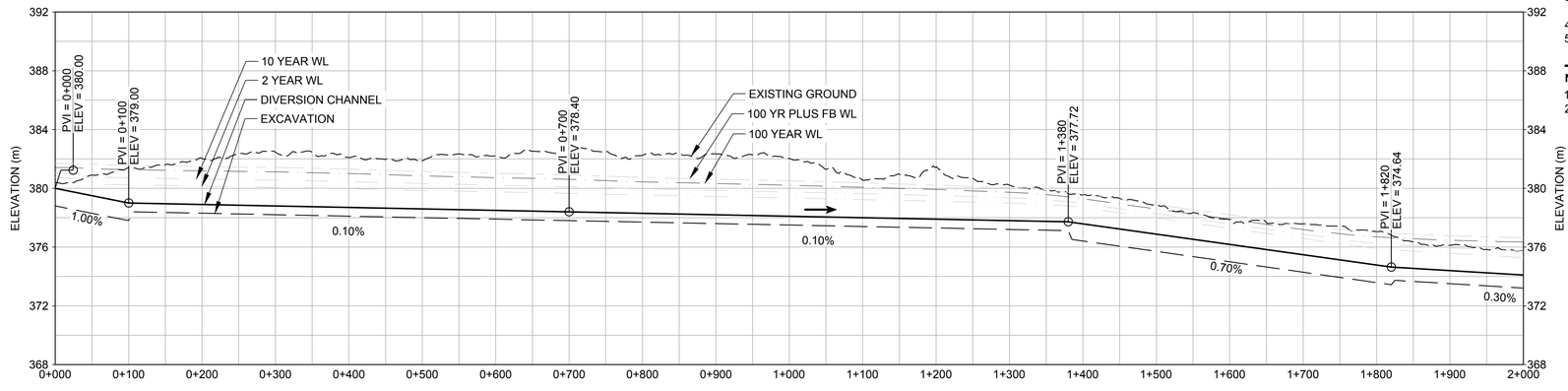


PLAN - BIBOU CREEK DIVERSION CHANNEL DC1 (STA. 0+000 TO 2+000)

SCALE 1:4,000



PROFILE - BIBOU CREEK DIVERSION CHANNEL DC1 (STA. 0+000 TO 2+000)

SCALE 1:4,000

VERTICAL SCALE 1:200

DC1												
Segment								Embankment	Erosion Protection			
Segment Number	Station		Length	Typical Cross-Section #	Typical Cross-Section Drawing #	Low Flow Detail	Low Flow Detail Drawing #	Height above Invert	Total Thickness	Erosion Protection Size (D50)	Filter Layers	Erosion Protection Height above Invert
	From	*To*	*m*					*m*	*m*	*mm*	*Filter 1 / Filter 2*	*m*
1	0+000	0+100	100	1	C206	1	C210	Right Side: 2.12 m -	1.20	300	Cobble Gravel	2.12
2	0+100	0+700	600	2	C206	1	C210	Right Side: 2.57 m -	0.60	100	Gravel -	2.61
3	0+700	1+380	680	2	C206	1	C210	Right Side: 2.22 m -	0.60	100	Gravel -	2.51
4	1+380	1+820	440	1	C206	1	C210	- -	1.20	300	Cobble Gravel	2.20
5	1+820	2+120	300	2	C206	1	C210	Right Side: 2.79 m -	0.60	100	Gravel -	2.77

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 10 20
1:200 METRES

0 200 400
1:4,000 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE - DIVERSION CHANNEL 1 (STA. 0+000 TO STA. 2+000)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	6 of 75	C201

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

0 25 mm

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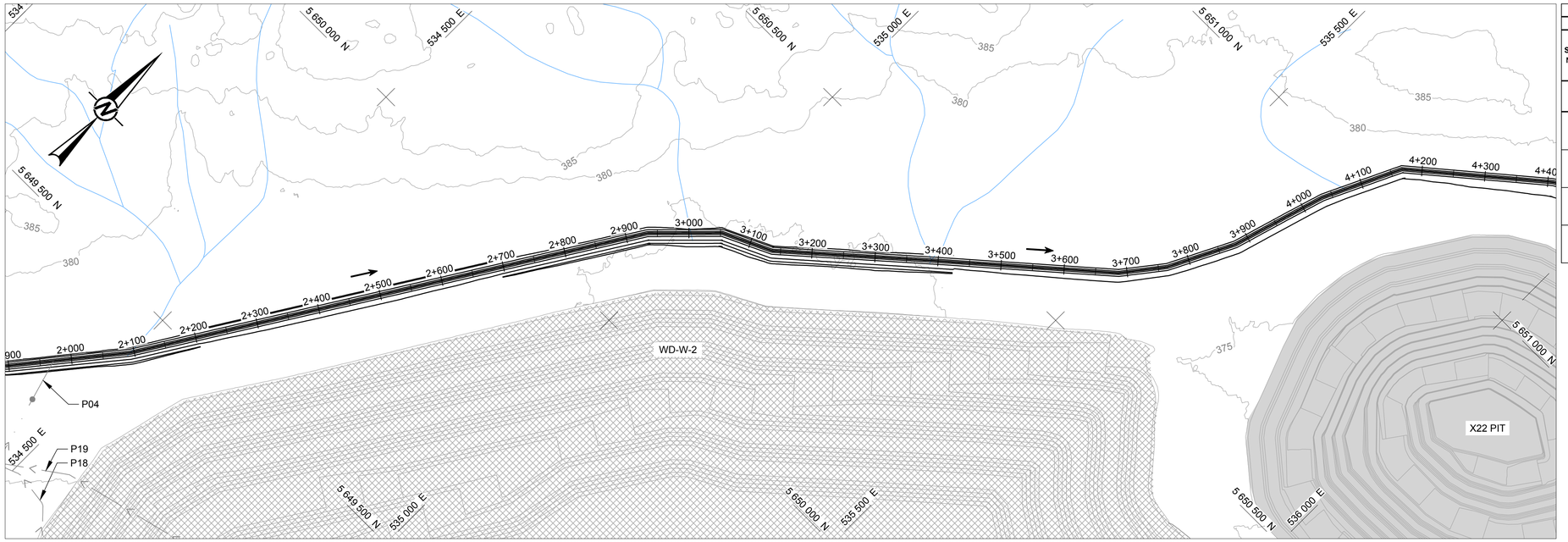
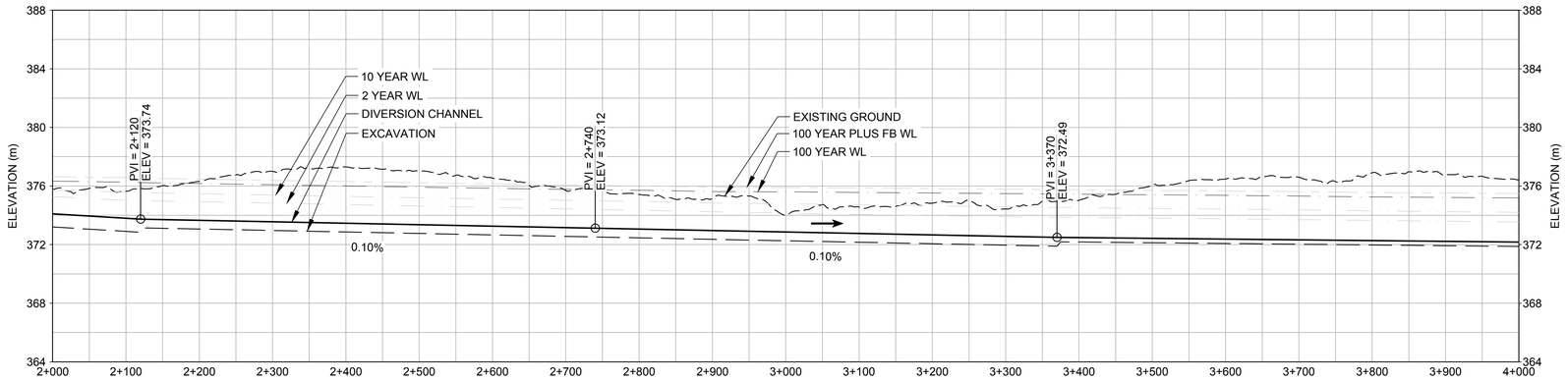


PLAN - BIBOU CREEK DIVERSION CHANNEL DC1 (STA. 2+000 TO 4+000)

SCALE 1:4,000



PROFILE - BIBOU CREEK DIVERSION CHANNEL DC1 (STA. 2+000 TO 4+000)

SCALE 1:4,000

VERTICAL SCALE 1:200

DC1												
Segment								Embankment	Erosion Protection			
Segment Number	Station		Length	Typical Cross-Section #	Typical Cross-Section Drawing #	Low Flow Detail	Low Flow Detail Drawing #	Height above Invert	Total Thickness	Erosion Protection Size (D50)	Filter Layers	Erosion Protection Height above Invert
	From	To	m					m	m	mm	Filter 1 / Filter 2	m
5	1+620	2+120	300	2	C206	1	C210	Right Side: 2.79 m -	0.60	100	Gravel -	2.77
6	2+120	2+740	620	2	C206	1	C210	Right Side: 2.90 m -	0.60	100	Gravel -	2.91
7	2+740	3+370	630	2	C206	1	C210	Right Side: 3.23 m -	0.60	100	Gravel -	3.24
8	3+370	5+250	1880	3	C206	1	C210	Right Side: 3.45 m -	0.30	50	- -	3.53

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 10 20
1:200 METRES

0 200 400
1:4,000 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE - DIVERSION CHANNEL 1 (STA. 2+000 TO STA. 4+000)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	7 of 75	C202

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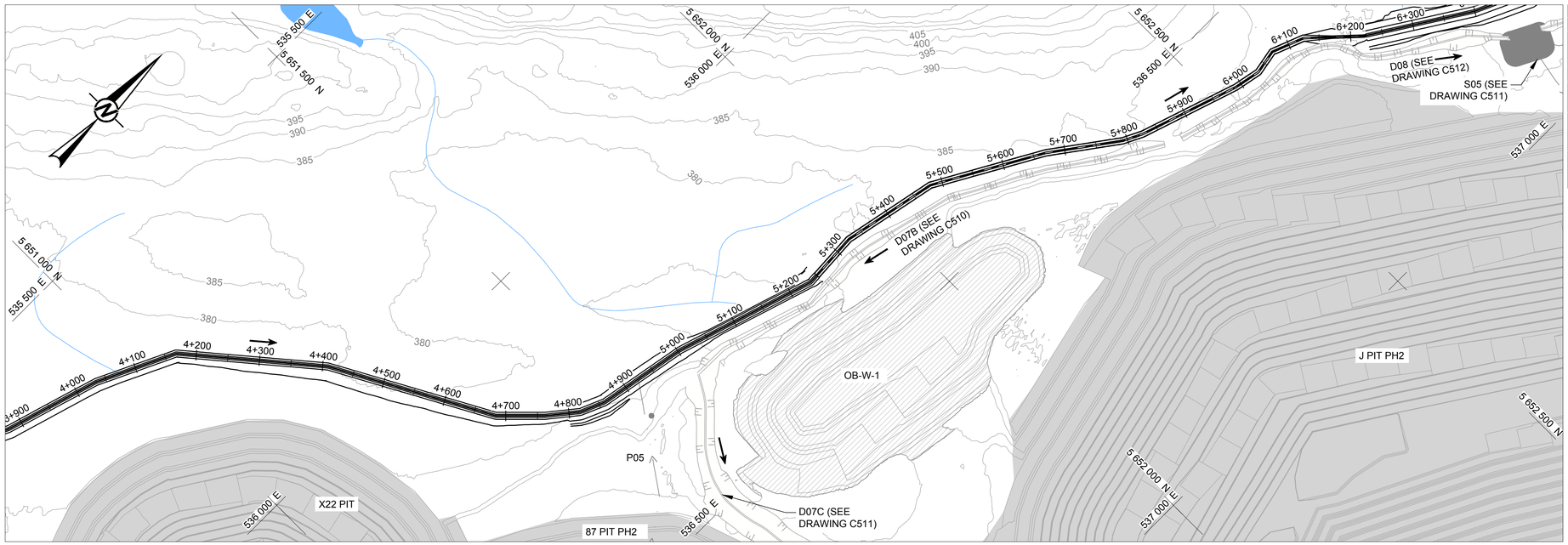
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm



PLAN - BIBOU CREEK DIVERSION CHANNEL DC1 (STA. 4+000 TO 6+000)

SCALE 1:4,000

PROFILE - BIBOU CREEK DIVERSION CHANNEL DC1 (STA. 4+000 TO 6+000)

SCALE 1:4,000

VERTICAL SCALE 1:200

DC1												
Segment								Embankment	Erosion Protection			
Segment Number	Station		Length	Typical Cross-Section #	Typical Cross-Section Drawing #	Low Flow Detail	Low Flow Detail Drawing #	Height above Invert	Total Thickness	Erosion Protection Size (D50)	Filter Layers	Erosion Protection Height above Invert
	From	*To*	*m*					*m*	*m*	*mm*	*Filter 1 / Filter 2*	*m*
8	3+370	5+250	1880	3	C206	1	C210	Right Side: 3.45 m -	0.30	50	- -	3.53
9	5+250	6+170	920	4	C207	2	C211	- -	0.30	50	- -	3.43

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
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4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 10 20
1:200 METRES

0 200 400
1:4,000 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE - DIVERSION CHANNEL 1 (STA. 4+000 TO STA. 6+000)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	8 of 75	C203

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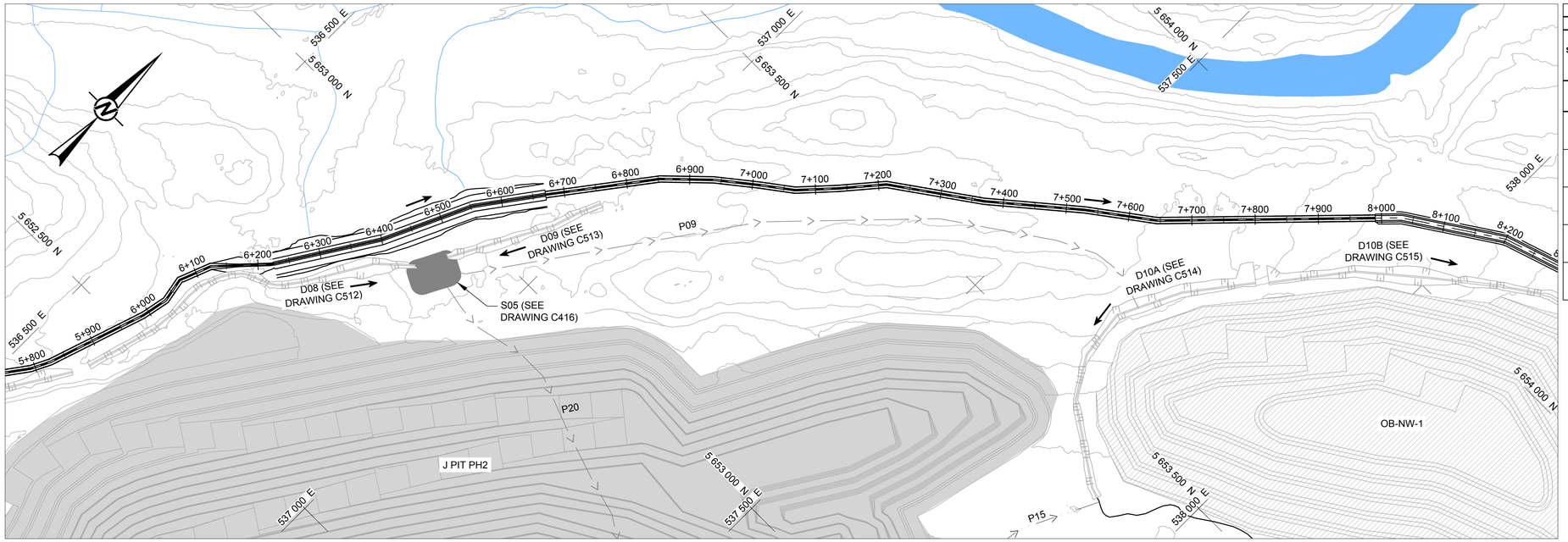
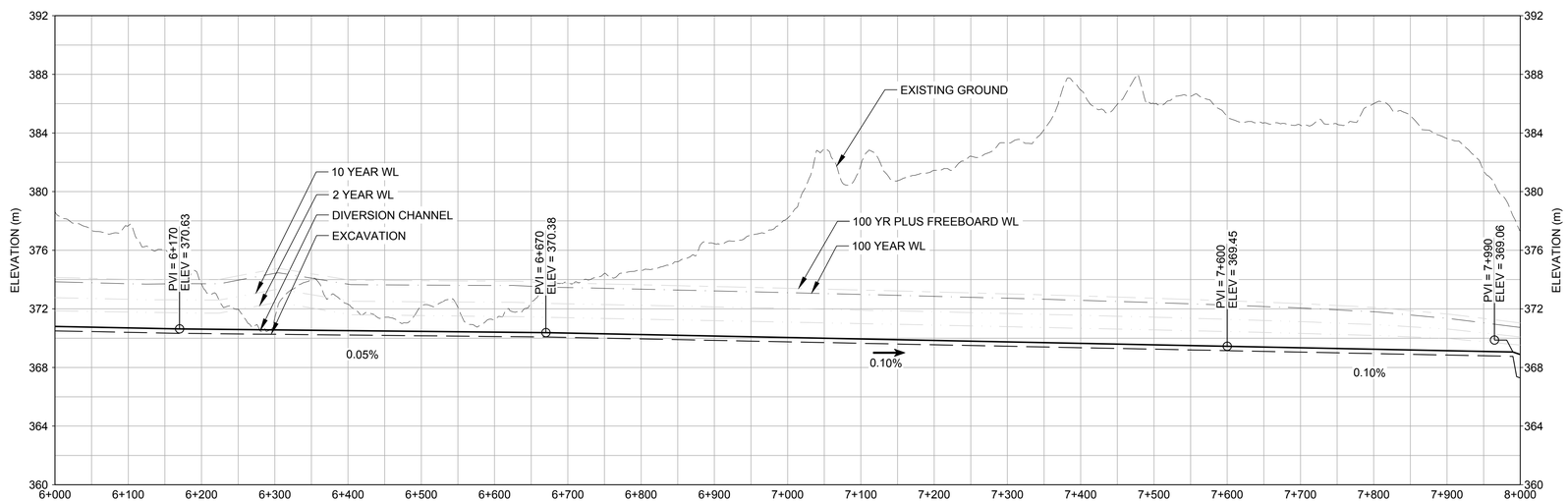
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm



PLAN - BIBOU CREEK DIVERSION CHANNEL DC1 (STA. 6+000 TO 8+000)

SCALE 1:4,000



PROFILE - BIBOU CREEK DIVERSION CHANNEL DC1 (STA. 6+000 TO 8+000)

SCALE 1:4,000

VERTICAL SCALE 1:200

DC1												
Segment								Embankment	Erosion Protection			
Segment Number	Station		Length	Typical Cross-Section #	Typical Cross-Section Drawing #	Low Flow Detail	Low Flow Detail Drawing #	Height above Invert	Total Thickness	Erosion Protection Size (D50)	Filter Layers	Erosion Protection Height above Invert
	From	To	m					m	m	mm	Filter 1 / Filter 2	m
9	5+250	6+170	920	4	C207	2	C211	- -	0.30	50	- -	3.43
10	6+170	6+670	500	5	C207	2	C211	Right Side: 3.49 m Left Side: 3.49 m	0.30	50	- -	4.27
11	6+670	7+600	930	4	C207	2	C211	- -	0.30	50	- -	3.40
12	7+600	7+990	390	6	C208	2	C211	- -	0.30	50	- -	3.10
13	7+990	8+510	520	7	C208	3	C212	Right Side: 2.46 m Left Side: 2.67 m	1.60	50	Cobble Gravel	2.66

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
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4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 10 20
1:200 METRES

0 200 400
1:4,000 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

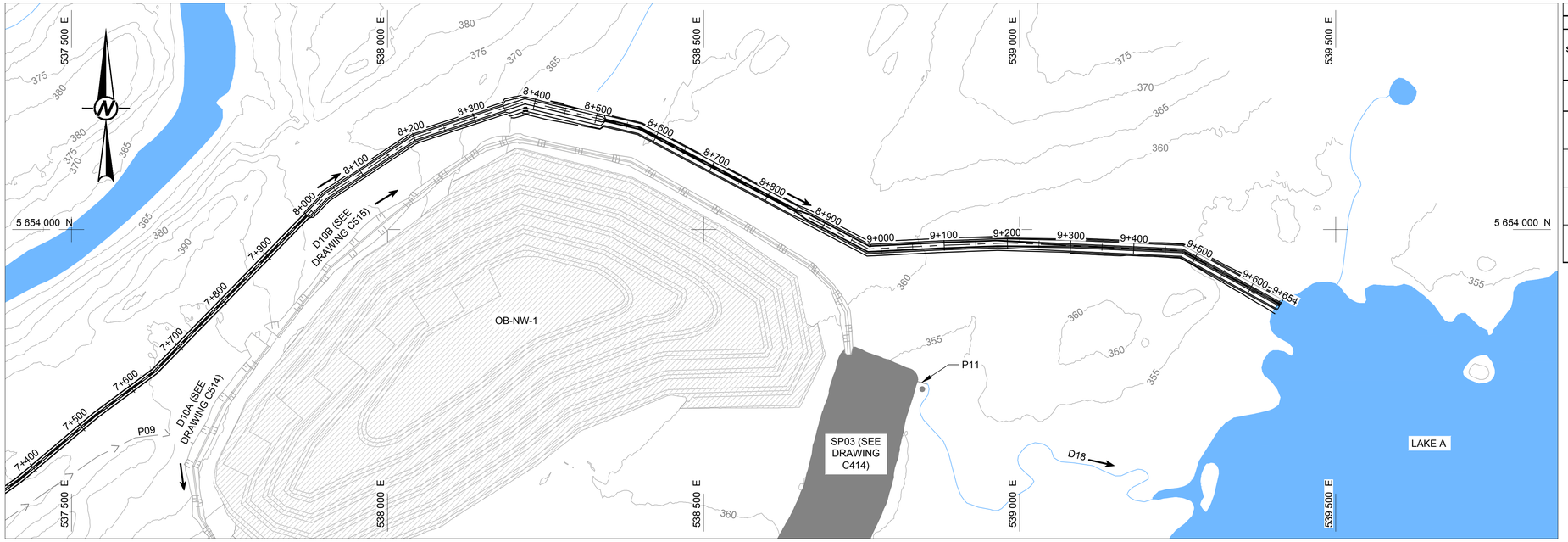
PLAN AND PROFILE - DIVERSION CHANNEL 1 (STA. 6+000 TO STA. 8+000)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	9 of 75	C204

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG09.dwg | Last Edited By: tfetene Date: 2024-05-02 Time:4:21:26 PM | Printed By: JCzternastek Date: 2024-05-03 Time:3:02:42 PM

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

0 25 mm



PLAN - BIBOU CREEK DIVERSION CHANNEL DC1 (STA. 8+000 TO 9+660)

SCALE 1:4,000

PROFILE - BIBOU CREEK DIVERSION CHANNEL DC1 (STA. 8+000 TO 9+660)

SCALE 1:4,000
VERTICAL SCALE 1:200

DC1												
Segment								Embankment	Erosion Protection			
Segment Number	Station		Length	Typical Cross-Section #	Typical Cross-Section Drawing #	Low Flow Detail	Low Flow Detail Drawing #	Height above Invert	Total Thickness	Erosion Protection Size (D50)	Filter Layers	Erosion Protection Height above Invert
	From	*To*	*m*					*m*	*m*	*mm*	*Filter 1 / Filter 2*	*m*
13	7+990	8+510	520	7	C208	3	C212	Right Side: 2.46 m Left Side: 2.67 m	1.60	50	Cobble Gravel	2.66
14	8+510	8+870	360	8	C208	2	C211	- -	0.60	100	Gravel -	2.56
15	8+870	9+300	430	9	C209	3	C212	Right Side: 2.08 m -	1.60	50	Cobble Gravel	2.08
16	9+300	9+654	354	10	C209	-		- -	0.60	100	Gravel -	2.80

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
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4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
3. THE 1.70% SLOPE REPRESENTS AN AVERAGE SLOPE THROUGH THE SEGMENT, FOR HYDRAULIC MODELLING OF FLOOD FLOWS. THE COMPOUND SLOPE IN THESE SEGMENTS, WHICH INCORPORATES ADDITIONAL DETAILS FOR FISH PASSAGE, IS REPRESENTED BY THE DETAILED SCHEMATICS SHOWN IN DRAWING C212.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 10 20
1:200 METRES

0 200 400
1:4,000 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE - DIVERSION CHANNEL 1 (STA. 8+000 TO STA. 9+654)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	10 of 75	C205

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

0 25 mm

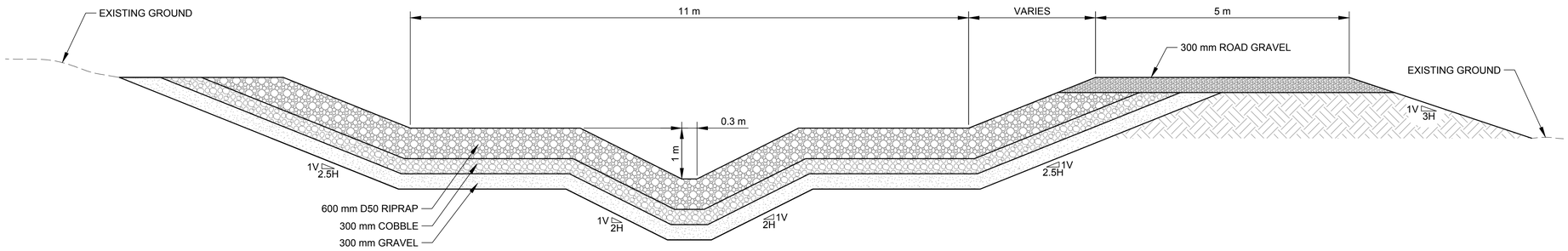
Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG010.dwg | Last Edited By: tfeterre Date: 2024-05-02 Time:4:39:26 PM | Printed By: JCzternastek Date: 2024-05-03 Time:3:14:08 PM

LEGEND

- EXISTING GROUND
- COBBLE
- RIPRAP
- GRAVEL
- ROAD GRAVEL
- COMPACTED FILL

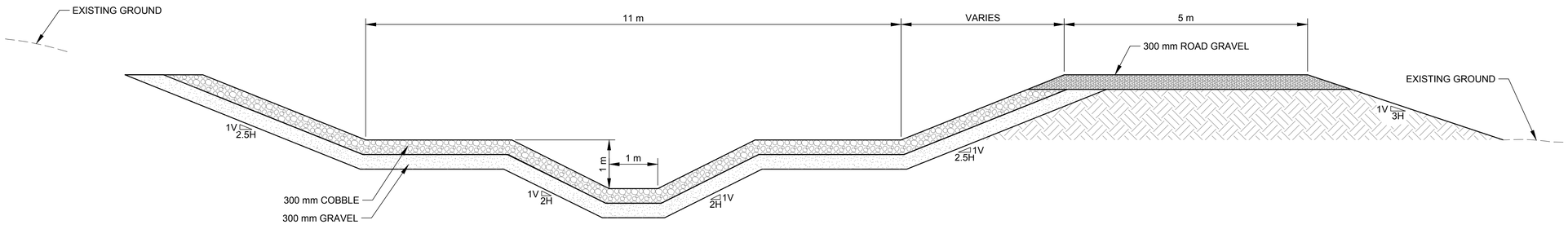
NOTE(S)

1. DURING DETAILED DESIGN A LOW-PERMEABILITY LAYER MAY BE ADDED AT REQUIRED LOCATIONS TO MITIGATE AGAINST GROUNDWATER SEEPAGE LOSS FROM THE CHANNEL SO THAT LOW FLOW DEPTHS FOR FISH PASSAGE ARE MAINTAINED.



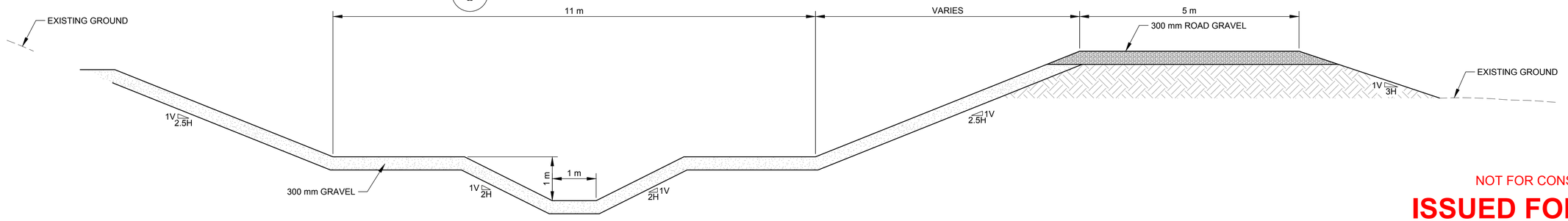
TYPICAL CROSS-SECTION 1 (MEANDERING CHANNEL - SEE DRAWING C210 FOR FISH PASSAGE AND HABITAT DETAILS) (STA. 0+000 TO STA. 0+100 AND STA. 1+380 TO STA. 1+820)

SCALE 1:50 A --



TYPICAL CROSS-SECTION 2 (MEANDERING CHANNEL - SEE DRAWING C210 FOR FISH PASSAGE AND HABITAT DETAILS) (STA. 0+100 TO STA. 1+380 AND STA. 1+820 TO STA. 3+370)

SCALE 1:50 B --



TYPICAL CROSS-SECTION 3 (MEANDERING CHANNEL - SEE DRAWING C210 FOR FISH PASSAGE AND HABITAT DETAILS) (STA. 3+370 TO STA. 5+250)

SCALE 1:50 C --

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 2 4

1:50 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

TYPICAL SECTIONS AND DETAILS DIVERSION CHANNEL 1 (1 OF 4)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	11 of 75	C206

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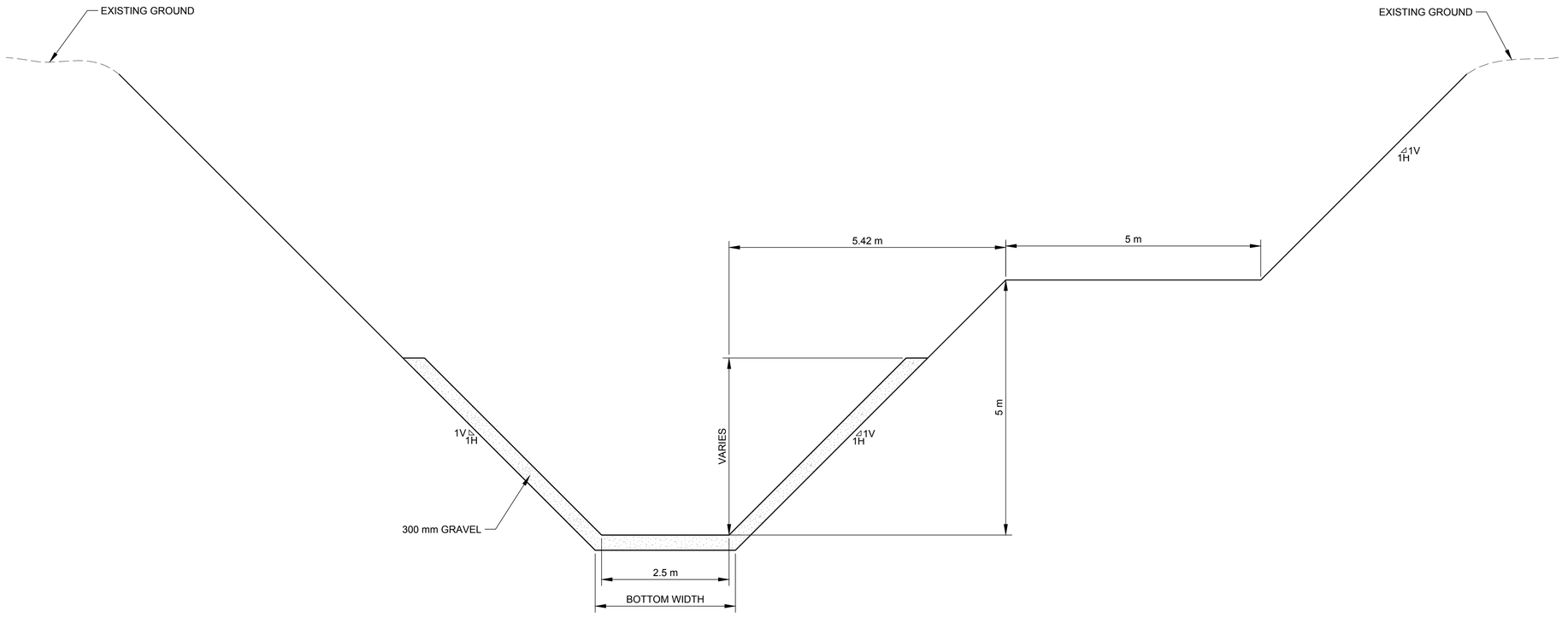
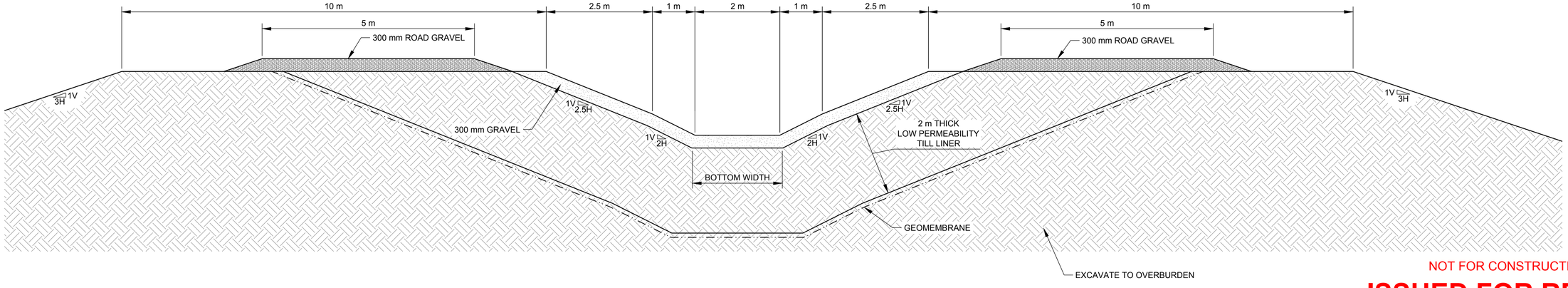
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm



TYPICAL CROSS-SECTION 4 (WEIRS - SEE DRAWING C211 FOR FISH PASSAGE AND HABITAT DETAILS)
SCALE 1:50 D
(STA. 5+250 TO STA. 6+170 AND STA. 6+670 TO STA. 7+600)



TYPICAL CROSS-SECTION 5 (WEIRS - SEE DRAWING C211 FOR FISH PASSAGE AND HABITAT DETAILS)
SCALE 1:50 E
(STA. 6+170 TO STA.6+670)

LEGEND

- EXISTING GROUND
- GEOMEMBRANE
- COBBLE
- RIPRAP
- GRAVEL
- ROAD GRAVEL
- COMPACTED FILL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 2 4
1:50 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp
CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
TYPICAL SECTIONS AND DETAILS DIVERSION CHANNEL 1 (2 OF 4)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	12 of 75	C207

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

0 25 mm

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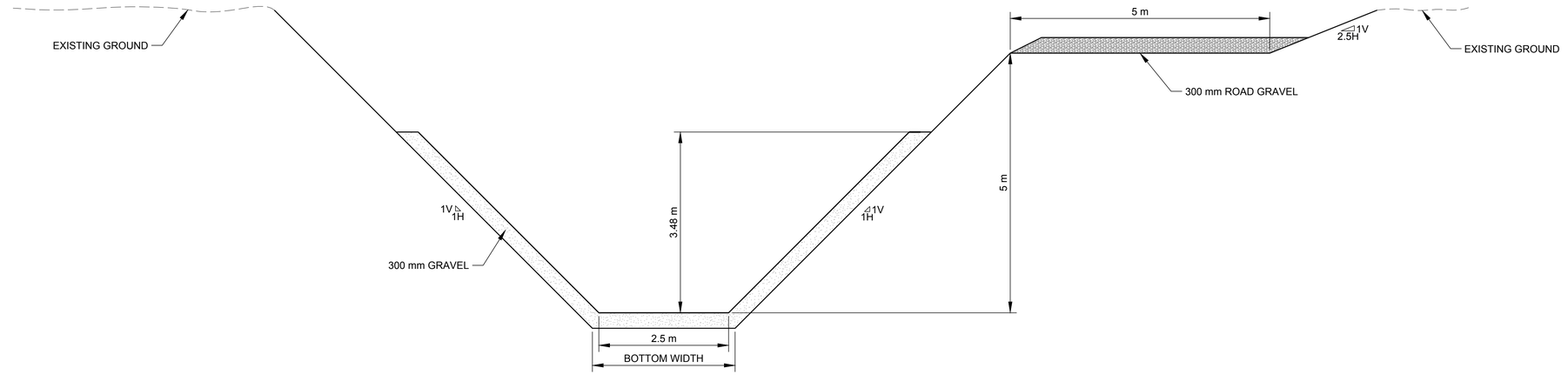
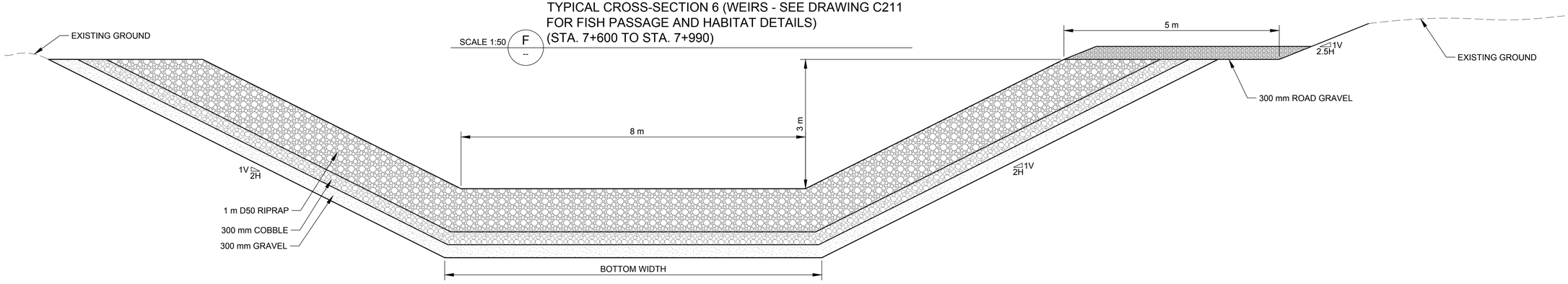


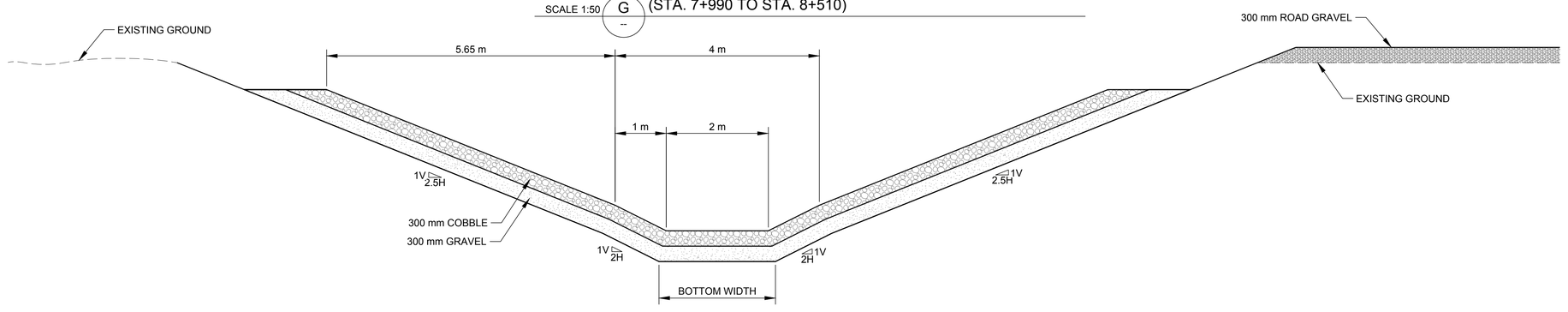
TYPICAL CROSS-SECTION 6 (WEIRS - SEE DRAWING C211 FOR FISH PASSAGE AND HABITAT DETAILS)
(STA. 7+600 TO STA. 7+990)

SCALE 1:50 F --



TYPICAL CROSS-SECTION 7 (ROCK RAMPS - SEE DRAWING C212 FOR FISH PASSAGE AND HABITAT DETAILS)
(STA. 7+990 TO STA. 8+510)

SCALE 1:50 G --



TYPICAL CROSS-SECTION 8 (WEIRS - SEE DRAWING C211 FOR FISH PASSAGE AND HABITAT DETAILS)
(STA. 8+510 TO STA. 8+870)

SCALE 1:50 H --

LEGEND

- EXISTING GROUND
- COBBLE
- RIPRAP
- GRAVEL
- ROAD GRAVEL

NOTE(S)

1. DURING DETAILED DESIGN A LOW-PERMEABILITY LAYER MAY BE ADDED AT REQUIRED LOCATIONS TO MITIGATE AGAINST GROUNDWATER SEEPAGE LOSS FROM THE CHANNEL SO THAT LOW FLOW DEPTHS FOR FISH PASSAGE ARE MAINTAINED.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 2 4
1:50 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

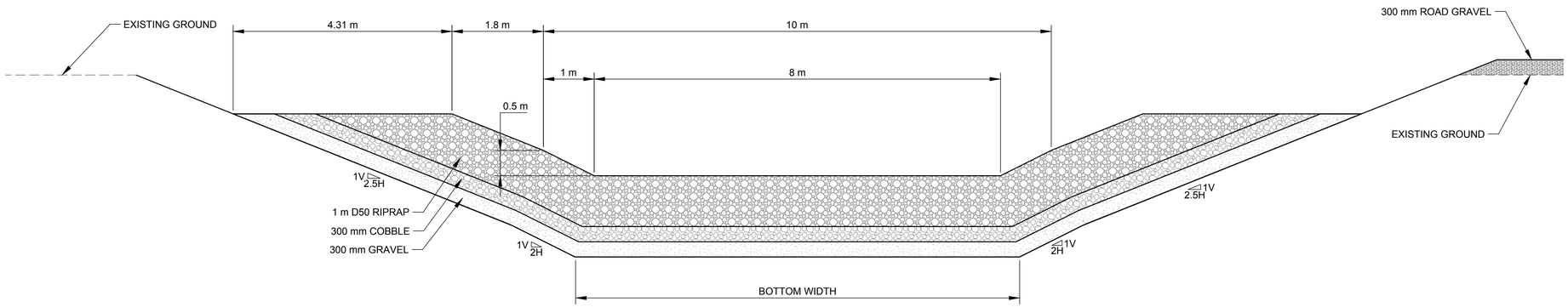
TYPICAL SECTIONS AND DETAILS DIVERSION CHANNEL 1 (3 OF 4)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	13 of 75	C208

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG064.dwg | Last Edited By: tfeterne Date: 2024-05-03 Time:9:06:12 AM | Printed By: TFeterne Date: 2024-05-03 Time:3:41:32 PM

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

0 25 mm



TYPICAL CROSS-SECTION 9 (ROCK RAMPS - SEE DRAWING C212 FOR FISH PASSAGE AND HABITAT DETAILS)
(STA. 8+870 TO STA. 9+300)

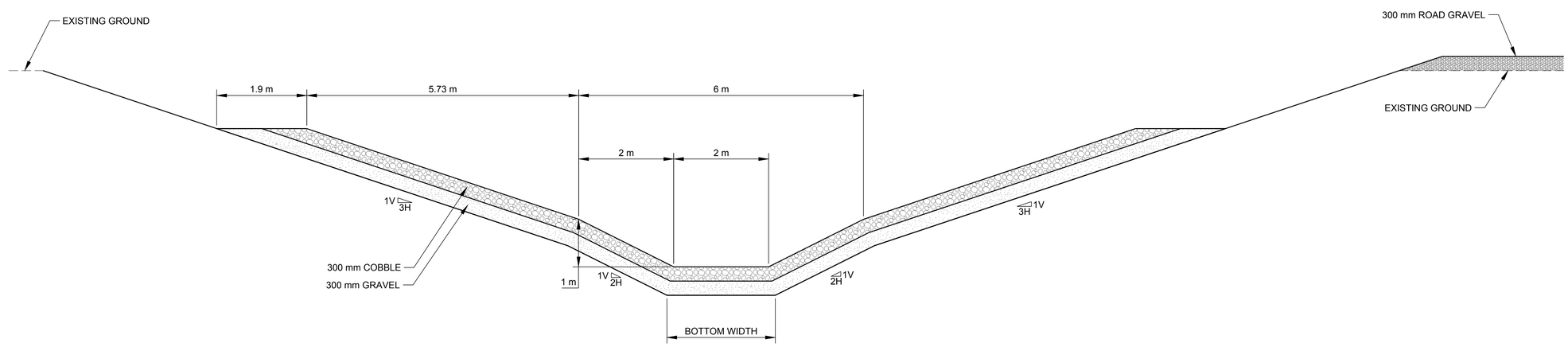
SCALE 1:50 I --

LEGEND

- EXISTING GROUND
- COBBLE
- RIPRAP
- GRAVEL
- ROAD GRAVEL

NOTE(S)

1. DURING DETAILED DESIGN A LOW-PERMEABILITY LAYER MAY BE ADDED AT REQUIRED LOCATIONS TO MITIGATE AGAINST GROUNDWATER SEEPAGE LOSS FROM THE CHANNEL SO THAT LOW FLOW DEPTHS FOR FISH PASSAGE ARE MAINTAINED.



TYPICAL CROSS-SECTION 10
(STA. 9+300 TO STA. 9+654)

SCALE 1:50 J --

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 2 4
1:50 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
TYPICAL SECTIONS AND DETAILS DIVERSION CHANNEL 1 (4 OF 4)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	14 of 75	C209

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG0064.dwg | Last Edited By: tfetene Date: 2024-05-03 Time:9:06:12 AM | Printed By: TFetene Date: 2024-05-03 Time:3:41:57 PM

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

0 25 mm

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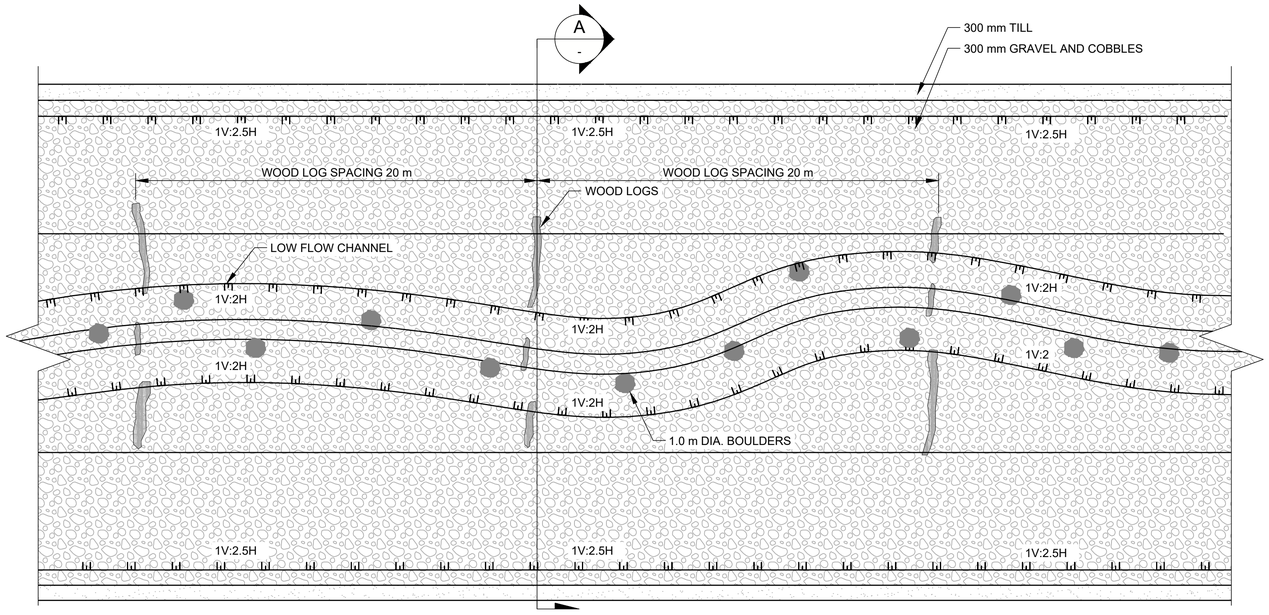
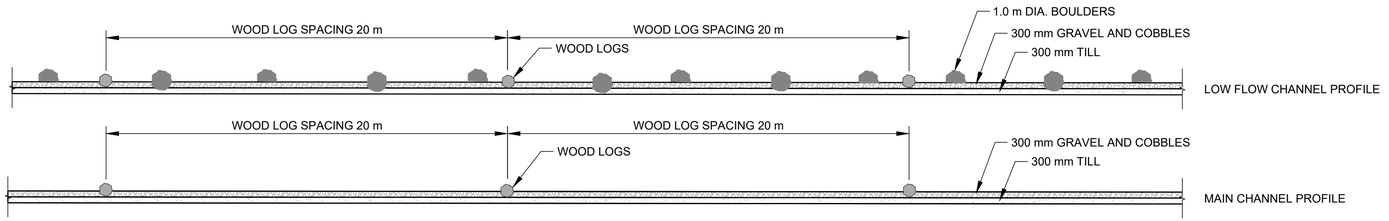
LEGEND

- BOULDERS
- WOOD LOGS
- GRAVEL AND COBBLES
- TILL



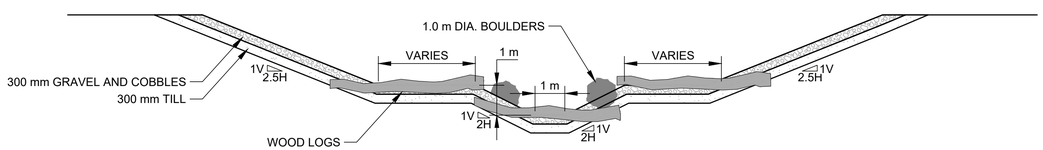
PLAN - DIVERSION CHANNEL DETAIL TYPE 1 - GENTLE MEANDER (FOR TYPICAL CROSS-SECTIONS 1, 2, AND 3)

SCALE 1:150



PROFILE - DIVERSION CHANNEL DETAIL TYPE 1 - GENTLE MEANDER (FOR TYPICAL CROSS-SECTIONS 1, 2, AND 3)

SCALE 1:150



SECTION - DIVERSION CHANNEL DETAIL TYPE 1 - GENTLE MEANDER (FOR TYPICAL CROSS-SECTIONS 1, 2, AND 3)

SCALE 1:100 A -

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 5 10
1:150 METRES

0 5 10
1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

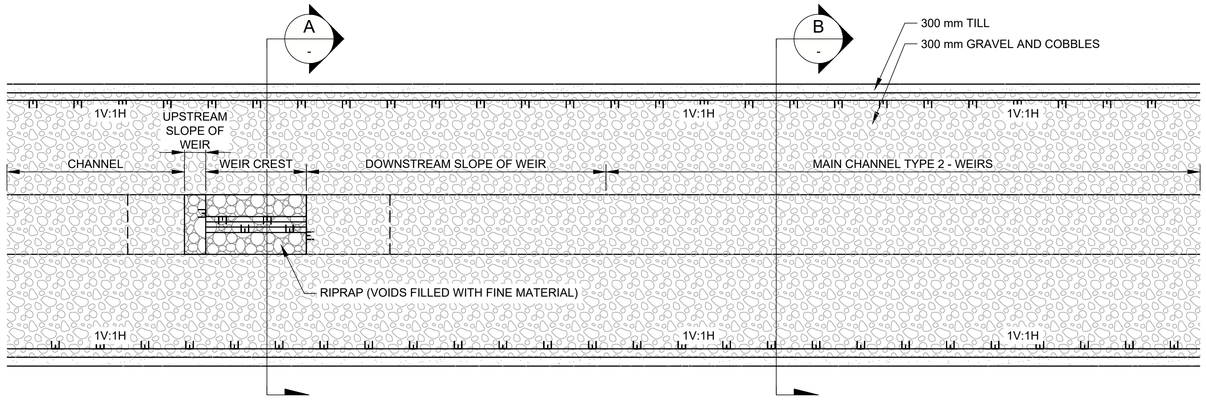
DIVERSION CHANNEL DETAIL TYPE 1 - GENTLE MEANDER

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	15 of 75	C210

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
0 25 mm

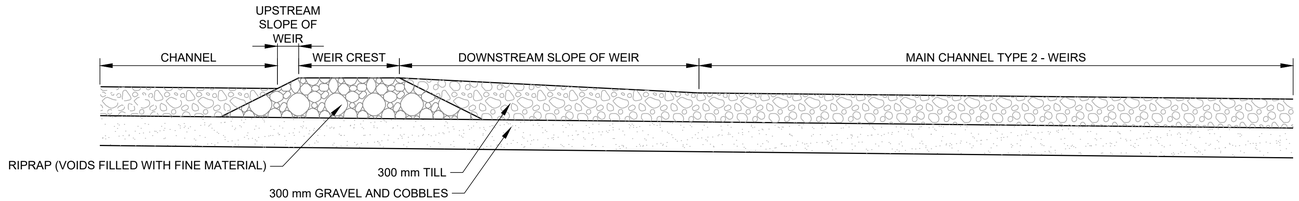
LEGEND

- GRAVEL AND COBBLES
- RIPRAP
- TILL



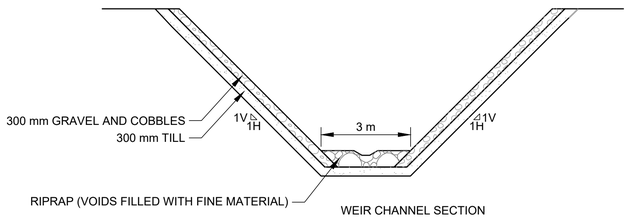
PLAN - DIVERSION CHANNEL TYPE 2 - WEIRS (FOR TYPICAL CROSS-SECTIONS 4, 5, 6, AND 8)

SCALE 1:150



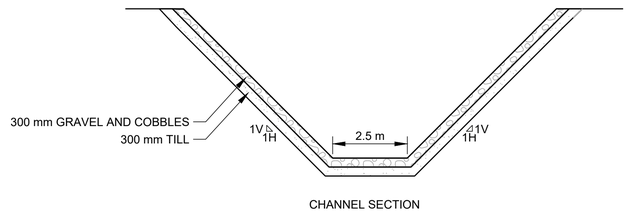
PROFILE - DIVERSION CHANNEL DETAIL TYPE 2 - WEIRS (FOR TYPICAL CROSS-SECTIONS 4, 5, 6, AND 8)

SCALE 1:150
VERTICAL SCALE 1:30



SECTION - DIVERSION CHANNEL DETAIL TYPE 2 - WEIRS (FOR TYPICAL CROSS-SECTIONS 4, 5, 6, AND 8)

SCALE 1:100 A -



SECTION - DIVERSION CHANNEL DETAIL TYPE 2 - WEIRS (FOR TYPICAL CROSS-SECTIONS 4, 5, 6, AND 8)

SCALE 1:100 B -

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 1 2
1:30 METRES

0 5 10
1:150 METRES

0 5 10
1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

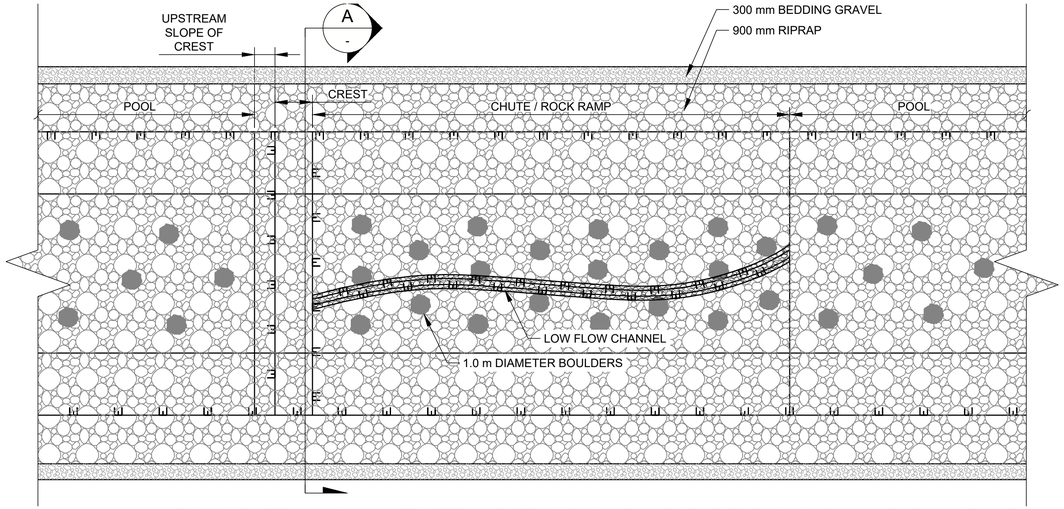
DIVERSION CHANNEL DETAIL TYPE 2 - WEIRS

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	16 of 75	C211

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

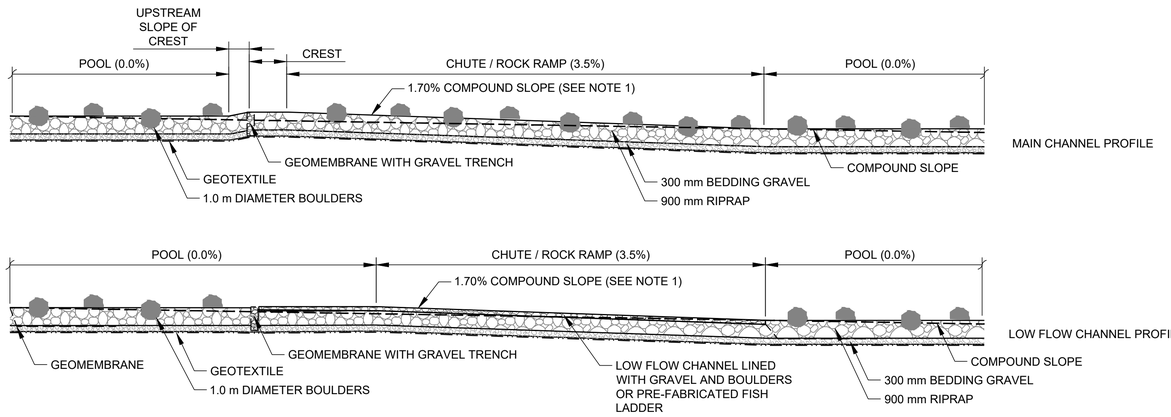
0 25 mm

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\09_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG912.dwg | Last Edited By: jcztemastek Date: 2024-05-03 Time:9:41:43 AM | Printed By: JCztemastek Date: 2024-05-03 Time:10:22:27 AM



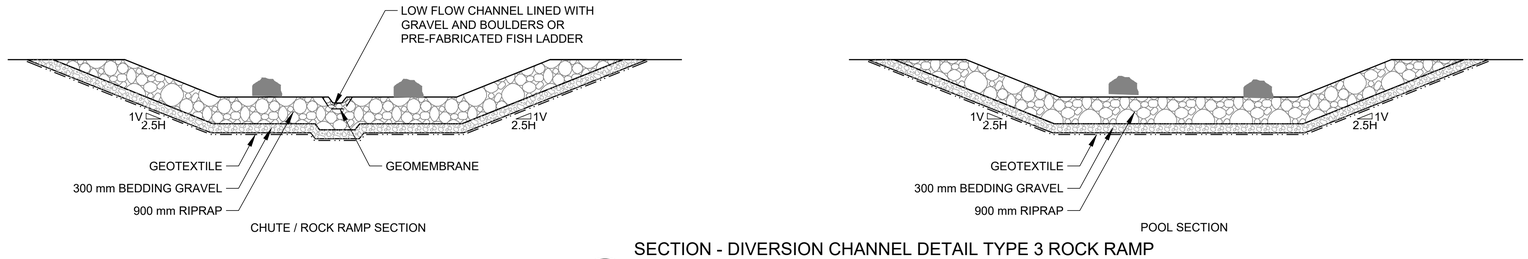
PLAN - DIVERSION CHANNEL DETAIL TYPE 3 - ROCK RAMP (FOR TYPICAL CROSS-SECTIONS 7 AND 9)

SCALE 1:150



PROFILE - DIVERSION CHANNEL DETAIL TYPE 3 ROCK RAMP (FOR TYPICAL CROSS-SECTIONS 7 AND 9)

SCALE 1:150



SECTION - DIVERSION CHANNEL DETAIL TYPE 3 ROCK RAMP (FOR TYPICAL CROSS-SECTIONS 7 AND 9)

SCALE 1:100 A -

LEGEND

- BOULDERS
- GEOTEXTILE
- BEDDING GRAVEL
- RIPRAP

NOTE(S)

1. THE 1.70% SLOPE REPRESENTS AN AVERAGE SLOPE THROUGH THE SEGMENT, FOR HYDRAULIC MODELING OF FLOOD FLOWS. THE COMPOUND SLOPE IN THESE SEGMENTS, WHICH INCORPORATES ADDITIONAL DETAILS FOR FISH PASSAGE, IS REPRESENTED BY THE DETAILED SCHEMATICS SHOWN IN DRAWING C212.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 5 10
1:150 METRES

0 5 10
1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

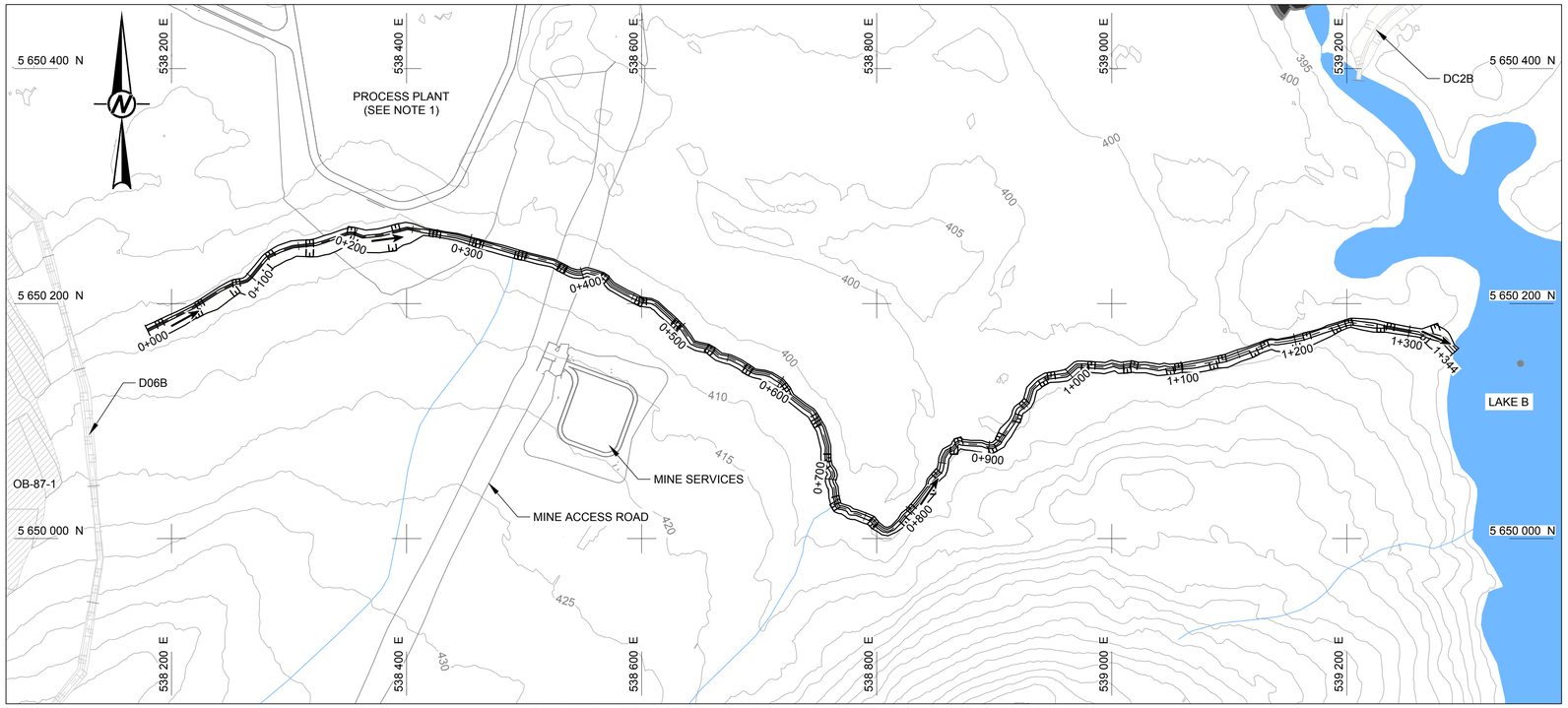
DIVERSION CHANNEL DETAIL TYPE 3 - ROCK RAMP

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	17 of 75	C212

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

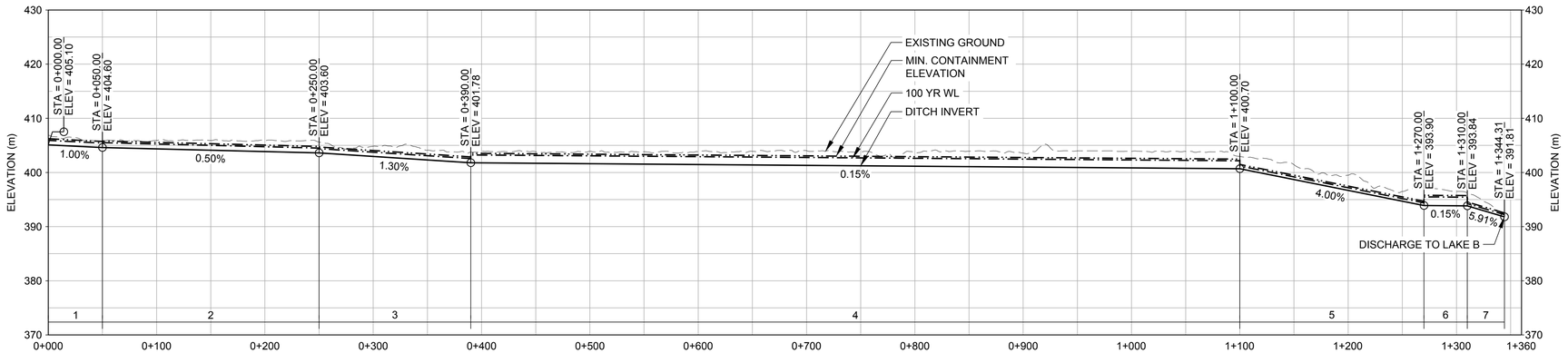
25 mm

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG\63.dwg | Last Edited By: jczternastek Date: 2024-05-03 Time:10:21:19 AM | Printed By: JCzternastek Date: 2024-05-03 Time:10:21:39 AM



PLAN - DIVERSION CHANNEL (NON-CONTACT WATER) - DC2A

SCALE 1:2,500



PROFILE - DIVERSION CHANNEL (NON-CONTACT WATER) - DC2A

SCALE 1:2,500

VERTICAL SCALE 1:500

DC2A													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
1	0	50	1.2	C530	50	1.00%	3	2	1.55	100	2 yr	0.29	0.16	0.74
											10 yr	2.22	0.48	1.35
											100 yr	6.8	0.83	1.83
2	50	250	1.2	C530	200	0.50%	3	2	1.91	100	2 yr	0.29	0.18	0.65
											10 yr	2.22	0.53	1.18
											100 yr	6.80	0.91	1.59
3	250	390	2.2	C531	140	1.30%	1	3	2.05	300	2 yr	0.29	0.12	0.76
											10 yr	2.22	0.41	1.58
											100 yr	6.80	0.80	2.25
4	390	1110	2.2	C531	720	0.15%	1	3	2.77	100	2 yr	0.29	0.23	0.39
											10 yr	2.22	0.78	0.76
											100 yr	6.80	1.46	1.04
5	1110	1280	2.2	C531	170	4.00%	1	4	2.70	300	2 yr	0.29	0.07	0.98
											10 yr	2.22	0.25	2.11
											100 yr	6.80	0.48	3.13
6	1280	1320	2.2	C531	40	0.15%	1	2	2.93	100	2 yr	0.29	0.27	0.47
											10 yr	2.22	0.88	0.88
											100 yr	6.80	1.59	1.19
7	1320	1356.9	1.2	C530	37	5.50%	3	5	1.57	300	2 yr	0.29	0.06	0.88
											10 yr	2.22	0.21	1.87
											100 yr	6.80	0.40	2.73

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ADDITIONAL DRAINAGE FEATURE AROUND THE PROCESS PLANT WILL BE DEFINED, IF REQUIRED, AFTER THE CONFIRMATION OF THE PLANT LAYOUT.
2. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
3. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 100 200
1:2,500 METRES

0 20 40
1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE - DIVERSION CHANNEL 2A

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	18 of 75	C300

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG013.dwg | Last Edited By: aspuler Date: 2024-05-03 Time:4:33:54 PM | Printed By: ASpuler Date: 2024-05-03 Time:4:36:00 PM

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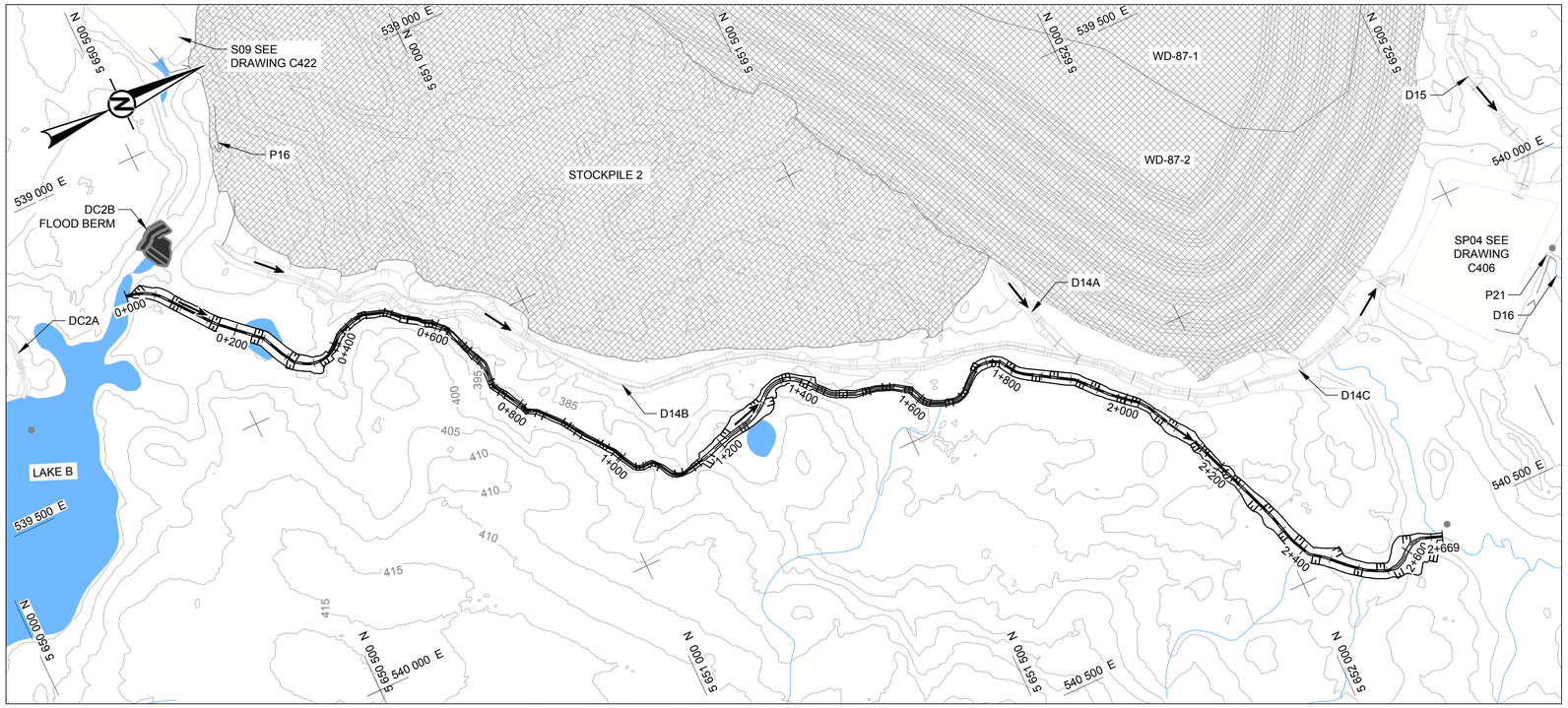
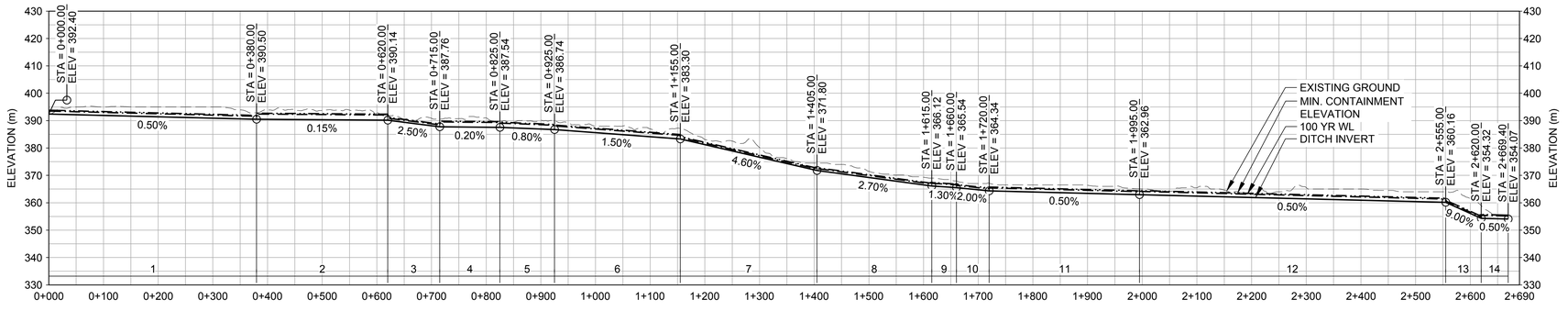


PLAN - DIVERSION CHANNEL (NON-CONTACT WATER) - DC2B

SCALE 1:5,000



PROFILE - DIVERSION CHANNEL (NON-CONTACT WATER) - DC2B

SCALE 1:5,000

VERTICAL SCALE 1:1,000

DC2B													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	To			(m)	%	(H:1V	(m)	(m)	(mm)	(Years)	(m3/s)	(m)	(m/s)
1	0	380	1.2	C530	380	0.50%	3	3	2.82	300	2 yr	0.59	0.22	0.75
											10 yr	3.94	0.61	1.34
											100 yr	12.96	1.11	1.86
2	380	620	2.2	C531	240	0.15%	1	3	3.11	100	2 yr	0.59	0.32	0.55
											10 yr	3.94	0.99	1.00
											100 yr	12.96	1.90	1.39
3	620	715	2.2	C531	95	2.50%	1	5	2.15	300	2 yr	0.59	0.11	1.03
											10 yr	3.94	0.35	2.09
											100 yr	12.96	0.72	3.16
4	715	825	2.2	C531	110	0.20%	1	3	3.10	100	2 yr	0.59	0.30	0.60
											10 yr	3.94	0.91	1.11
											100 yr	12.96	1.76	1.54
5	825	925	2.2	C531	100	0.80%	1	2	2.86	100	2 yr	0.59	0.27	0.95
											10 yr	3.94	0.83	1.69
											100 yr	12.96	1.56	2.32
6	925	1155	2.2	C531	230	1.50%	1	2	2.45	300	2 yr	0.59	0.23	1.16
											10 yr	3.94	0.69	2.12
											100 yr	12.96	1.33	2.93
7	1155	1405	1.2	C530	250	4.60%	3	6	3.15	500	2 yr	0.59	0.09	1.03
											10 yr	3.94	0.28	2.06
											100 yr	12.96	0.55	3.06
8	1405	1615	2.2	C531	210	2.70%	1	5	2.46	300	2 yr	0.59	0.11	1.05
											10 yr	3.94	0.34	2.14
											100 yr	12.96	0.70	3.24
9	1615	1660	2.2	C531	45	1.30%	1	4	2.72	300	2 yr	0.59	0.16	0.91
											10 yr	3.94	0.49	1.79
											100 yr	12.96	0.99	2.63
10	1660	1720	2.2	C531	60	2.00%	1	5	2.16	300	2 yr	0.59	0.12	0.96
											10 yr	3.94	0.38	1.94
											100 yr	12.96	0.77	2.93
11	1720	1995	1.2	C530	275	0.50%	3	3	2.48	100	2 yr	0.59	0.22	0.75
											10 yr	3.94	0.61	1.34
											100 yr	12.96	1.11	1.86
12	1995	2555	1.2	C530	560	0.50%	3	3	3.04	100	2 yr	0.59	0.24	0.68
											10 yr	3.94	0.66	1.20
											100 yr	12.96	1.19	1.66
13	2555	2620	1.2	C530	65	9.00%	3	6	5.43	500	2 yr	0.59	0.08	1.21
											10 yr	3.94	0.24	2.44
											100 yr	12.96	0.48	3.66
14	2620	2669.4	1.2	C530	49	0.50%	3	3	2.11	100	2 yr	0.59	0.22	0.75
											10 yr	3.94	0.61	1.34
											100 yr	12.96	1.11	1.86

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

0 200 400
1:5,000 METRES

0 50 100
1:1,000 METRES

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE - DIVERSION CHANNEL 2B

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	19 of 75	C301

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG014.dwg | Last Edited By: jczternastek Date: 2024-05-03 Time:12:02:53 PM | Printed By: ASouter Date: 2024-05-03 Time:4:40:14 PM

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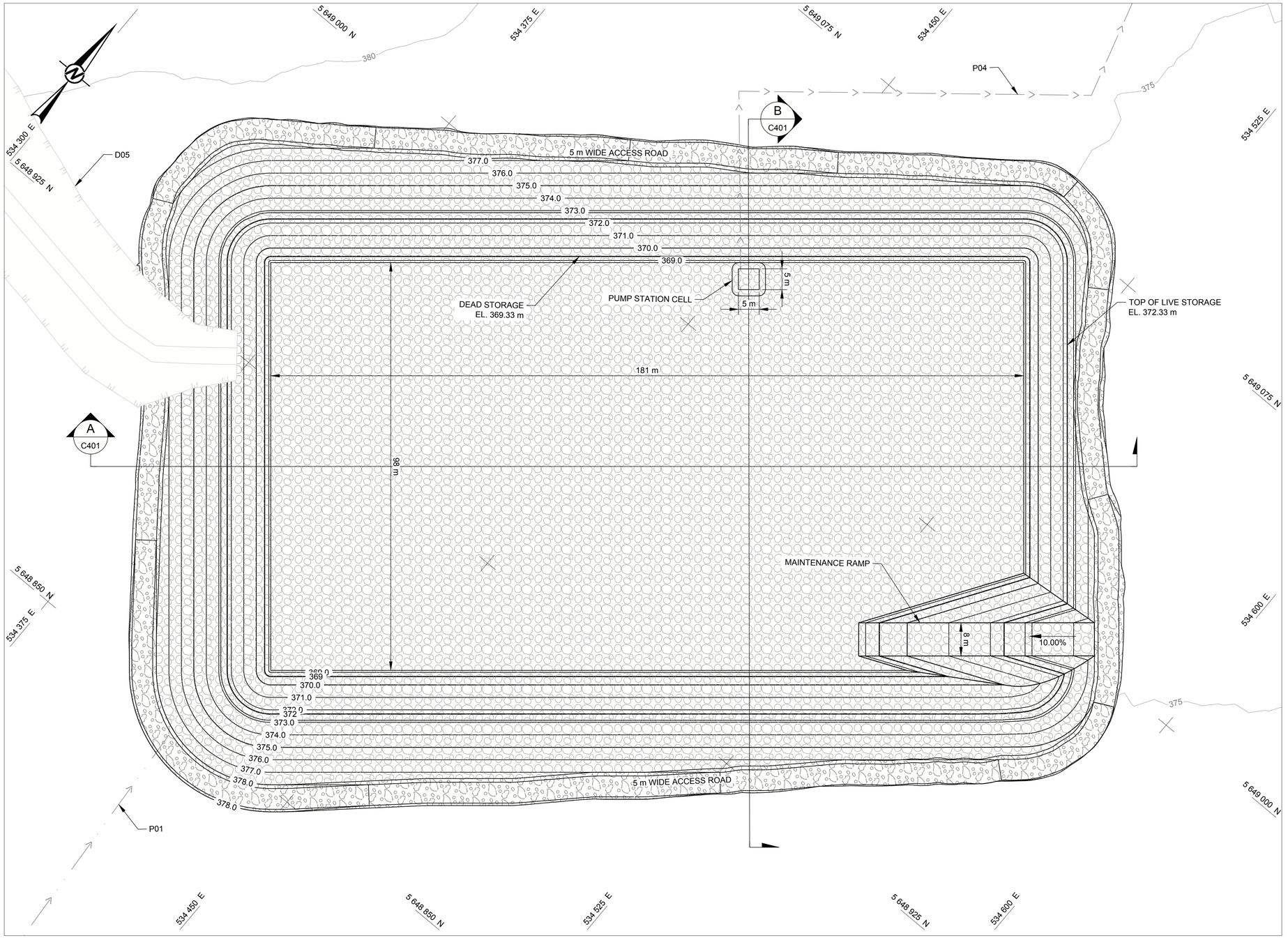

WATER MANAGEMENT

		SP01
PARAMETER	UNIT	
INVERT ELEVATION	masl	368.83
TOP OF DEAD STORAGE	masl	369.33
LIVE STORAGE ELEVATION	masl	372.33
CONTAINMENT ELEVATION	masl	372.83
BEDROCK ELEVATION	masl	363.05
DEAD STORAGE VOLUME	m^3	8,773
LIVE STORAGE VOLUME	m^3	74,522.43
TOTAL CONTAINMENT VOLUME	m^3	83,296

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- ROCK FILL
- ROAD GRAVEL

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 20 40
1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN – SETTLING POND SP01

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	20 of 75	C400

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25 mm
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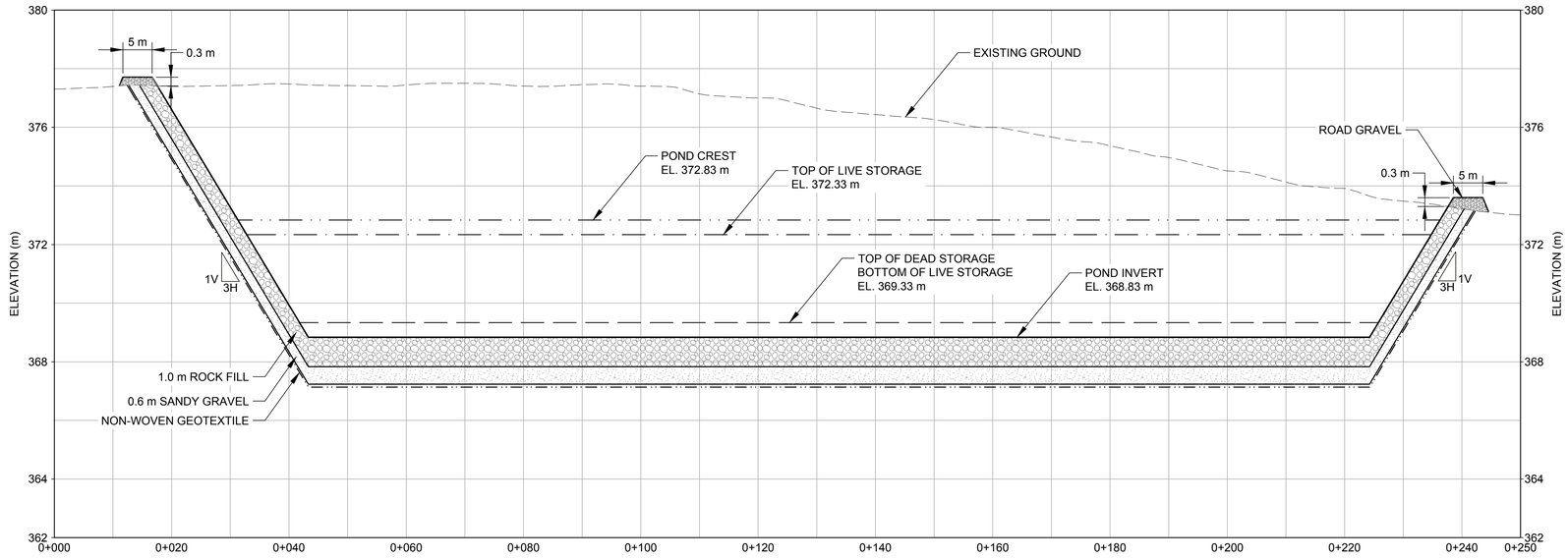

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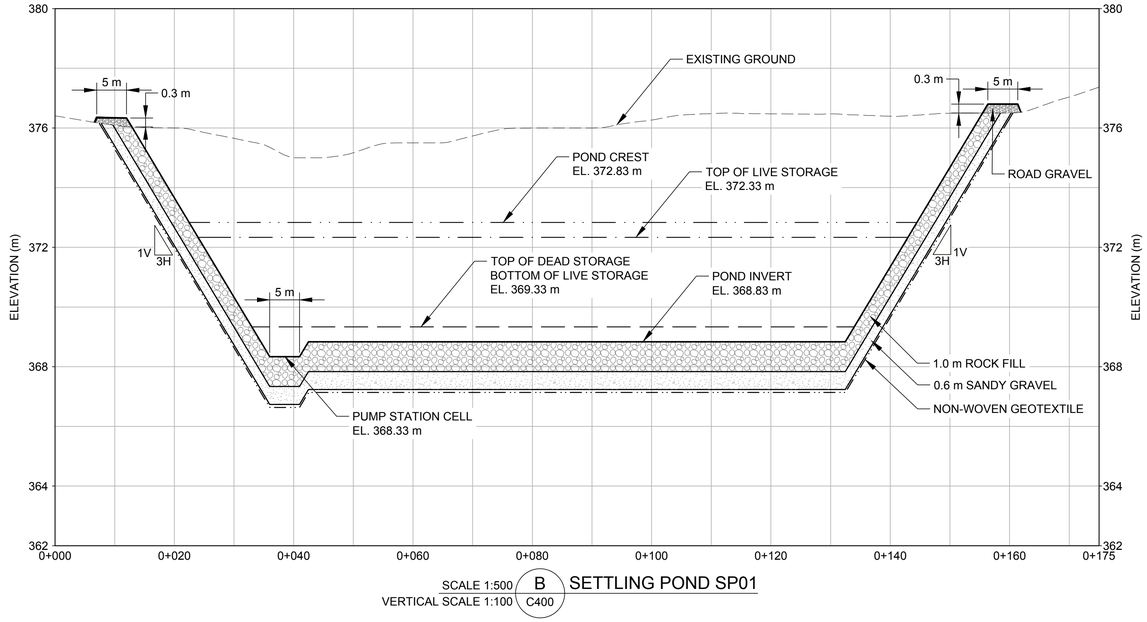


SCALE 1:500 / VERTICAL SCALE 1:100 — B (C400) — SETTLING POND SP01

LEGEND

- NON-WOVEN GEOTEXTILE
- ROCK FILL
- ROAD GRAVEL
- SANDY GRAVEL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 20 40
1:500 METRES

0 5 10
1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
WSP
CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

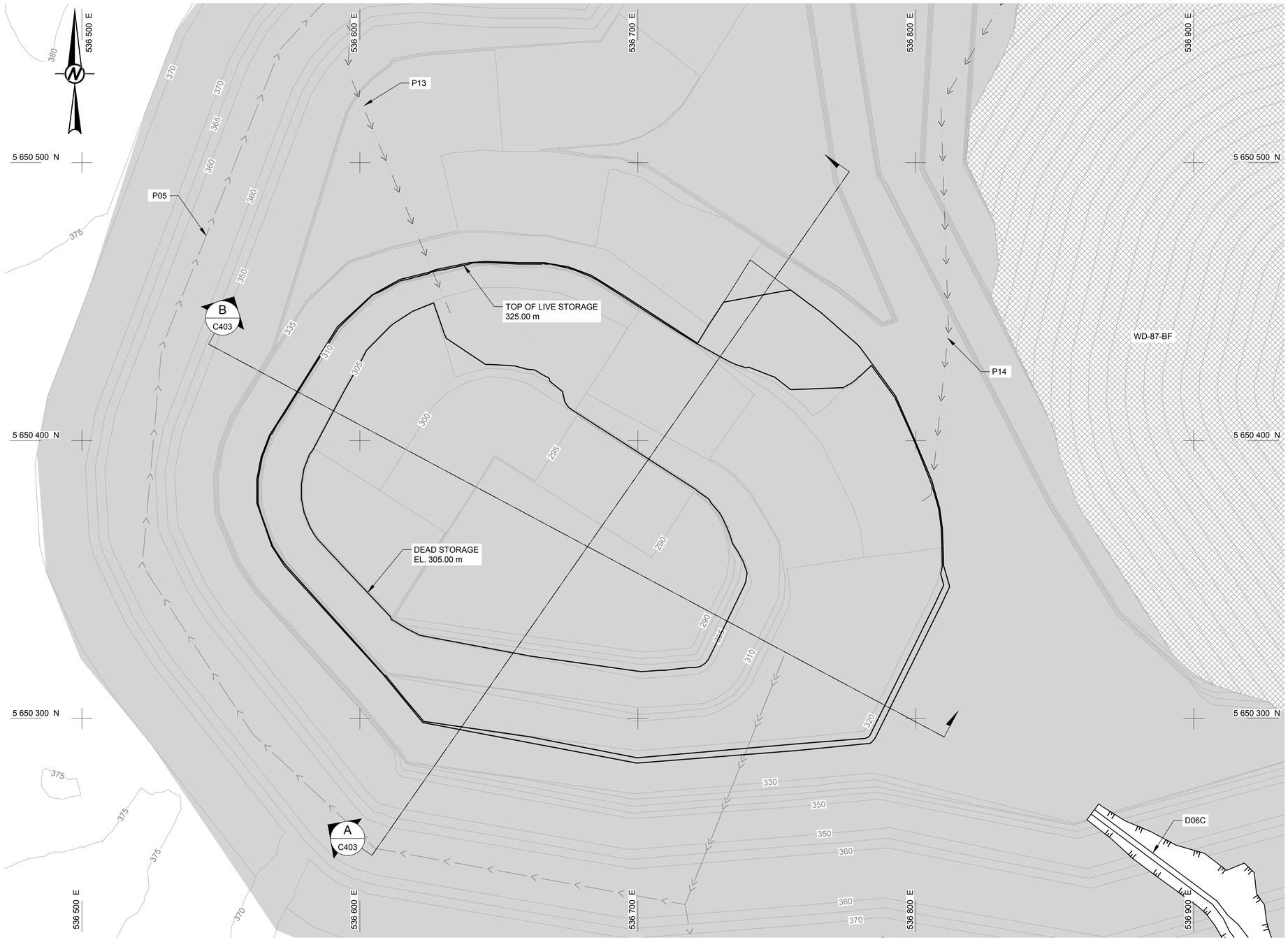
TITLE
SECTIONS – SETTLING POND SP01

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	21 of 75	C401

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

0 25 mm

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG017.dwg | Last Edited By: jcztemastek Date: 2024-05-03 Time:10:39:11 AM | Printed By: JCztemastek Date: 2024-05-03 Time:10:41:35 AM



WATER MANAGEMENT

		SP02
PARAMETER	UNIT	
INVERT ELEVATION	masl	290.00
TOP OF DEAD STORAGE	masl	305.00
LIVE STORAGE ELEVATION	masl	325.00
CONTAINMENT ELEVATION	masl	330.00
BEDROCK ELEVATION	masl	--
DEAD STORAGE VOLUME	m^3	127,707
LIVE STORAGE VOLUME	m^3	516,128
TOTAL CONTAINMENT VOLUME	m^3	757,867

LEGEND

- TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- ROCK FILL
- ROAD GRAVEL

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, DECEMBER 18, 2023.
3. PROCESS PLANT LAYOUT FROM LYCOPODIUM, NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25 2022.
5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
3. SP02 SURFACE FROM AGP V9 50 KTPD MINE PLAN. THE SURFACE AND SECTIONS SHOWN REPRESENT THE 87 PIT PHASE 0 PIT SHELL, WHICH IS EXCAVATED IN THE EARLY STAGES ON THE MINE PLAN TO ACCOMMODATE CONTACT WATER RUNOFF.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 50 100
1:1,000 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN – SETTLING POND SP02

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	22 of 75	C402

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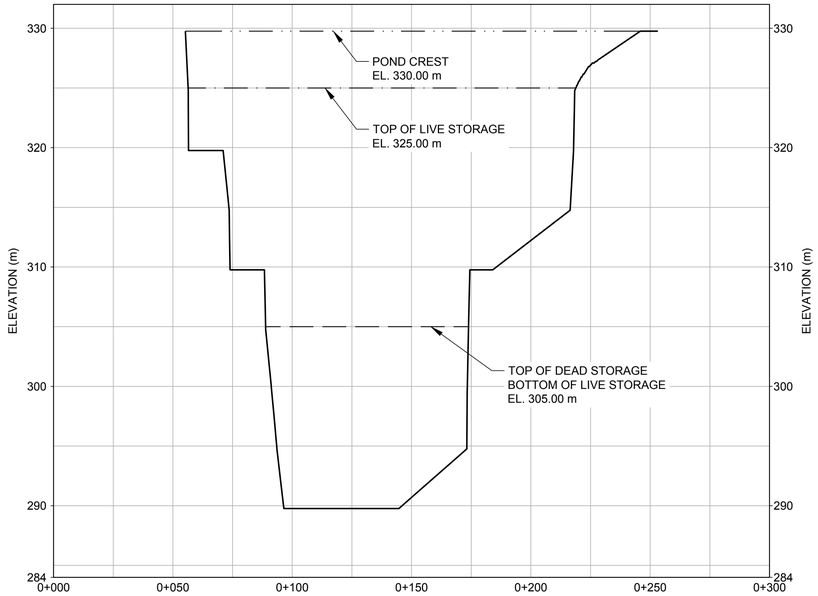
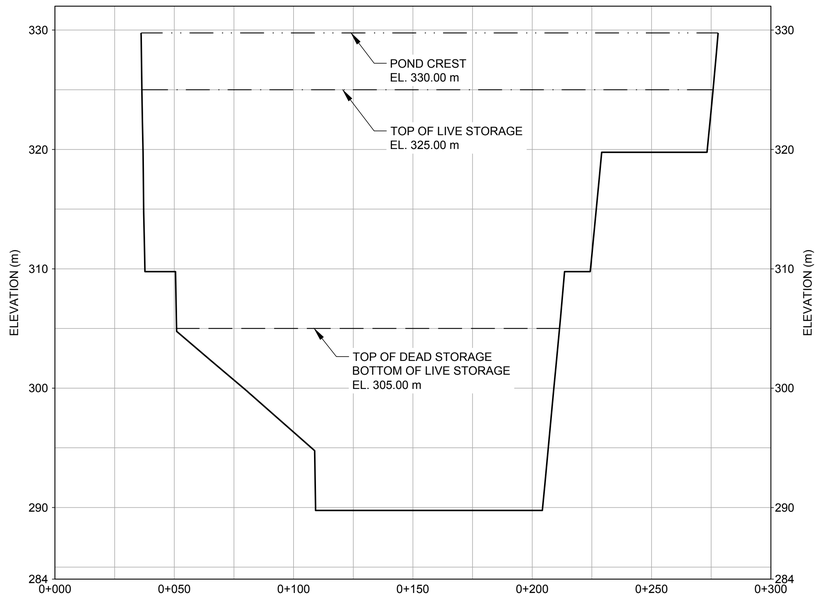


SCALE 1:1 250 m
VERTICAL SCALE 1:250

A C402 SETTLING POND SP02



SCALE 1:1 250 m
VERTICAL SCALE 1:250

B C402 SETTLING POND SP02

LEGEND

- NON-WOVEN GEOTEXTILE
- ROCK FILL
- ROAD GRAVEL
- SANDY GRAVEL

NOTE(S)

1. SP02 SURFACE FROM AGP V9 50 KTPD MINE PLAN. THE SURFACE AND SECTIONS SHOWN REPRESENT THE 87 PIT PHASE 0 PIT SHELL, WHICH IS EXCAVATED IN THE EARLY STAGES ON THE MINE PLAN TO ACCOMMODATE CONTACT WATER RUNOFF.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 50 100
1:1,250 METRES

0 10 20
1:250 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

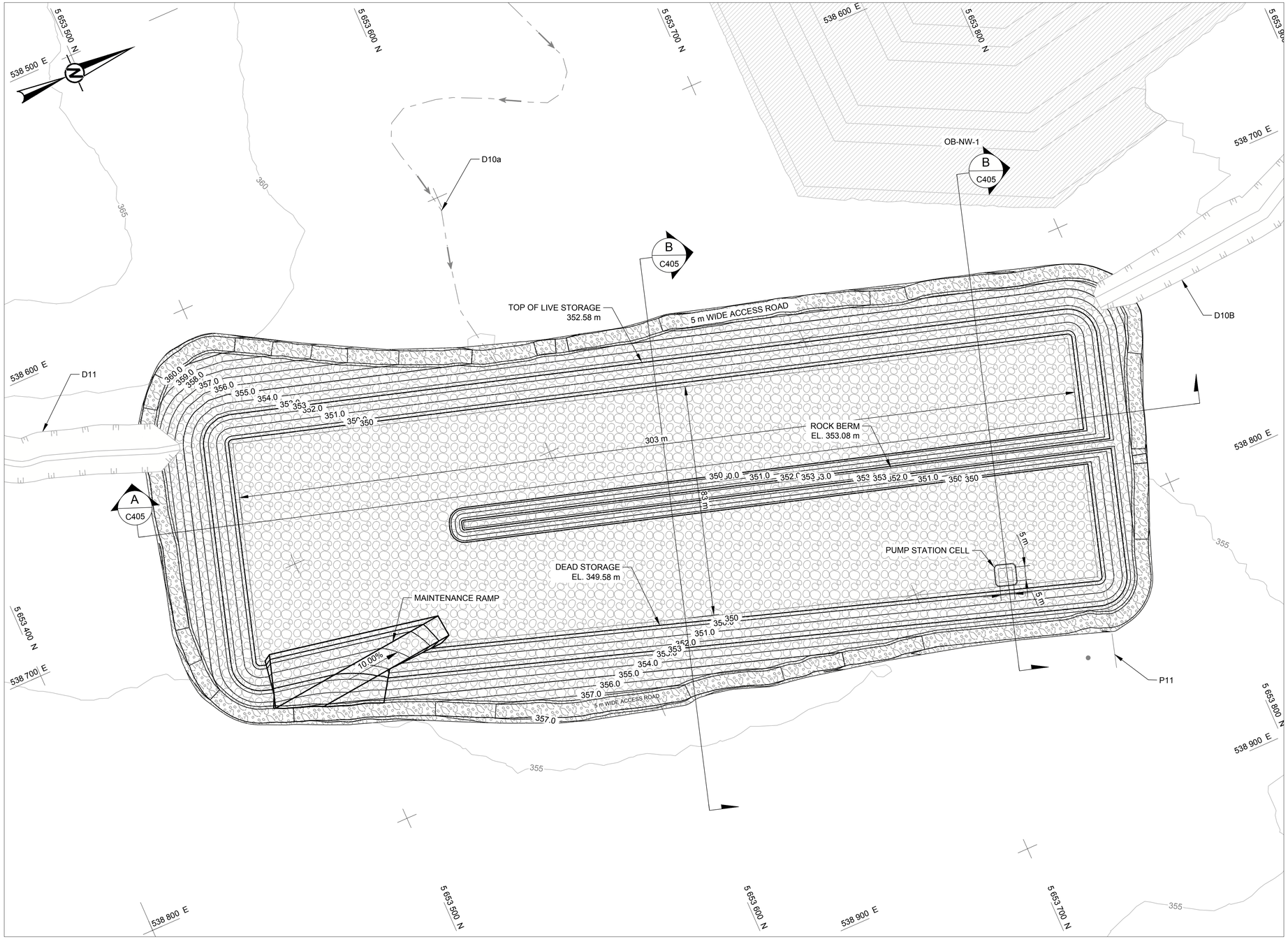
TITLE

SECTIONS – SETTLING POND SP02

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	23 of 75	C403

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG018.dwg | Last Edited By: jcsternastek Date: 2024-05-03 Time:10:59:36 AM | Printed By: JCsternastek Date: 2024-05-03 Time:11:06:14 AM

0 25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



WATER MANAGEMENT

		SP03
PARAMETER	UNIT	
INVERT ELEVATION	masl	349.08
TOP OF DEAD STORAGE	masl	349.58
LIVE STORAGE ELEVATION	masl	352.58
CONTAINMENT ELEVATION	masl	353.08
BEDROCK ELEVATION	masl	336.19
DEAD STORAGE VOLUME	m^3	11,556
LIVE STORAGE VOLUME	m^3	83,000
TOTAL CONTAINMENT VOLUME	m^3	99,598

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- ROCK FILL
- ROAD GRAVEL

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, DECEMBER 18, 2023.
3. PROCESS PLANT LAYOUT FROM LYCOPODIUM, NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25 2022.
5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 25 50
1:750 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN – SETTLING POND SP03

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	24 of 75	C404

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG019.dwg | Last Edited By: jczternastek Date: 2024-05-03 Time:11:18:13 AM | Printed By: JCzternastek Date: 2024-05-03 Time:11:20:30 AM

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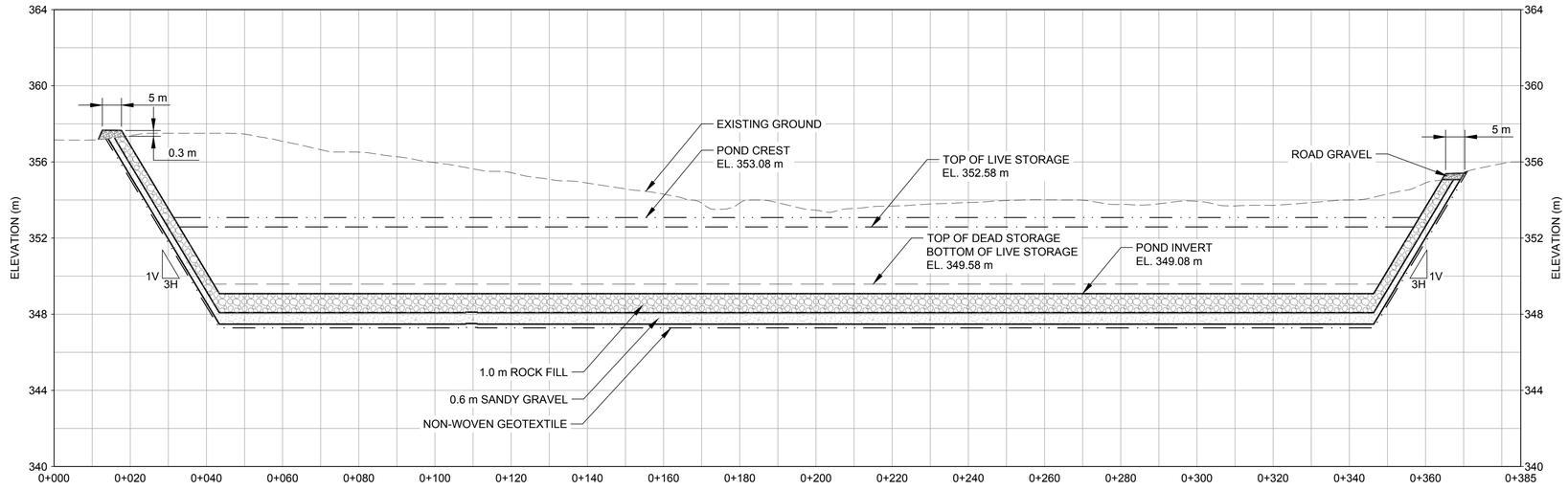
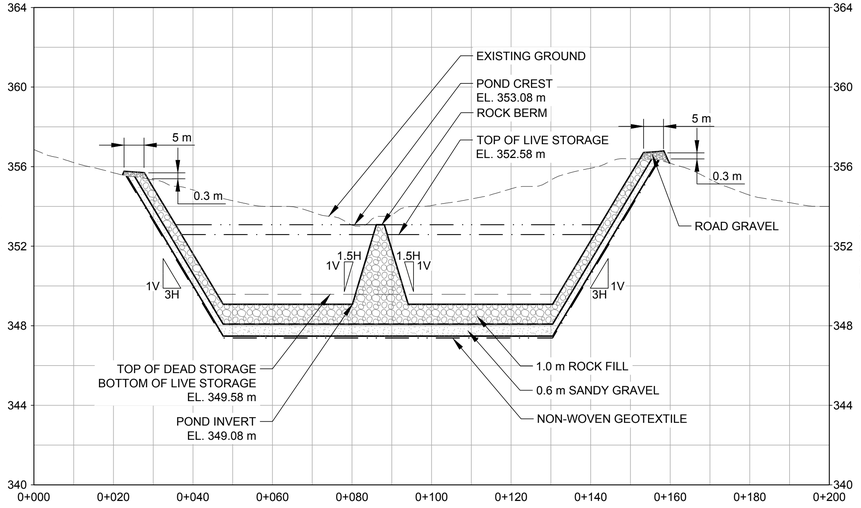


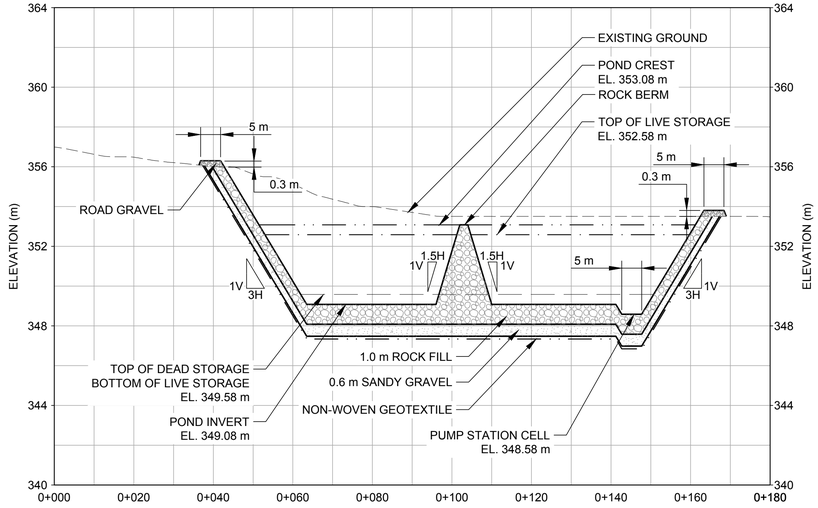
SCALE 1:750 m
VERTICAL SCALE 1:150

A C404 SETTLING POND SP03



SCALE 1:750 m
VERTICAL SCALE 1:150

B C404 SETTLING POND SP03



SCALE 1:750 m
VERTICAL SCALE 1:150

C C404 SETTLING POND SP03

LEGEND

- NON-WOVEN GEOTEXTILE
- ROCK FILL
- ROAD GRAVEL
- SANDY GRAVEL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 25 50
1:750 METRES

0 5 10
1:150 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SECTIONS – SETTLING POND SP03

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	25 of 75	C405

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

0 25 mm

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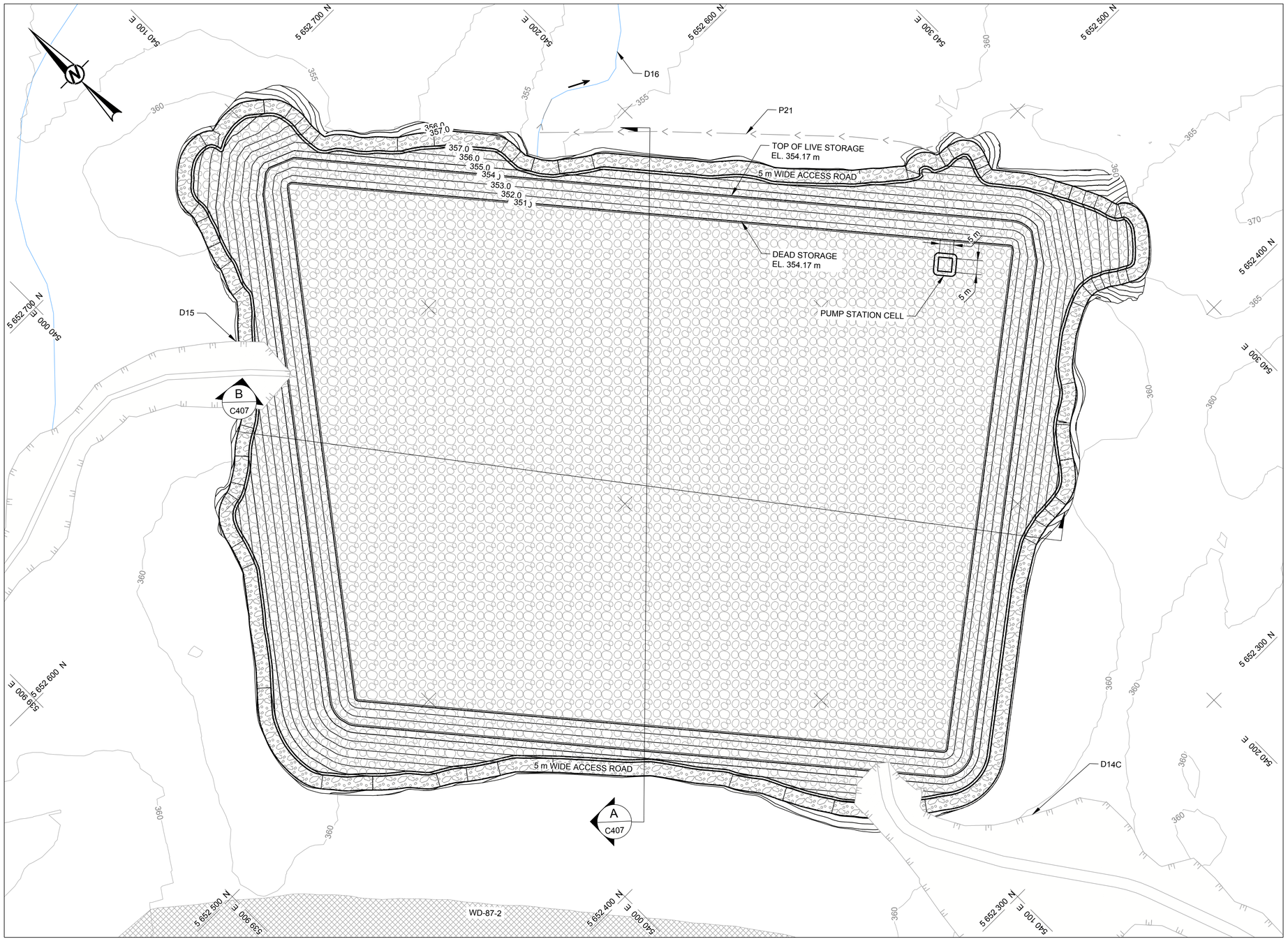


WATER MANAGEMENT

		SP04
PARAMETER	UNIT	
INVERT ELEVATION	masl	350.67
TOP OF DEAD STORAGE	masl	351.17
LIVE STORAGE ELEVATION	masl	354.17
CONTAINMENT ELEVATION	masl	354.67
BEDROCK ELEVATION	masl	345.55
DEAD STORAGE VOLUME	m^3	18,350
LIVE STORAGE VOLUME	m^3	145,000
TOTAL CONTAINMENT VOLUME	m^3	156,244

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- ROCK FILL
- ROAD GRAVEL

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, DECEMBER 18, 2023.
3. PROCESS PLANT LAYOUT FROM LYCOPODIUM, NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25 2022.
5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 25 50
1:750 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN – SETTLING POND SP04

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	26 of 75	C406

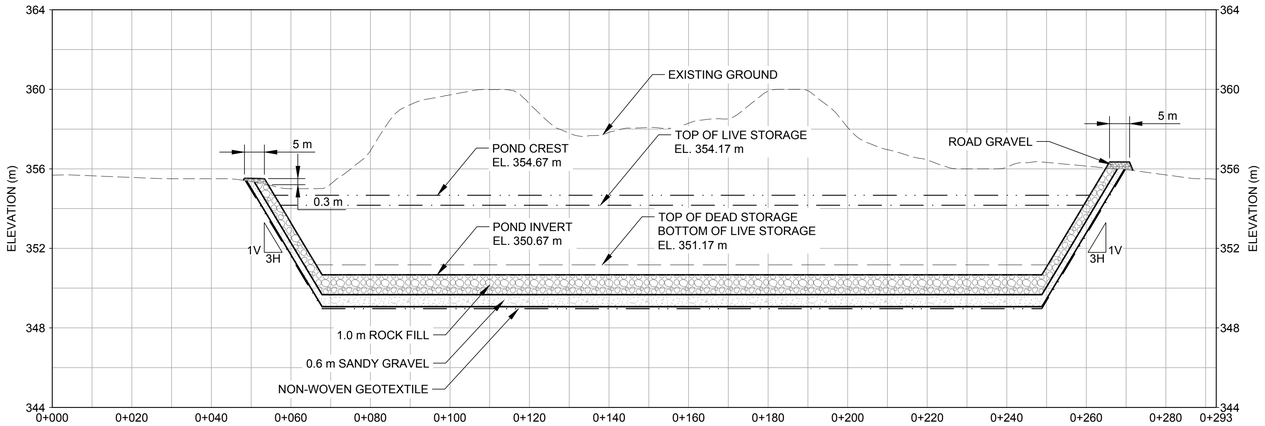
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG020.dwg | Last Edited By: tfeterne Date: 2024-05-03 Time:2:19:19 PM | Printed By: TFeterne Date: 2024-05-03 Time:2:20:13 PM

LEGEND

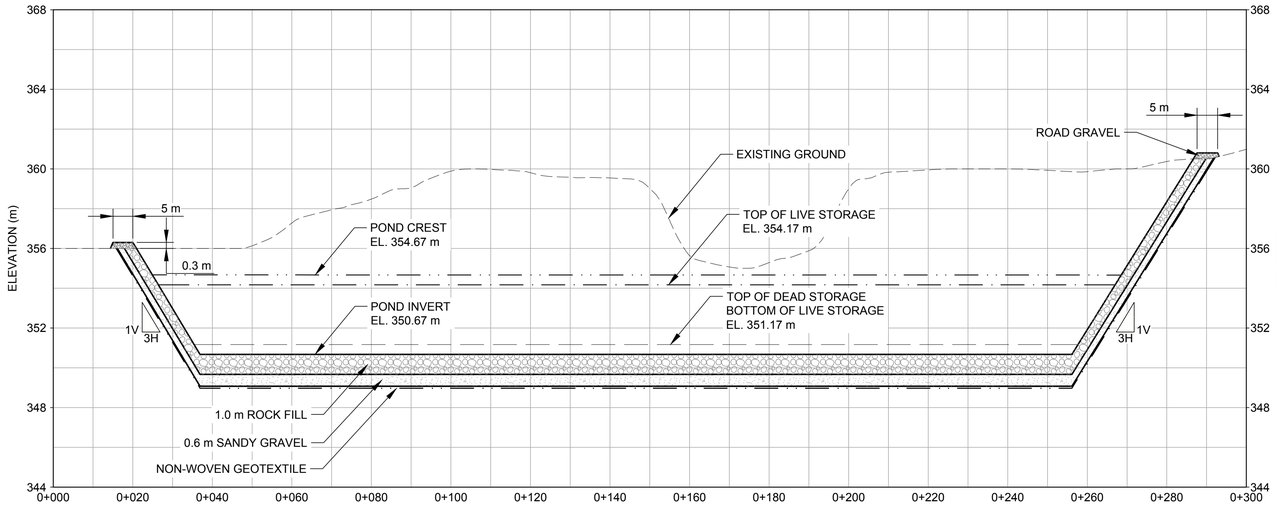
- NON-WOVEN GEOTEXTILE
- ROCK FILL
- ROAD GRAVEL
- SANDY GRAVEL



SCALE 1:750 m
VERTICAL SCALE 1:150

A C406

SETTLING POND SP04



SCALE 1:750 m
VERTICAL SCALE 1:150

B C406

SETTLING POND SP04

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 25 50
1:750 METRES

0 5 10
1:150 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SECTIONS – SETTLING POND SP04

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	27 of 75	C407

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

0 25 mm

WATER MANAGEMENT

		S01
PARAMETER	UNIT	
INVERT ELEVATION	masl	375.70
TOP OF DEAD STORAGE	masl	375.70
LIVE STORAGE ELEVATION	masl	377.70
CONTAINMENT ELEVATION	masl	378.20
BEDROCK ELEVATION	masl	374.60
DEAD STORAGE VOLUME	m^3	8,439
LIVE STORAGE VOLUME	m^3	74,810
TOTAL CONTAINMENT VOLUME	m^3	94,818

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- ROCK FILL
- ROAD GRAVEL

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, DECEMBER 18, 2023.
3. PROCESS PLANT LAYOUT FROM LYCOPODIUM, NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25 2022.
5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 25 50
1:750 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN – SUMP S01

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	28 of 75	C408

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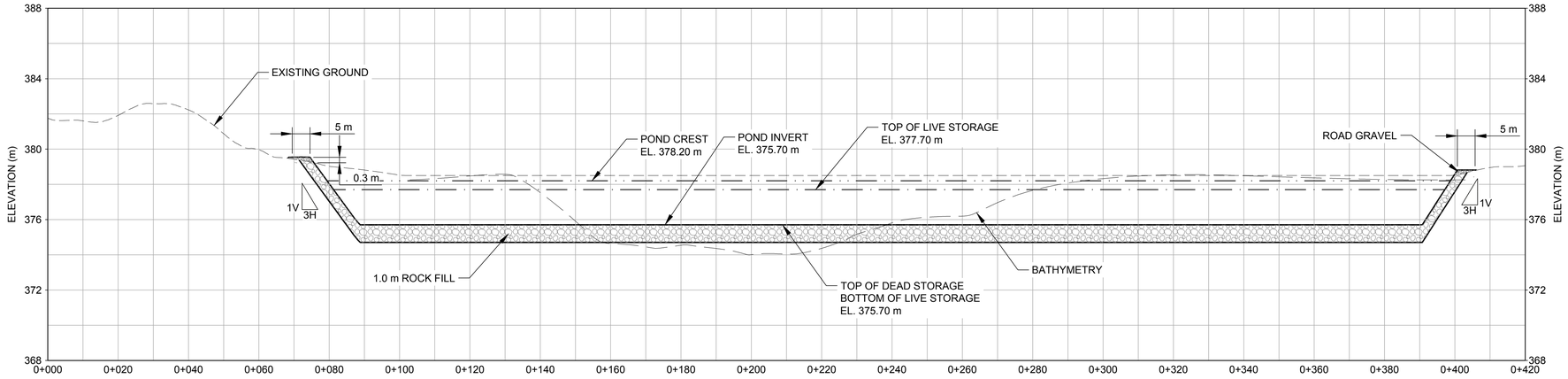
LEGEND

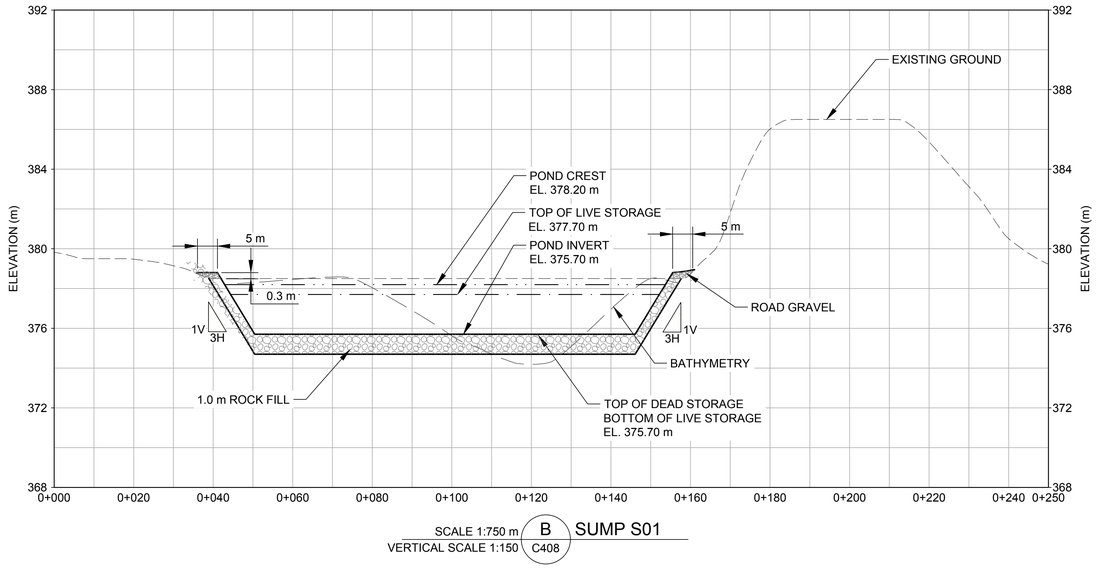
ROCK FILL

ROAD GRAVEL



SCALE 1:750 m
VERTICAL SCALE 1:150

A C408 SUMP S01



SCALE 1:750 m
VERTICAL SCALE 1:150

B C408 SUMP S01

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 25 50
1:750 METRES

0 5 10
1:150 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SECTIONS – SUMP S01

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	29 of 75	C409

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG021.dwg | Last Edited By: tfetene Date: 2024-05-03 Time:12:02:01 PM | Printed By: TFetene Date: 2024-05-03 Time:2:42:51 PM

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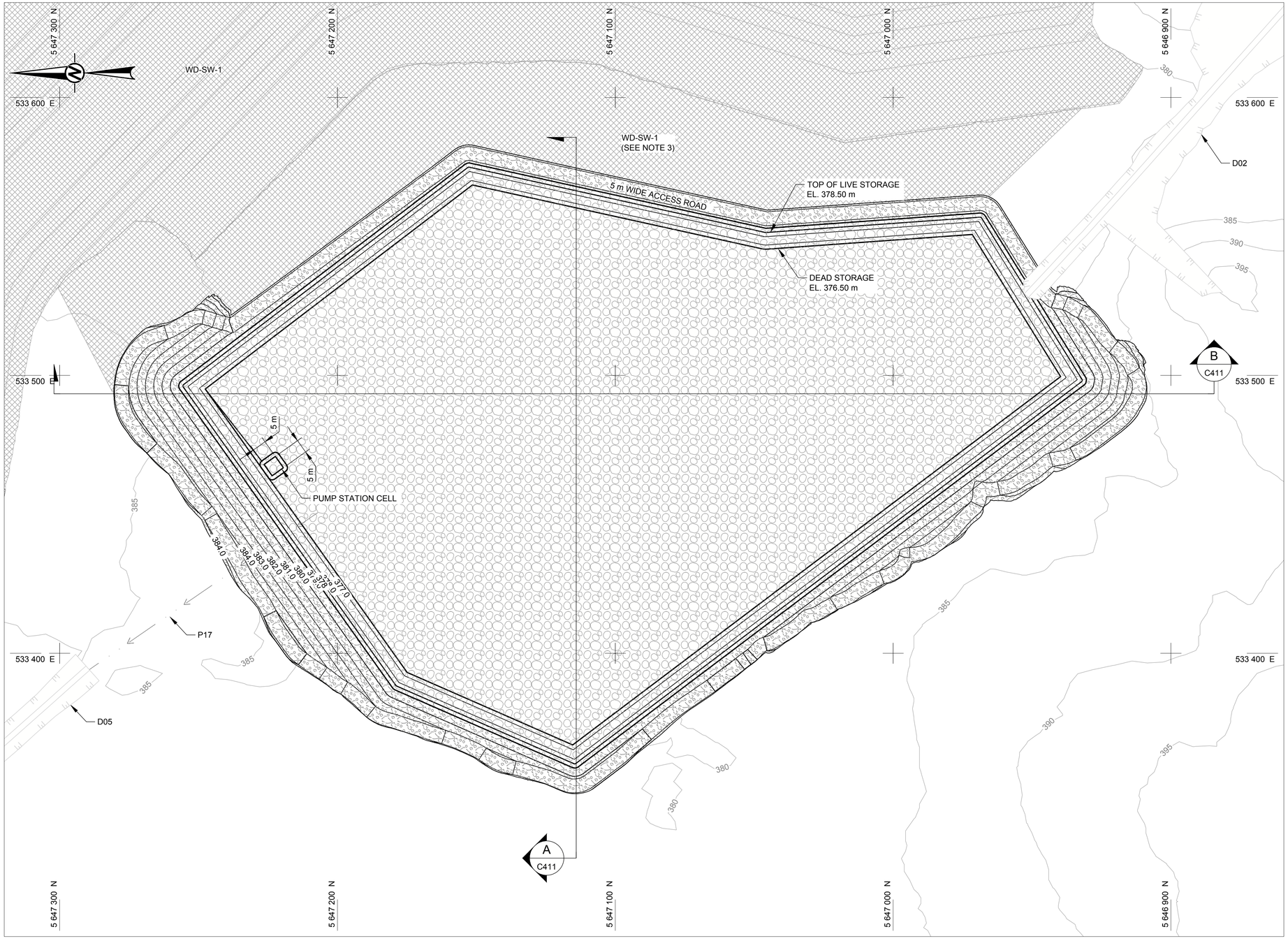


WATER MANAGEMENT

		S01B
PARAMETER	UNIT	
INVERT ELEVATION	masl	376.50
TOP OF DEAD STORAGE	masl	376.50
LIVE STORAGE ELEVATION	masl	378.50
CONTAINMENT ELEVATION	masl	379.00
BEDROCK ELEVATION	masl	--
DEAD STORAGE VOLUME	m^3	8,479
LIVE STORAGE VOLUME	m^3	74,810
TOTAL CONTAINMENT VOLUME	m^3	94,818

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- ROCK FILL
- ROAD GRAVEL

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, DECEMBER 18, 2023.
3. PROCESS PLANT LAYOUT FROM LYCOPODIUM, NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25 2022.
5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
3. WD-SW-1 IS EXPECTED TO EXTEND INTO THE EXISTING LAKE C FOOTPRINT PROVIDING THE EAST BOUNDARY OF S01B.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 20 40
1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

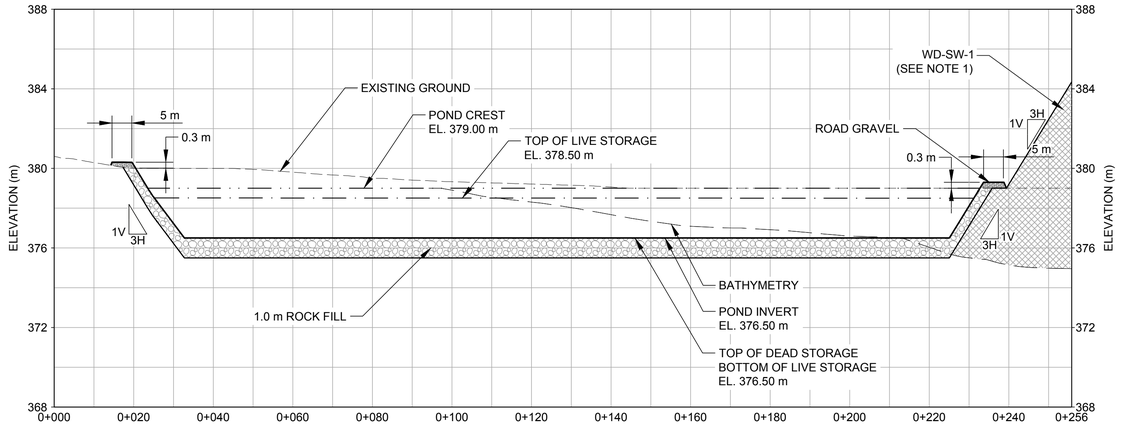
PLAN – SUMP S01B

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	30 of 75	C410

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DW0967.dwg | Last Edited By: tfeterne Date: 2024-05-03 Time:3:00:38 PM | Printed By: TFeterne Date: 2024-05-03 Time:3:13:56 PM

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

0 25 mm



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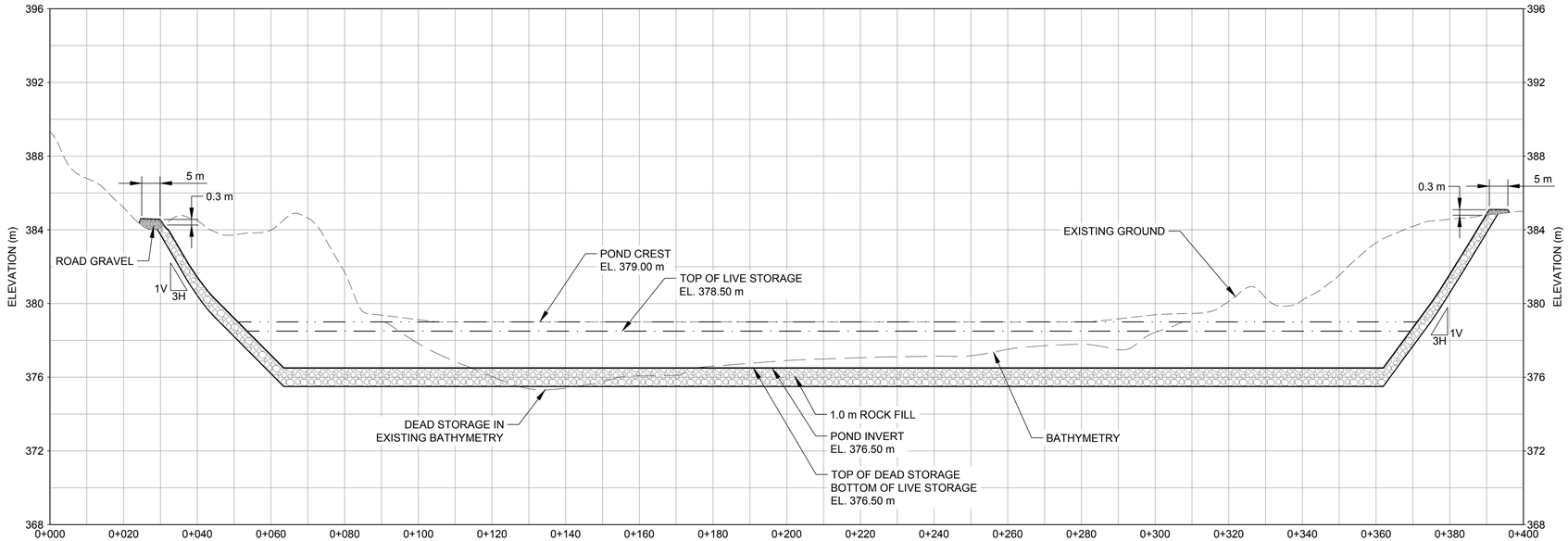


SCALE 1:750 / VERTICAL SCALE 1:150 — B / C410 — SUMP S01B

LEGEND

- ROCK FILL
- ROAD GRAVEL

NOTE(S)

1. WD-SW-1 IS EXPECTED TO EXTEND INTO THE EXISTING LAKE C FOOTPRINT PROVIDING THE EAST BOUNDARY OF S01B.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 25 50
1:750 METRES

0 5 10
1:150 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

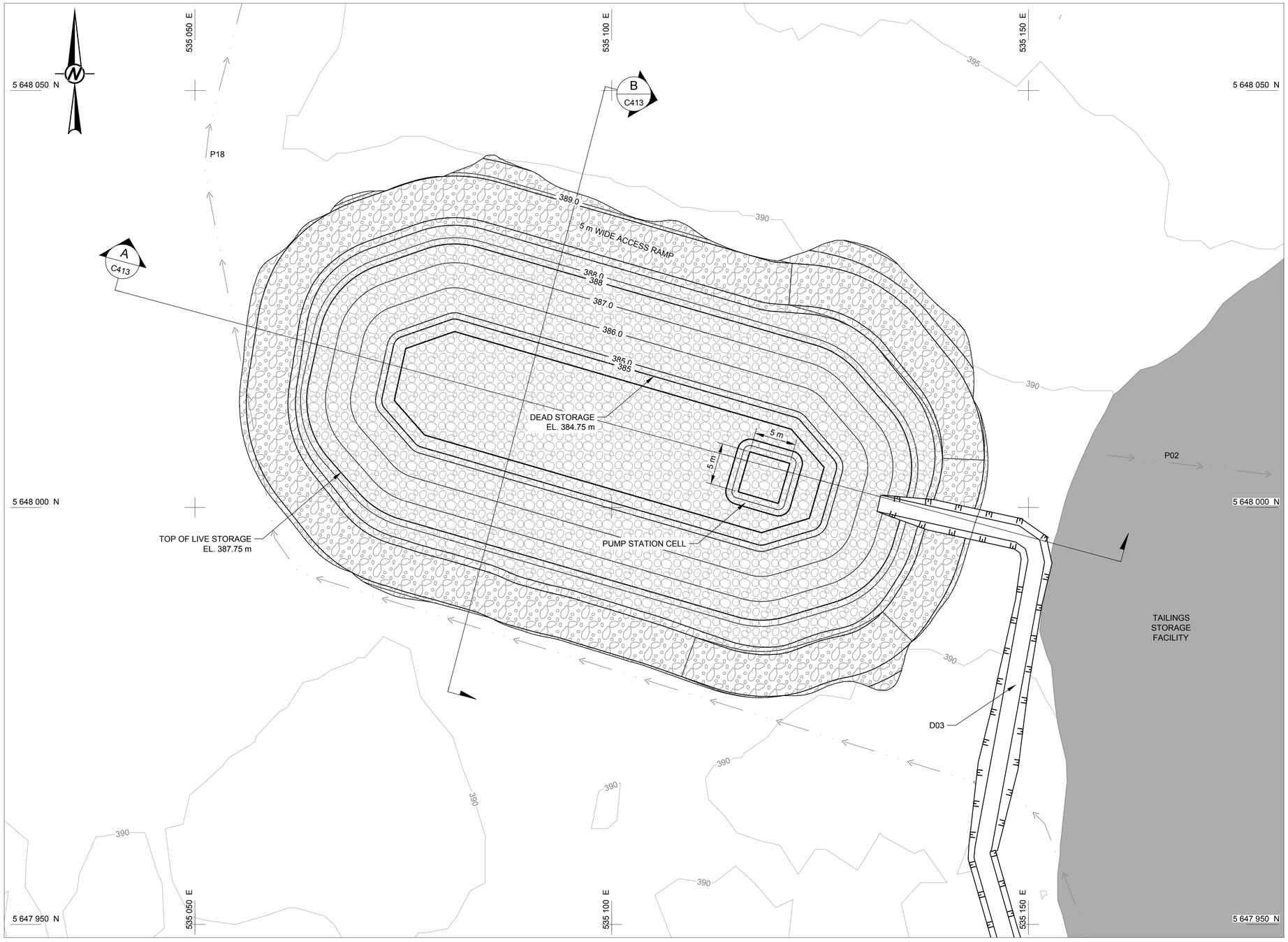
SECTIONS – SUMP S01B

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	31 of 75	C411

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG067.dwg | Last Edited By: tfeterie Date: 2024-05-03 Time:3:16:26 PM | Printed By: TFeterie Date: 2024-05-03 Time:3:45:03 PM

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

0 25 mm



WATER MANAGEMENT

		S02
PARAMETER	UNIT	
INVERT ELEVATION	masl	384.25
TOP OF DEAD STORAGE	masl	384.75
LIVE STORAGE ELEVATION	masl	387.75
CONTAINMENT ELEVATION	masl	388.25
BEDROCK ELEVATION	masl	386.85
DEAD STORAGE VOLUME	m^3	325
LIVE STORAGE VOLUME	m^3	4,000
TOTAL CONTAINMENT VOLUME	m^3	8,461

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- ROCK FILL
- ROAD GRAVEL

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, DECEMBER 18, 2023.
3. PROCESS PLANT LAYOUT FROM LYCOPODIUM, NOVEMBER 29, 2023.
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5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 20 40
1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp

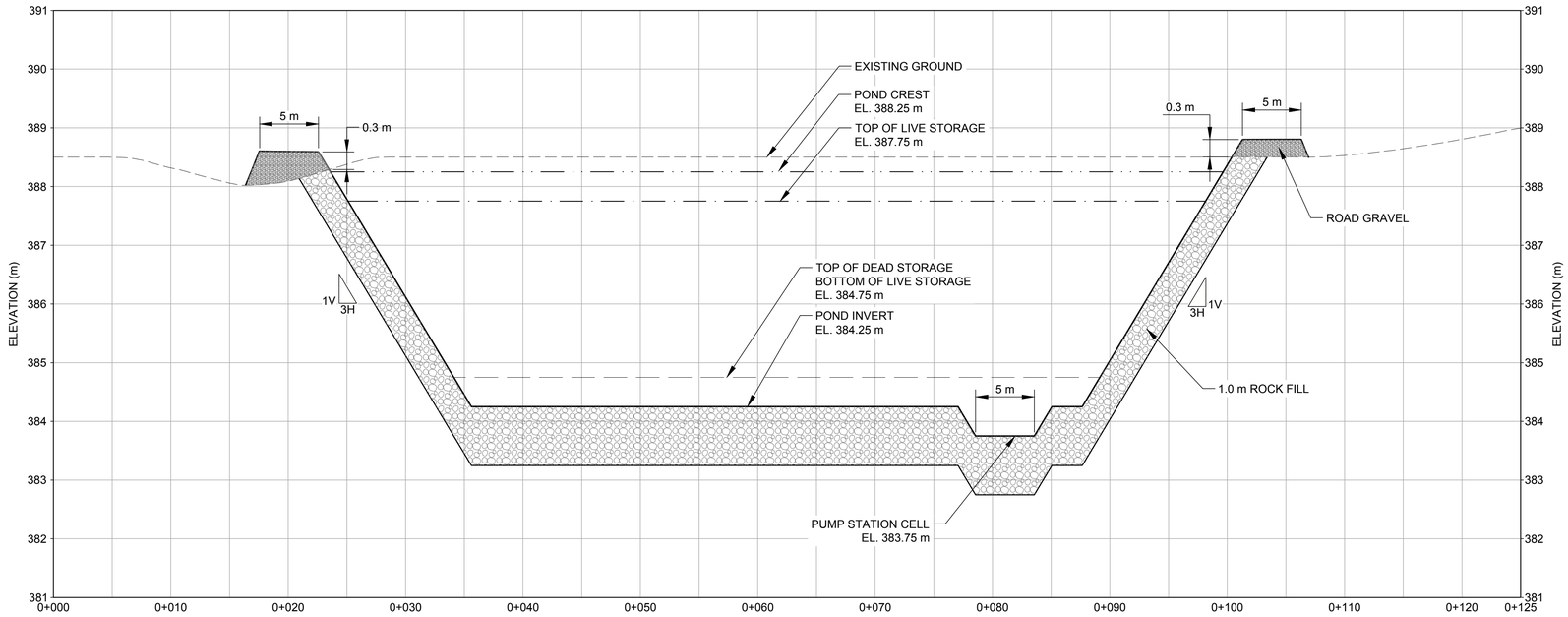
CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

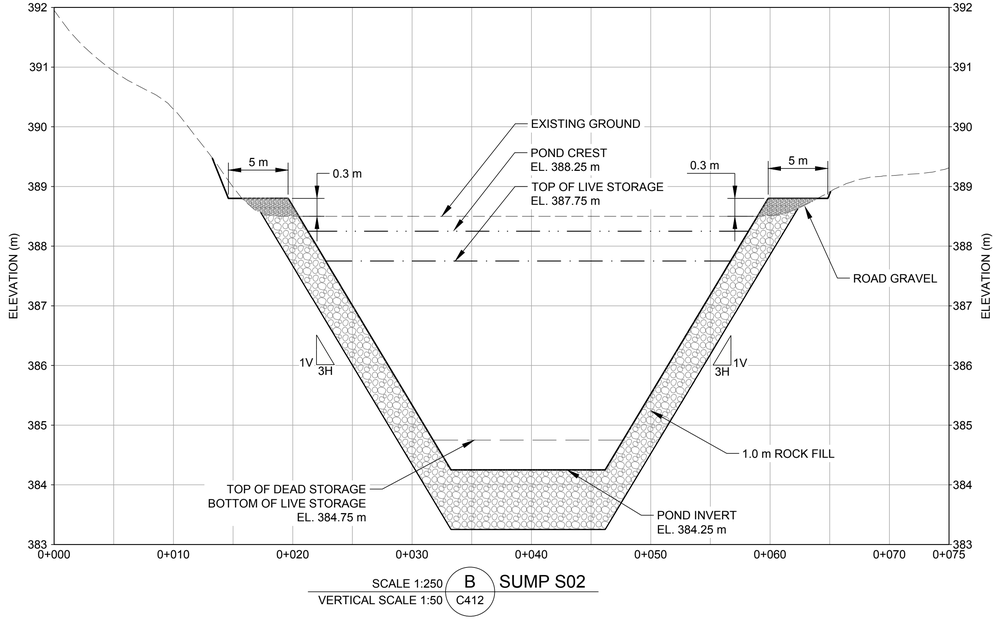
TITLE
PLAN – SUMP S02

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	32 of 75	C412

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG068.dwg | Last Edited By: jcctemastek Date: 2024-05-03 Time:12:27:56 PM | Printed By: TFetene Date: 2024-05-03 Time:3:20:59 PM
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
0 25 mm



SCALE 1:250 / VERTICAL SCALE 1:50 — A (C412) — SUMP S02



SCALE 1:250 / VERTICAL SCALE 1:50 — B (C412) — SUMP S02

LEGEND

- ROCK FILL
- ROAD GRAVEL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 10 20
1:250 METRES

0 2 4
1:50 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp
CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

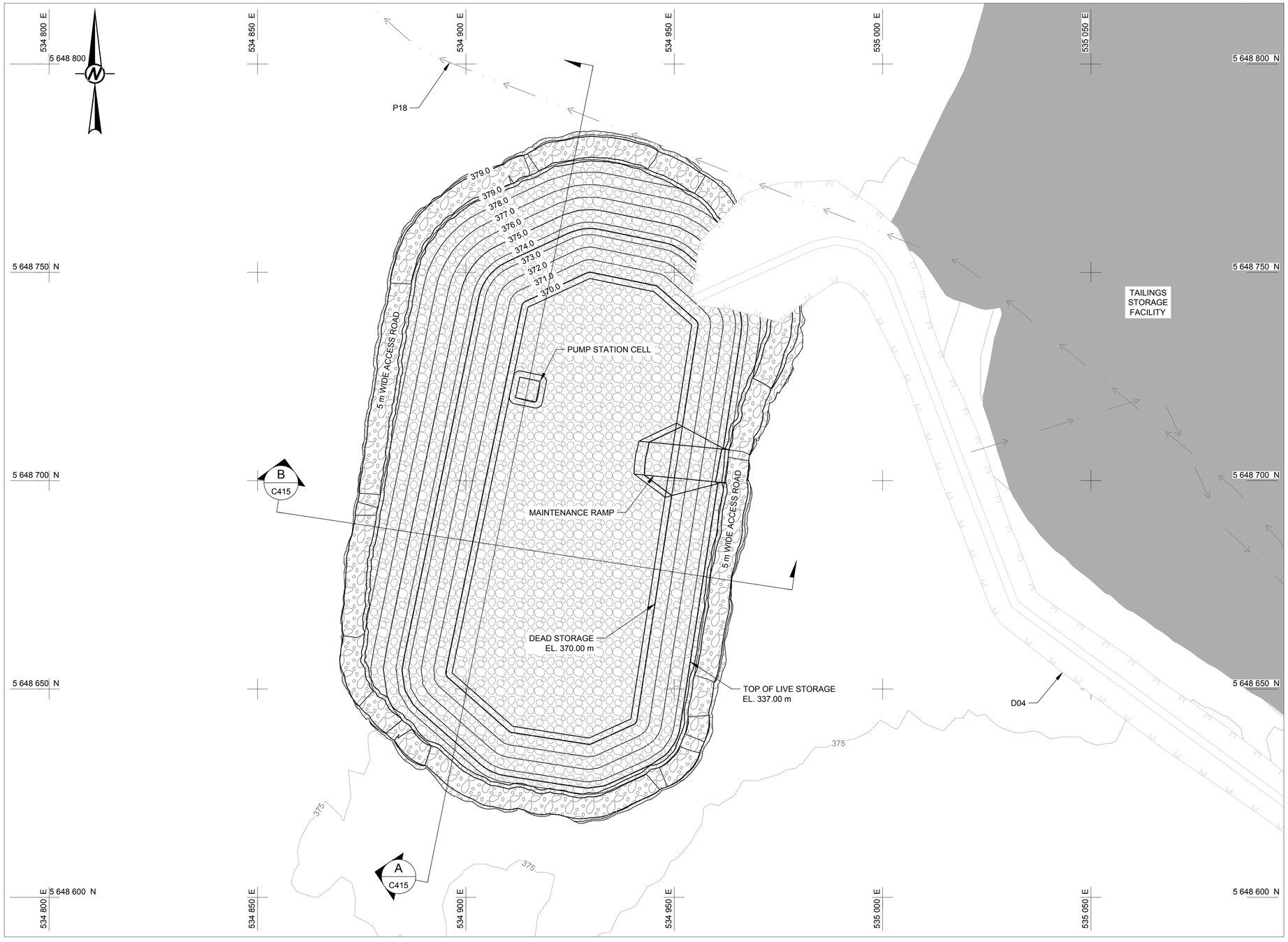
TITLE
SECTIONS – SUMP S02

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	33 of 75	C413

Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\99_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004DWG068.dwg | Last Edited By: tfetene Date: 2024-04-30 Time:2:01:58 PM | Printed By: JCzternastek Date: 2024-05-03 Time:12:27:11 PM

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

0 25 mm



WATER MANAGEMENT

		S03
PARAMETER	UNIT	
INVERT ELEVATION	masl	369.50
TOP OF DEAD STORAGE	masl	370.00
LIVE STORAGE ELEVATION	masl	373.00
CONTAINMENT ELEVATION	masl	373.50
BEDROCK ELEVATION	masl	363.05
DEAD STORAGE VOLUME	m^3	1,793
LIVE STORAGE VOLUME	m^3	15,000
TOTAL CONTAINMENT VOLUME	m^3	20,085

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- ROCK FILL
- ROAD GRAVEL

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, DECEMBER 18, 2023.
3. PROCESS PLANT LAYOUT FROM LYCOPODIUM, NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25 2022.
5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 20 40
1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN – SUMP S03

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	34 of 75	C414

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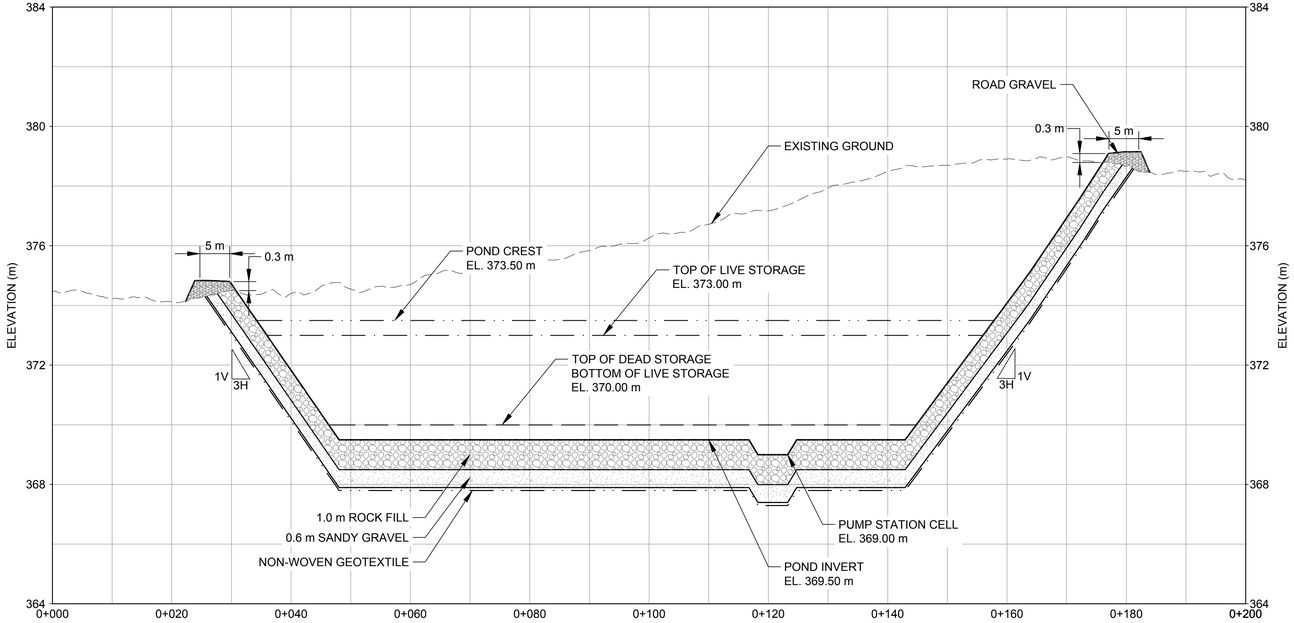

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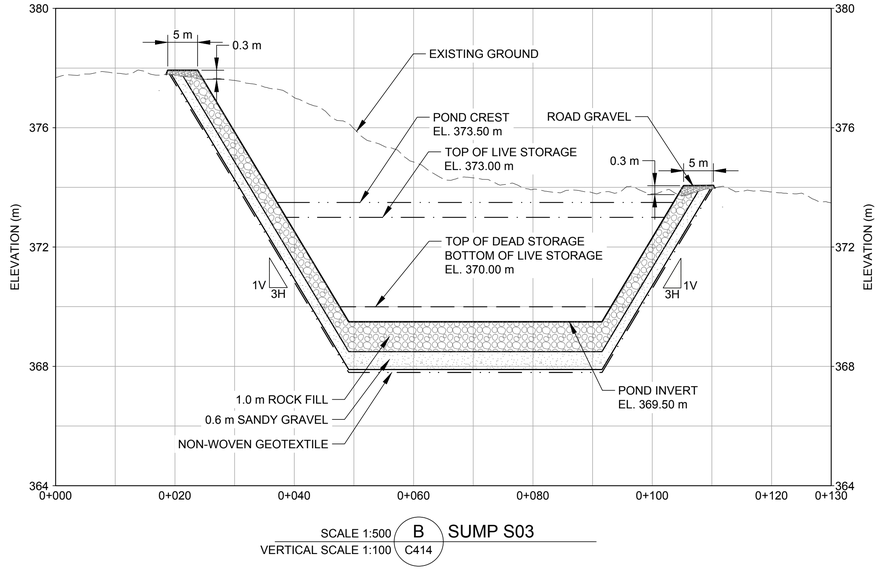
VERTICAL SCALE 1:100

A C414 SUMP S03



SCALE 1:500
VERTICAL SCALE 1:100

B C414 SUMP S03

LEGEND

- NON-WOVEN GEOTEXTILE
- ROCK FILL
- ROAD GRAVEL
- SANDY GRAVEL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 20 40
1:500 METRES

0 5 10
1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SECTIONS – SUMP S03

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	35 of 75	C415

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

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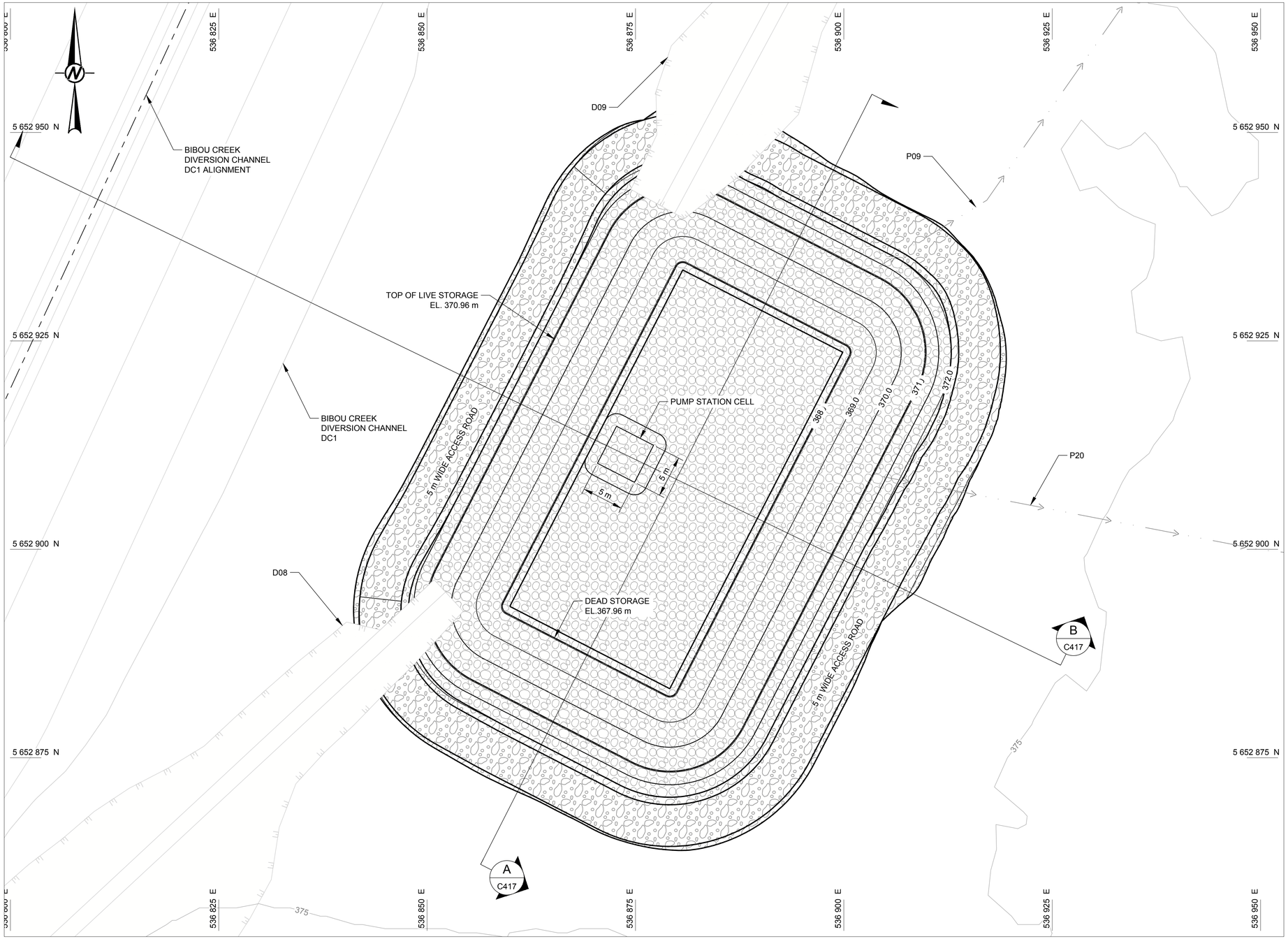

WATER MANAGEMENT

		S05
PARAMETER	UNIT	
INVERT ELEVATION	masl	367.66
TOP OF DEAD STORAGE	masl	367.69
LIVE STORAGE ELEVATION	masl	370.96
CONTAINMENT ELEVATION	masl	371.50
BEDROCK ELEVATION	masl	370.28
DEAD STORAGE VOLUME	m^3	212
LIVE STORAGE VOLUME	m^3	4,000
TOTAL CONTAINMENT VOLUME	m^3	4,840

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- ROCK FILL
- ROAD GRAVEL

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
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5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 10 20
1:250 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN – SUMP S05

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	36 of 75	C416

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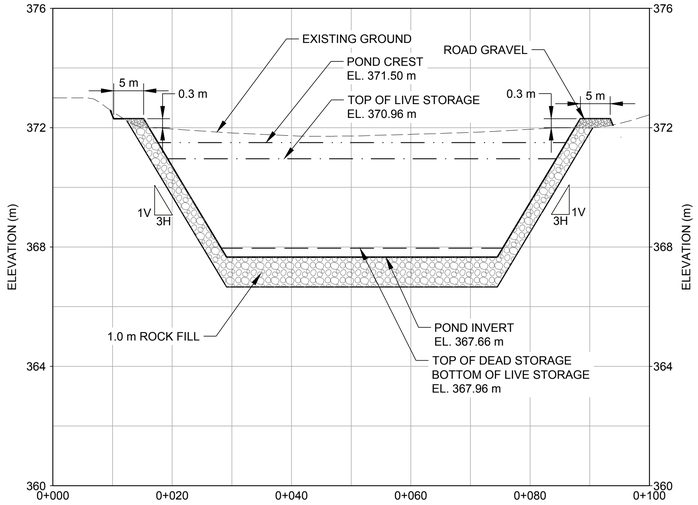

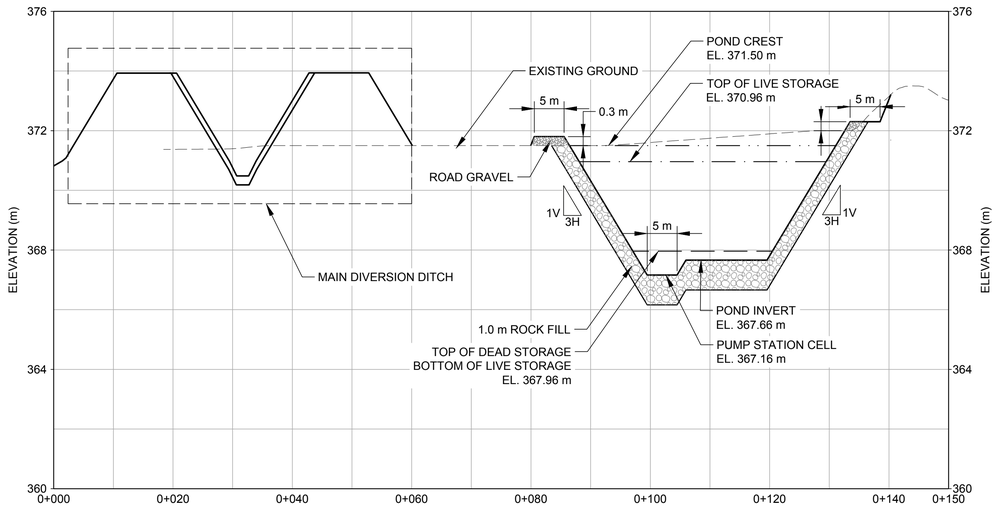

A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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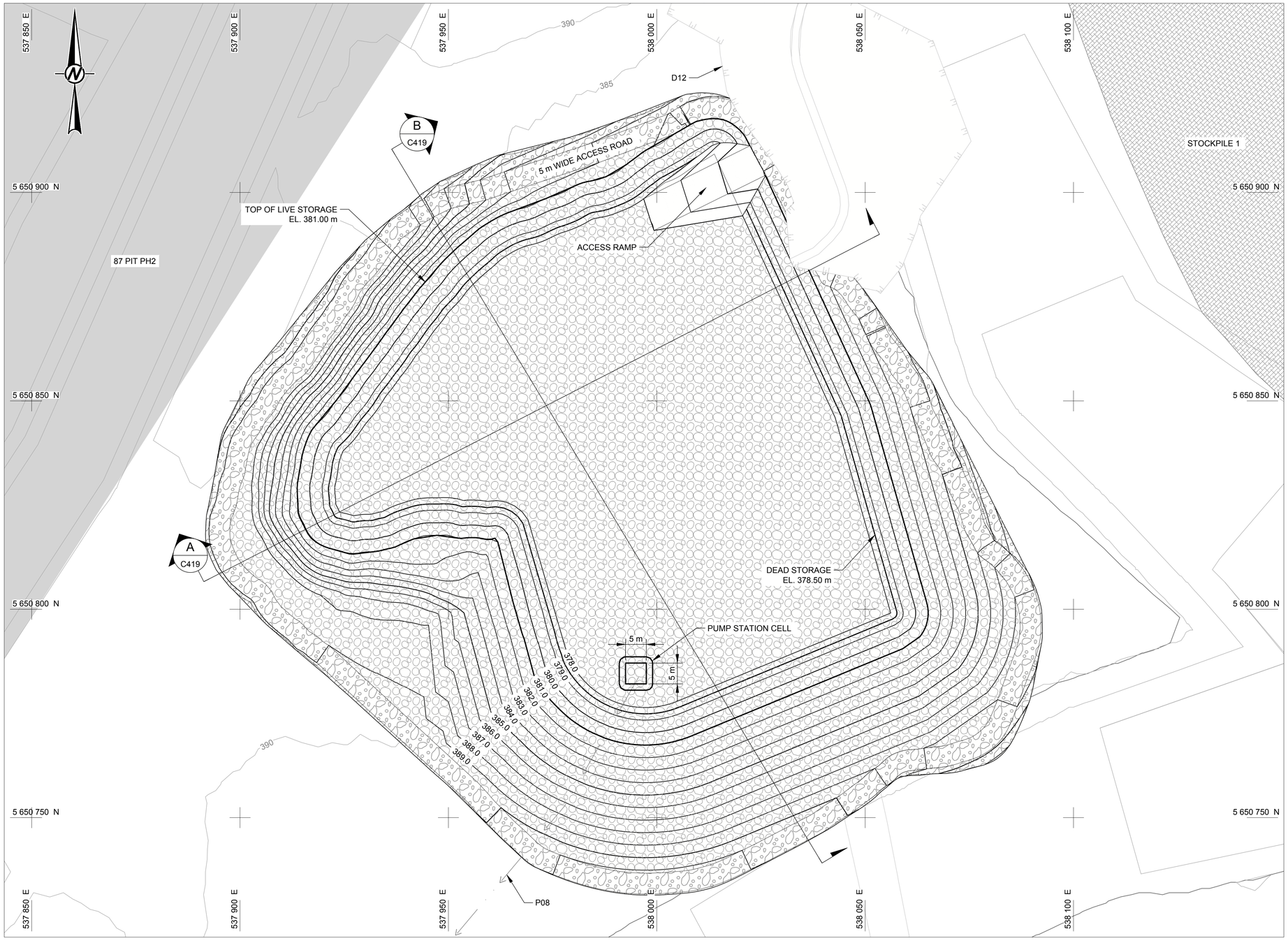
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

CONTROL
2257554004

37 75

DRAWING
A C417

0 25 mm



WATER MANAGEMENT

		S06
PARAMETER	UNIT	
INVERT ELEVATION	masl	378.00
TOP OF DEAD STORAGE	masl	378.50
LIVE STORAGE ELEVATION	masl	381.00
CONTAINMENT ELEVATION	masl	381.20
BEDROCK ELEVATION	masl	378.90
DEAD STORAGE VOLUME	m^3	4,934
LIVE STORAGE VOLUME (YEAR -2; SEE NOTE 3)	m^3	38,209
TOTAL CONTAINMENT VOLUME	m^3	38,209

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
- ROCK FILL
- ROAD GRAVEL

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, DECEMBER 18, 2023.
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4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25 2022.
5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
3. THE REQUIRED 100-YEAR LIVE STORAGE VOLUME OF SUMP S06 IS 53,000 m³. PRIOR TO THE CONSTRUCTION OF STOCKPILE STK1 THE MAXIMUM CONTAINMENT VOLUME OF S06 CONTAINMENT VOLUME IS 38,200 m³. THE VOLUME IS SUFFICIENT TO CONTAIN THE 10-YEAR DESIGN EVENT, WHICH HAS A PEAK STORAGE VOLUME OF 34,300 m³. OVERTOPPING OF S06 PRIOR TO CONSTRUCTION OF STK1 WILL SEND RUNOFF NORTH THROUGH EXISTING DITCHES TOWARD THE EXISTING 87 PIT. THE CONSTRUCTION OF STK1 LATER IN YEAR -2 INCREASES THE TOTAL CONTAINMENT VOLUME OF S06 TO APPROXIMATELY 106,000 m³. TO REDUCE RISK OF OVERTOPPING FROM THE 100-YEAR DESIGN FLOOD, IF CONSTRUCTION OF STK1 IS DELAYED BEYOND YEAR -2, A 2 m HIGH BERM MAY BE CONSTRUCTED ON THE EAST SIDE OF SUMP S06 TO INCREASE TOTAL CONTAINMENT VOLUME TO APPROXIMATELY 71,160 m³.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 20 40
1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN – SUMP S06

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	38 of 75	C418

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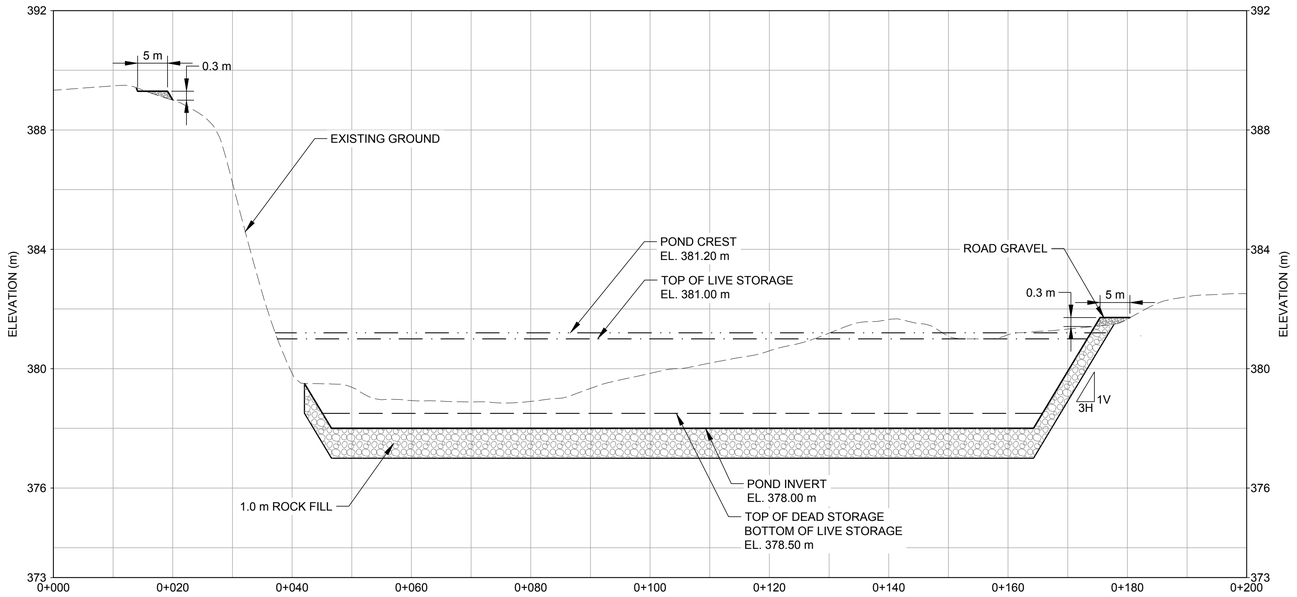

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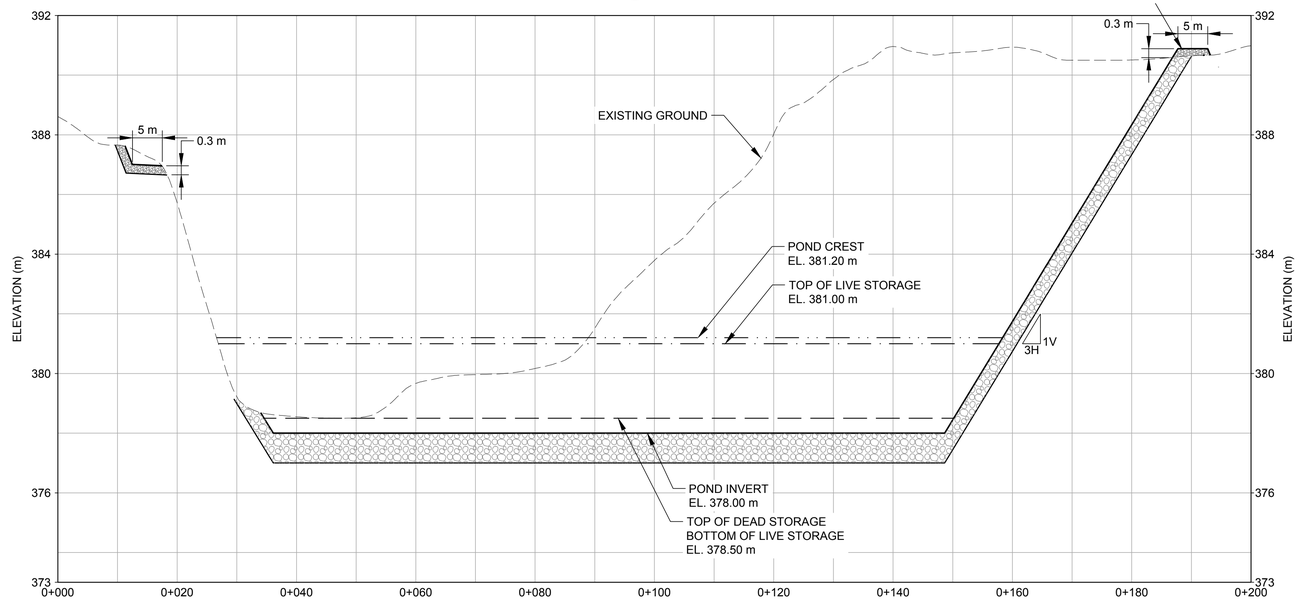
VERTICAL SCALE 1:100

A C418 SUMP S06



SCALE 1:500 m
VERTICAL SCALE 1:100

B C418 SUMP S06

LEGEND

- ROCK FILL
- ROAD GRAVEL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 20 40
1:500 METRES

0 5 10
1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
SECTIONS – SUMP S06

PROJECT NO. 2257554004
CONTROL
REV. A

DRAWING C419

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

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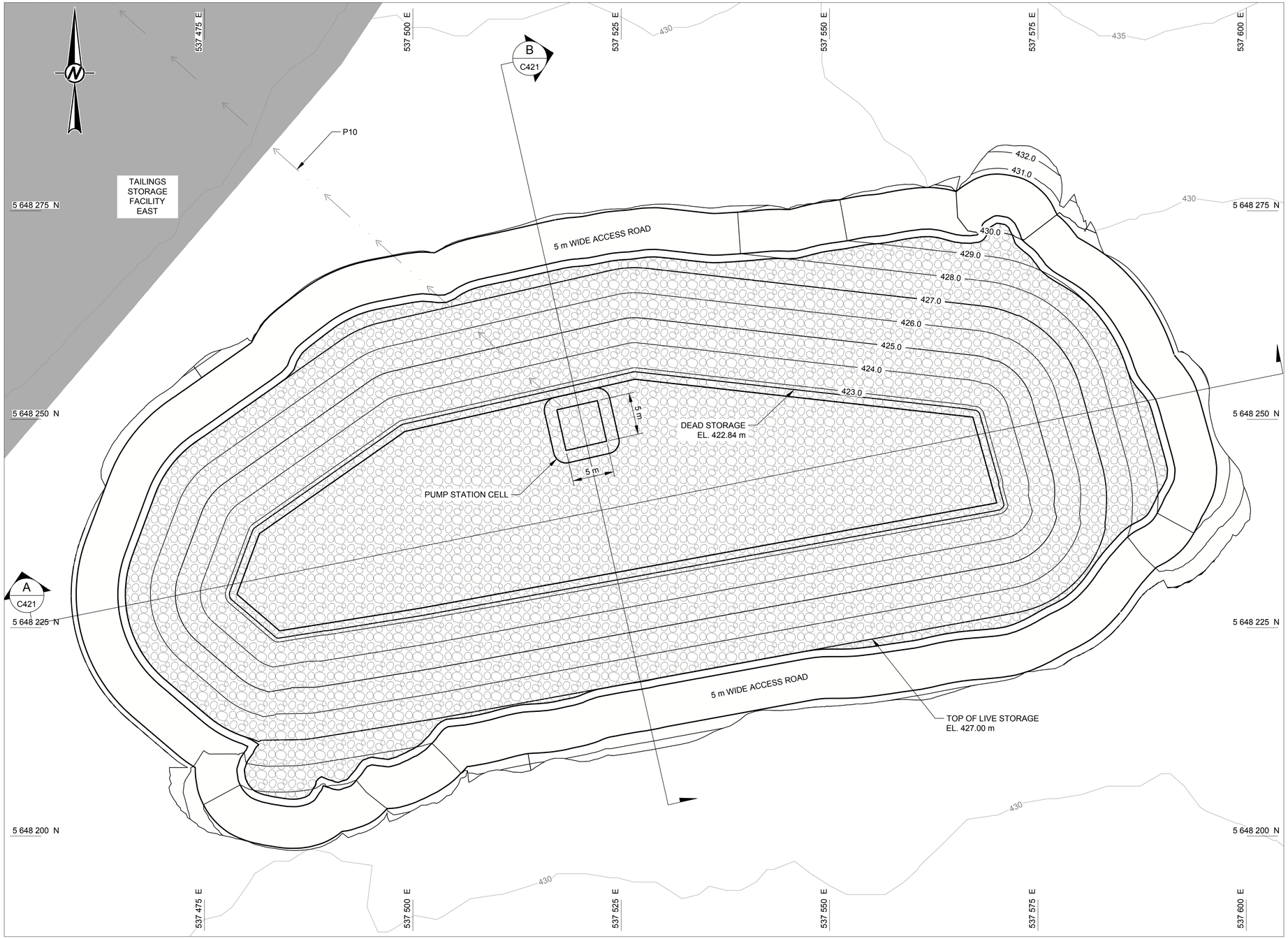

WATER MANAGEMENT

		S07
PARAMETER	UNIT	
INVERT ELEVATION	masl	422.54
TOP OF DEAD STORAGE	masl	422.84
LIVE STORAGE ELEVATION	masl	427.00
CONTAINMENT ELEVATION	masl	427.00
BEDROCK ELEVATION	masl	423.90
DEAD STORAGE VOLUME	m^3	1,372
LIVE STORAGE VOLUME	m^3	12,000
TOTAL CONTAINMENT VOLUME	m^3	16,085

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
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- ROAD GRAVEL

REFERENCE(S)

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2. MINE POLYGONS AND SURFACES FROM AGP MINING, DECEMBER 18, 2023.
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NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 10 20
1:250 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN – SUMP S07

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	40 of 75	C420

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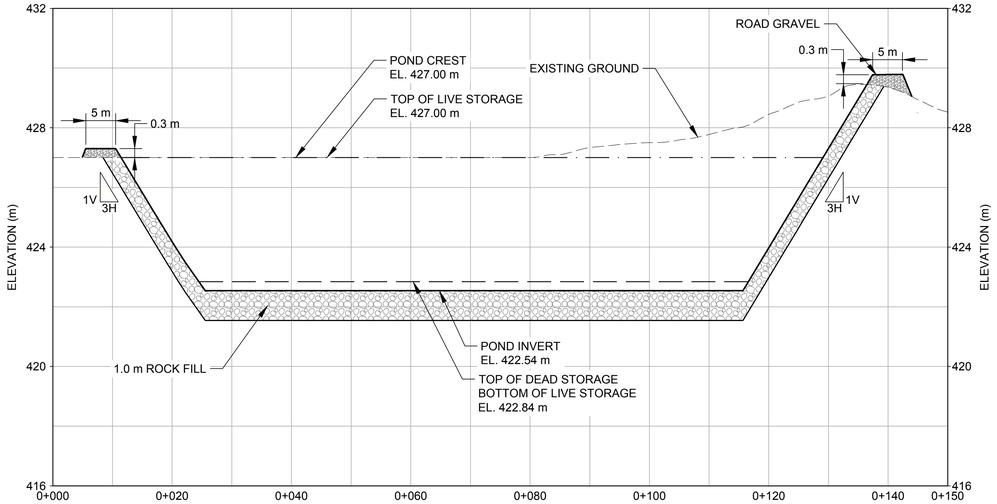

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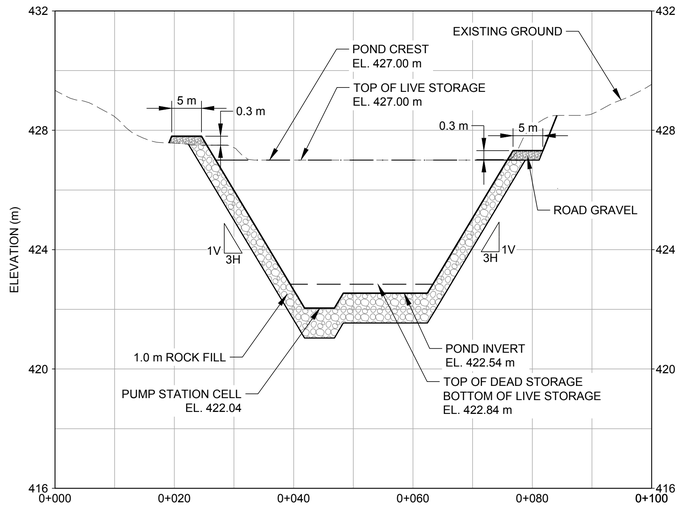
A C420 SUMP S07



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VERTICAL SCALE 1:100

B C420 SUMP S07

LEGEND

- ROCK FILL
- ROAD GRAVEL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 20 40
1:500 METRES

0 5 10
1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SECTIONS – SUMP S07

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	41 of 75	C421

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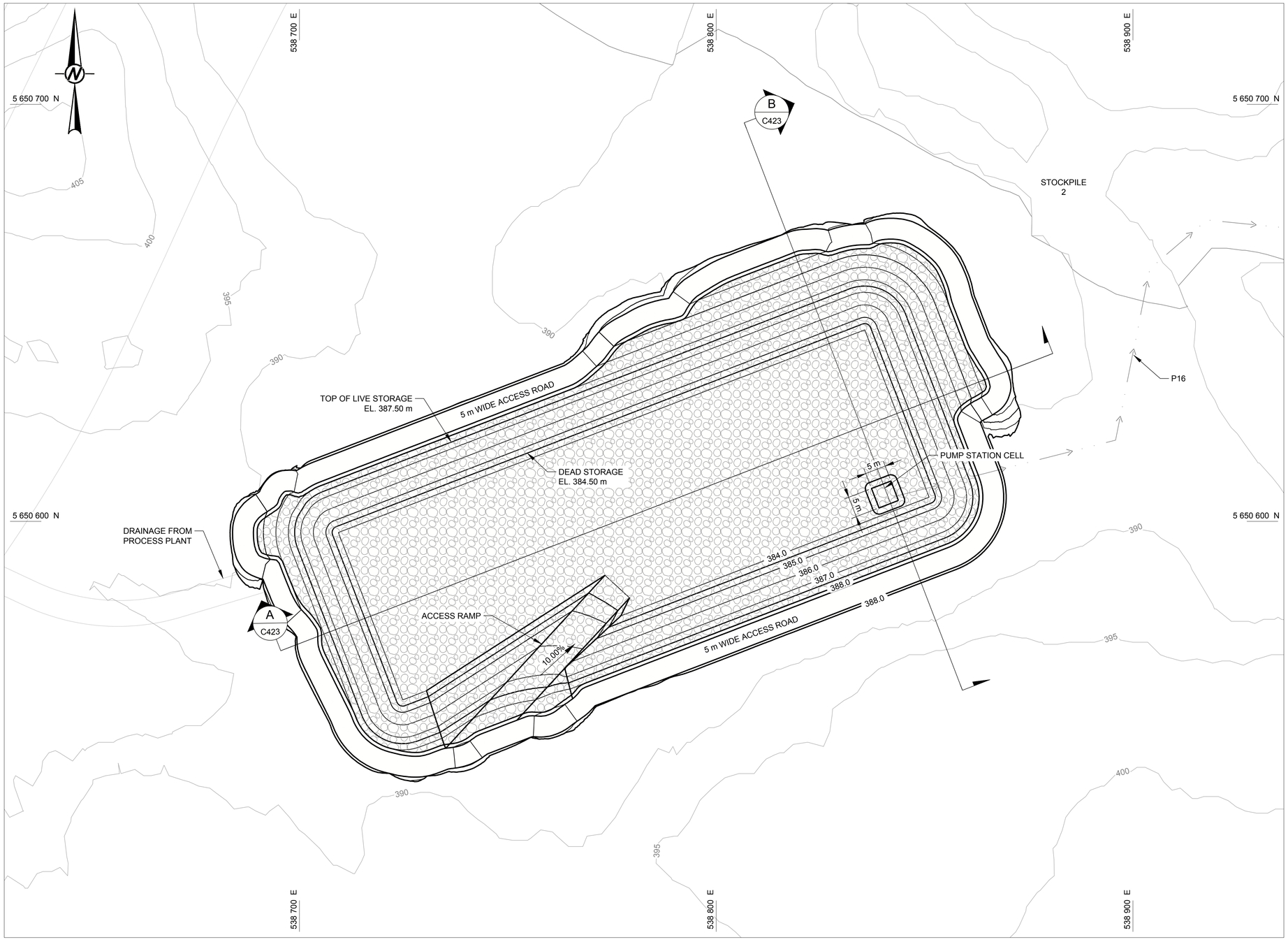

WATER MANAGEMENT

		S09
PARAMETER	UNIT	
INVERT ELEVATION	masl	384.00
TOP OF DEAD STORAGE	masl	384.50
LIVE STORAGE ELEVATION	masl	387.50
CONTAINMENT ELEVATION	masl	388.00
BEDROCK ELEVATION	masl	--
DEAD STORAGE VOLUME	m^3	3,313
LIVE STORAGE VOLUME	m^3	23,000
TOTAL CONTAINMENT VOLUME	m^3	31,625

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
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NOTE(S)

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2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 20 40

1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN – SUMP S09

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	42 of 75	C422

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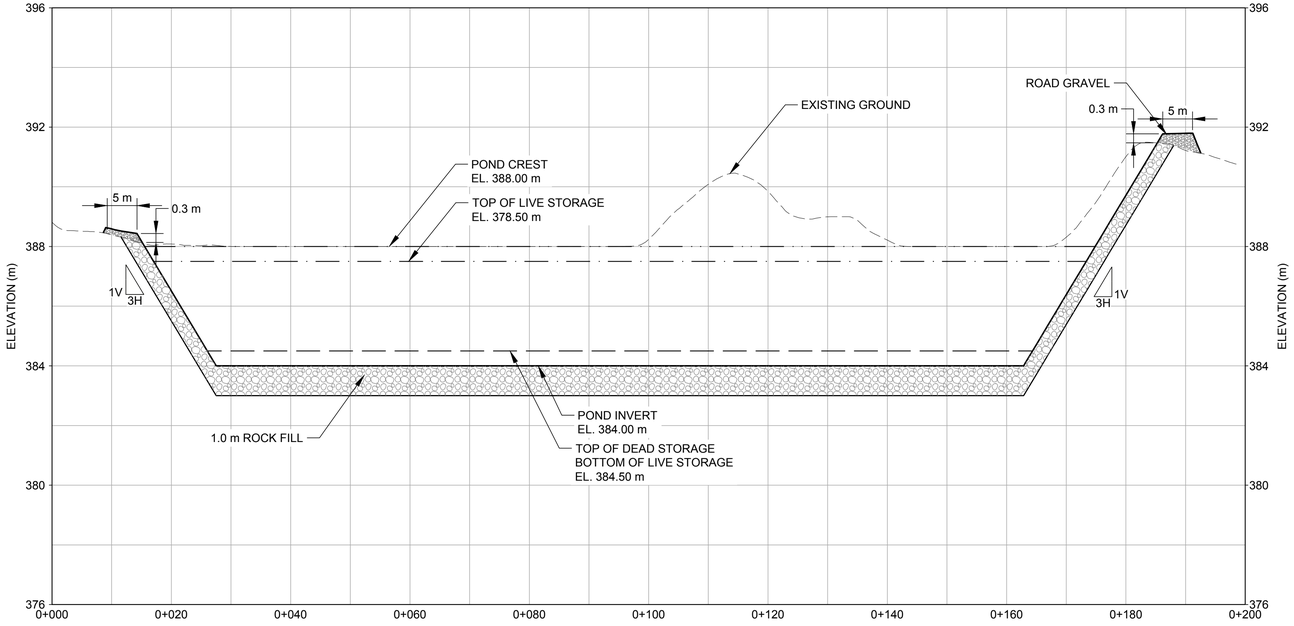
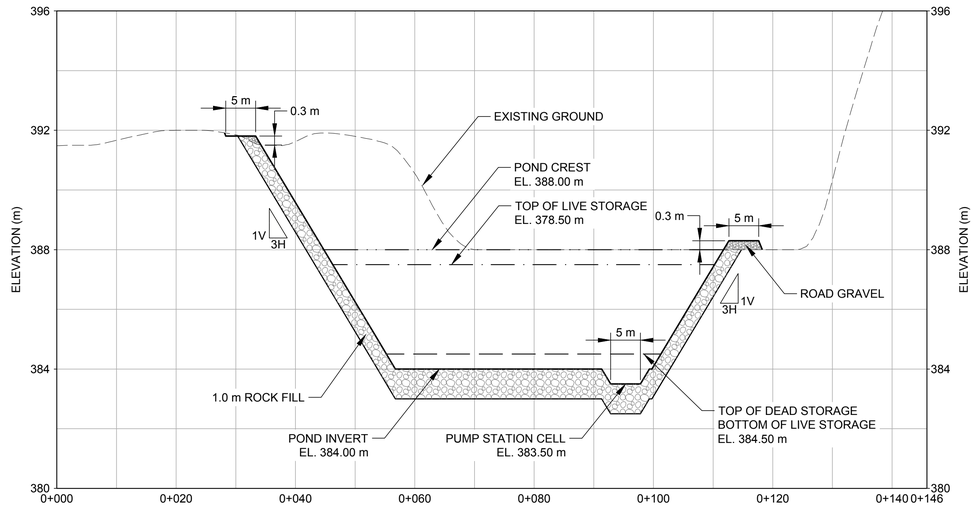
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm



SCALE 1:500 m
VERTICAL SCALE 1:100

A C422 SUMP S09



SCALE 1:500 m
VERTICAL SECLE 1:100

B C422 SUMP S09

LEGEND

- ROCK FILL
- ROAD GRAVEL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

1:500 METRES (0, 20, 40)

1:100 METRES (0, 5, 10)

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SECTIONS – SUMP S09

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	43 of 75	C423

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

25 mm

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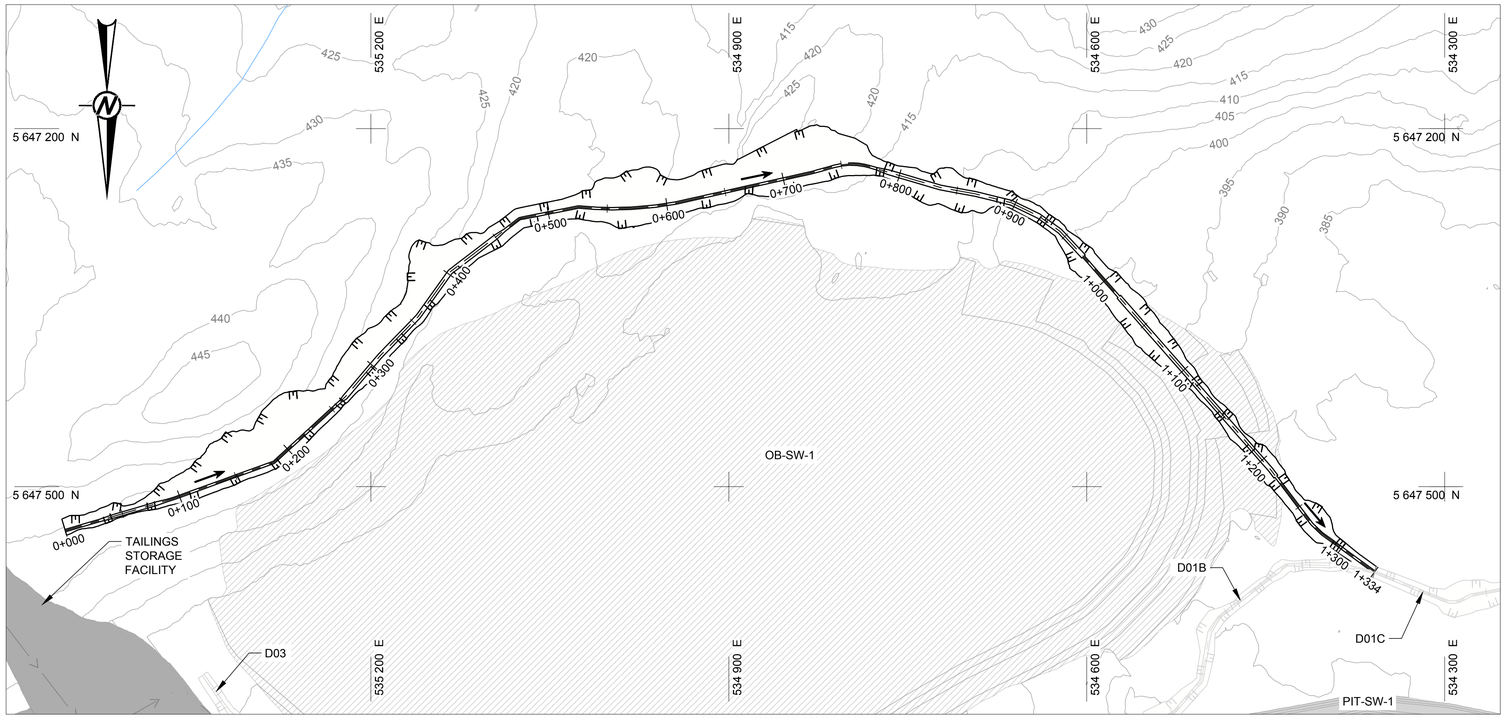
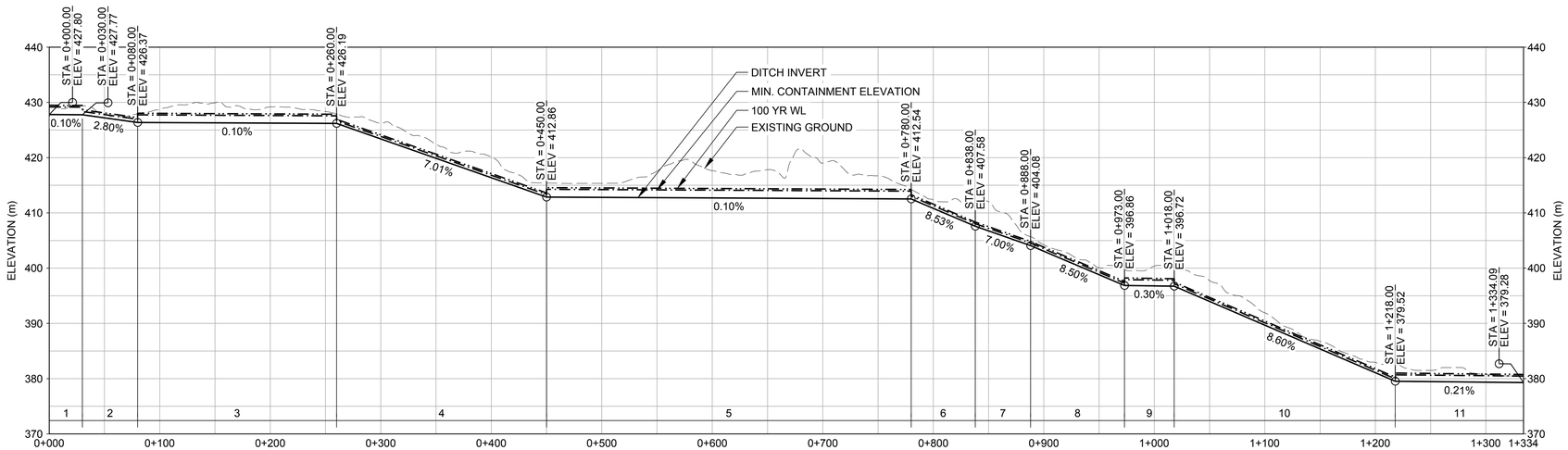


PLAN - CONTACT WATER DITCH - D01A
SCALE 1:2,500



PROFILE - CONTACT WATER DITCH - D01A
SCALE 1:2,500
VERTICAL SCALE 1:500

D01A													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
1	0	30	1.2	C530	30	0.10%	3	2	1.79	100	2 yr	1.42	0.63	0.58
											10 yr	3.91	1.02	0.76
											100 yr	7.6	1.38	0.90
2	30	80	1.2	C530	50	2.80%	3	3	1.69	300	2 yr	1.42	0.24	1.61
											10 yr	3.91	0.42	2.21
											100 yr	7.60	0.59	2.68
3	80	260	1.2	C530	180	0.10%	3	2	3.99	100	2 yr	1.42	0.63	0.58
											10 yr	3.91	1.02	0.76
											100 yr	7.60	1.38	0.90
4	260	450	1.2	C530	190	7.00%	3	4	2.73	500	2 yr	1.42	0.17	1.81
											10 yr	3.91	0.31	2.55
											100 yr	7.60	0.45	3.14
5	450	805	1.2	C530	355	0.10%	3	2	3.94	100	2 yr	1.42	0.63	0.58
											10 yr	3.91	1.02	0.76
											100 yr	7.60	1.38	0.90
6	805	880	1.2	C530	75	6.60%	3	4	2.48	500	2 yr	1.42	0.18	1.78
											10 yr	3.91	0.32	2.50
											100 yr	7.60	0.46	3.08
7	880	930	1.2	C530	50	7.00%	3	4	2.61	500	2 yr	1.42	0.17	1.81
											10 yr	3.91	0.31	2.55
											100 yr	7.60	0.45	3.14
8	930	1015	1.2	C530	85	8.50%	3	4	2.31	500	2 yr	1.42	0.17	1.90
											10 yr	3.91	0.30	2.68
											100 yr	7.60	0.43	3.31
9	1015	1060	1.2	C530	45	0.30%	3	2	3.15	100	2 yr	1.42	0.48	0.87
											10 yr	3.91	0.79	1.14
											100 yr	7.60	1.07	1.35
10	1060	1260	1.2	C530	200	8.60%	3	4	2.63	500	2 yr	1.42	0.17	1.91
											10 yr	3.91	0.30	2.69
											100 yr	7.60	0.43	3.32
11	1260	1379	1.2	C530	119	0.20%	3	2	2.00	100	2 yr	1.42	0.53	0.75
											10 yr	3.91	0.87	0.98
											100 yr	7.60	1.18	1.16

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2022.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 100 200
1:2,500 METRES

0 20 40
1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D01A

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	44 of 75	C500

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
0 25 mm

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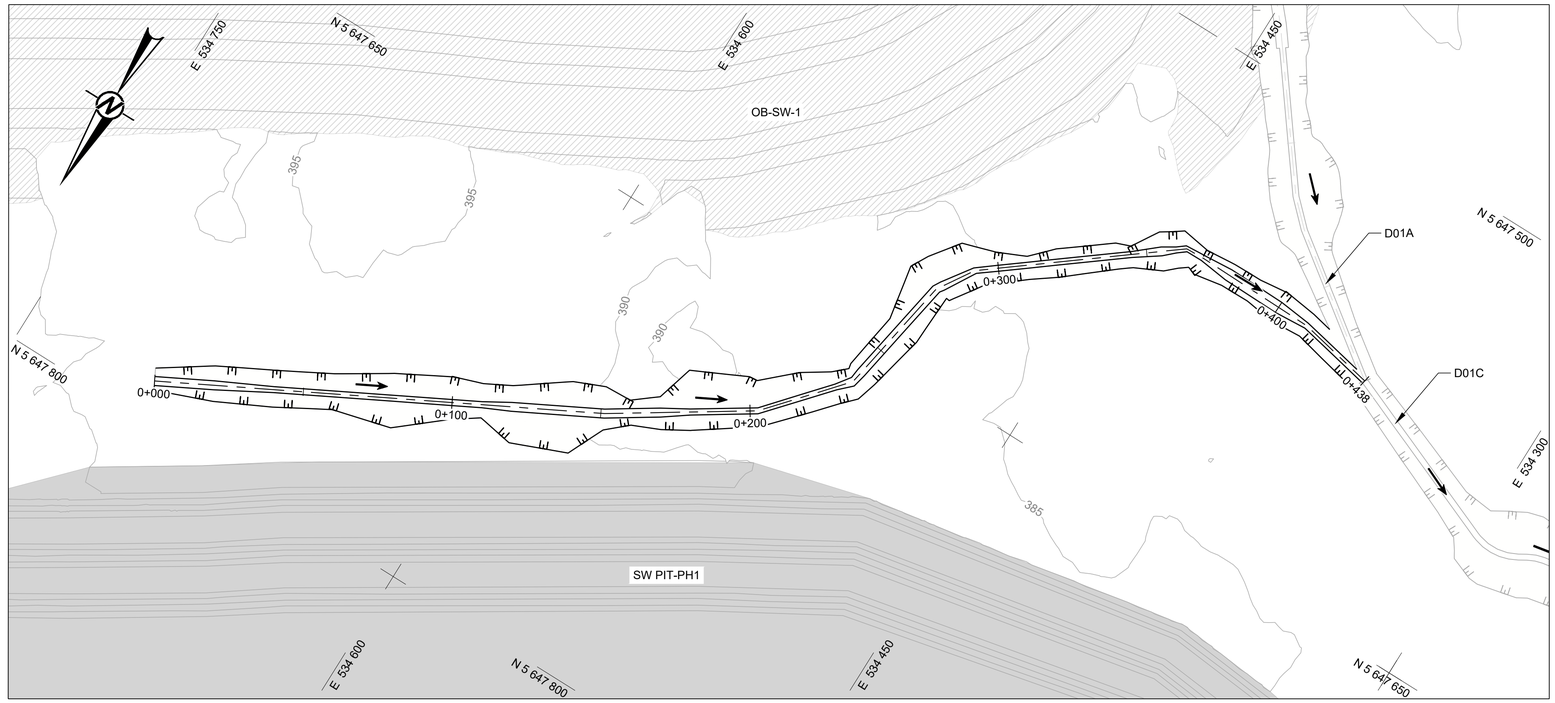
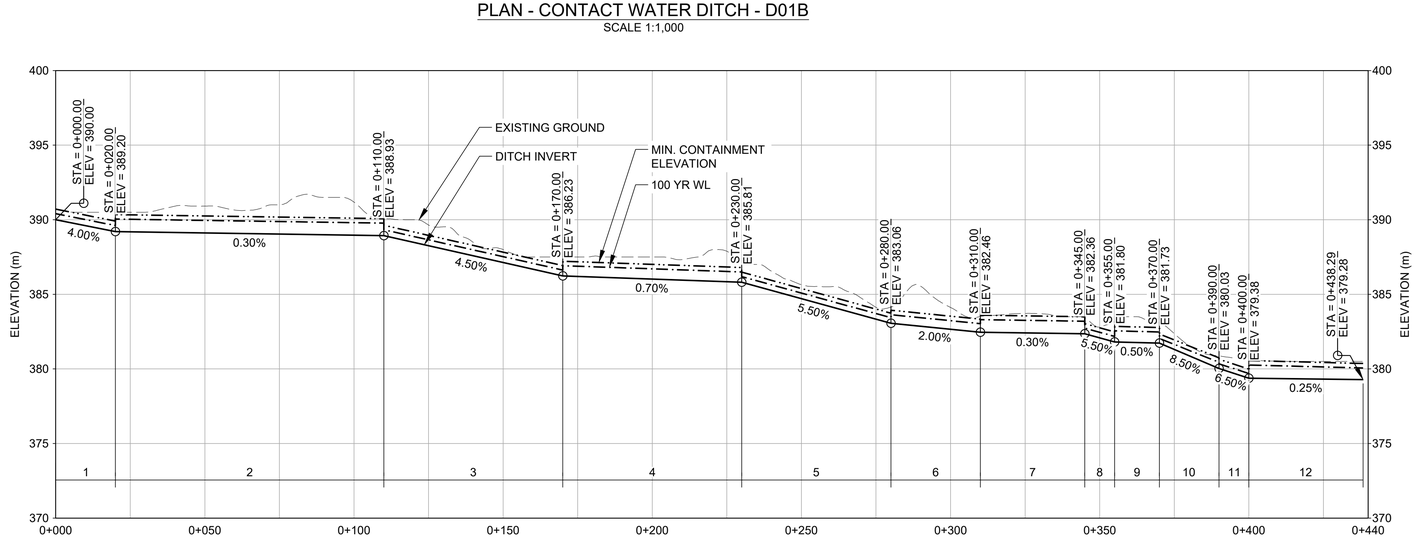


PLAN - CONTACT WATER DITCH - D01B
SCALE 1:1,000



PROFILE - CONTACT WATER DITCH - D01B
SCALE 1:1,000
VERTICAL SCALE 1:200

D01B													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m^3/s)*	*(m)*	*(m/s)*
1	0	20	1.2	C530	20	4.00%	3	3	0.96	300	2 yr	1.53	0.22	1.86
											10 yr	2.9	0.32	2.28
											100 yr	4.5	0.41	2.61
2	20	110	1.2	C530	90	0.30%	3	2	1.9	100	2 yr	1.53	0.5	0.88
											10 yr	2.9	0.68	1.05
											100 yr	4.5	0.84	1.18
3	110	170	1.2	C530	60	4.50%	3	3	1.09	300	2 yr	1.53	0.22	1.94
											10 yr	2.9	0.31	2.38
											100 yr	4.5	0.4	2.72
4	170	230	1.2	C530	60	0.70%	3	2	1.3	100	2 yr	1.53	0.4	1.2
											10 yr	2.9	0.55	1.43
											100 yr	4.5	0.69	1.61
5	230	280	1.2	C530	50	5.50%	3	3	1.13	300	2 yr	1.53	0.2	2.07
											10 yr	2.9	0.29	2.55
											100 yr	4.5	0.37	2.92
6	280	310	1.2	C530	30	2.00%	3	2	1.76	300	2 yr	1.53	0.33	1.56
											10 yr	2.9	0.46	1.87
											100 yr	4.5	0.57	2.11
7	310	345	1.2	C530	35	0.30%	3	2	1.2	100	2 yr	1.53	0.5	0.88
											10 yr	2.9	0.68	1.05
											100 yr	4.5	0.84	1.18
8	345	355	1.2	C530	10	5.50%	3	3	0.82	300	2 yr	1.53	0.2	2.07
											10 yr	2.9	0.29	2.55
											100 yr	4.5	0.37	2.92
9	355	370	1.2	C530	15	0.50%	3	2	1.62	100	2 yr	1.53	0.44	1.06
											10 yr	2.9	0.6	1.27
											100 yr	4.5	0.75	1.43
10	370	390	1.2	C530	20	8.50%	3	4	0.82	500	2 yr	1.53	0.17	2.04
											10 yr	2.9	0.24	2.54
											100 yr	4.5	0.31	2.94
11	390	400	1.2	C530	10	6.50%	3	4	0.92	300	2 yr	1.53	0.17	2.04
											10 yr	2.9	0.24	2.54
											100 yr	4.5	0.31	2.94
12	400	438.3	1.2	C530	38.29	0.25%	3	2	1.25	100	2 yr	1.53	0.52	0.83
											10 yr	2.9	0.71	0.98
											100 yr	4.5	0.88	1.1

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2022.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

0 50 100
1:1,000 METRES

0 10 20
1:200 METRES

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D01B

PROJECT NO.	CONTROL	REV.	45 of 75	DRAWING
2257554004		A		C501

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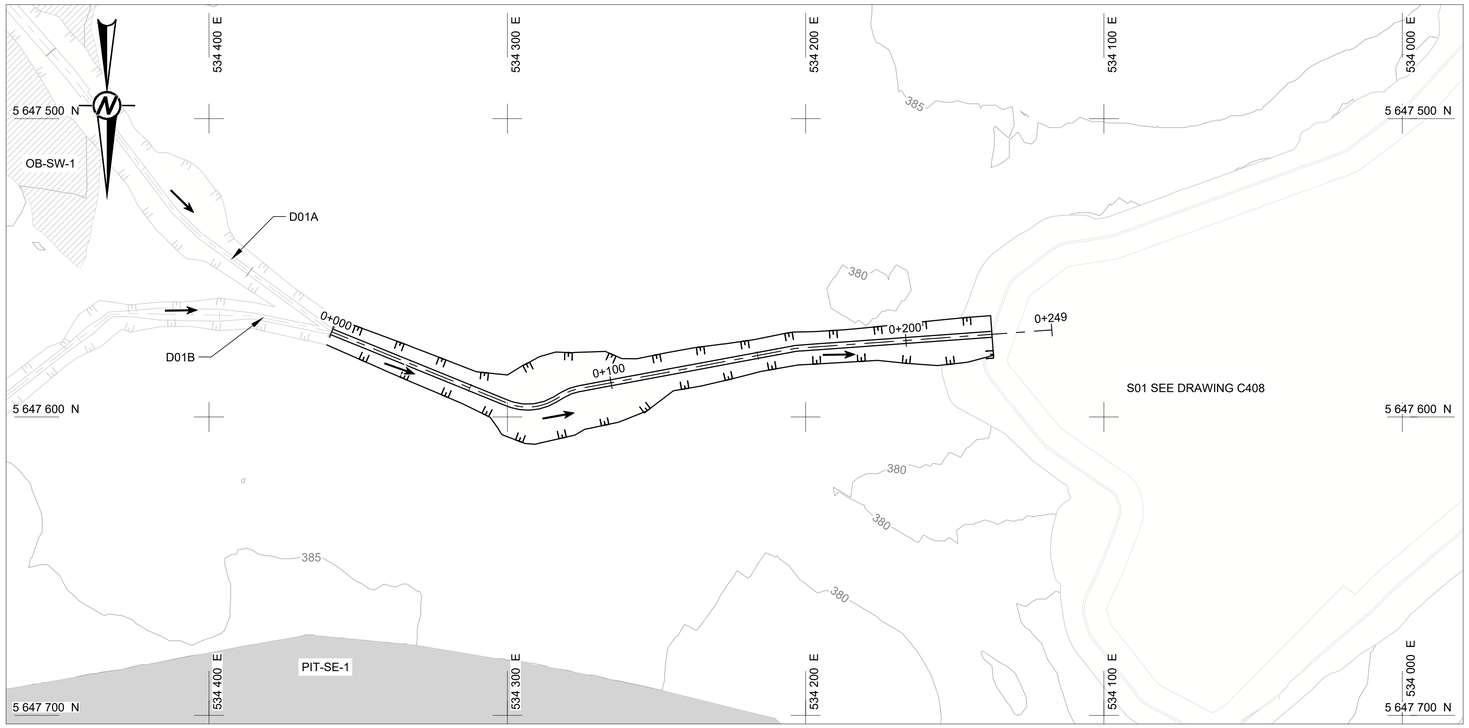
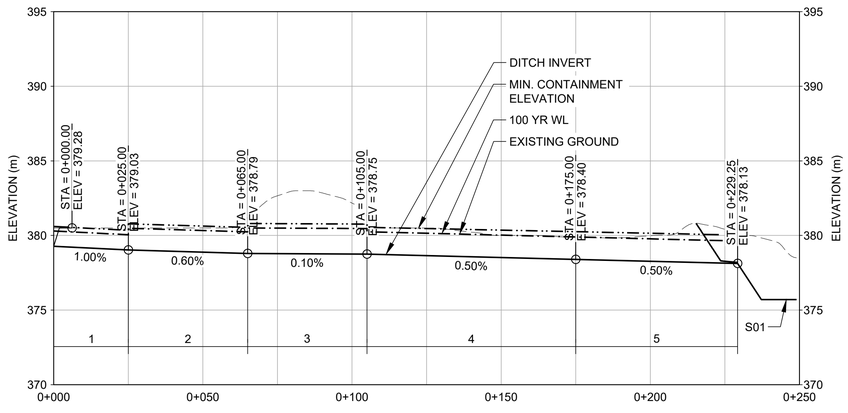
0 25 mm



PLAN - CONTACT WATER DITCH - D01C
SCALE 1:1,000



PROFILE - CONTACT WATER DITCH - D01C
SCALE 1:1,000
VERTICAL SCALE 1:200

D01C

Segment #	Station From	Station To	Typical Cross-Section	Reference Drawing	Segment Length (m)	Bed Slope %	Side Slope (H:1V)	Bottom Width (m)	Average Excavation Depth (m)	Erosion Protection Material D50 (mm)	Return Period (Years)	Design Flow (m3/s)	Channel Flow Depth (m)	Channel Flow Velocity (m/s)
1	0	25	1.1	C530	25	1.00%	3	2	1.24	300	2 yr	3.01	0.52	1.65
											10 yr	6.98	0.78	2.07
											100 yr	12.5	1.02	2.41
2	25	65	1.1	C530	40	0.60%	3	2	1.40	100	2 yr	3.01	0.59	1.37
											10 yr	6.98	0.88	1.71
											100 yr	12.5	1.15	1.99
3	65	105	1.1	C530	40	0.10%	3	2	3.68	100	2 yr	3.01	0.9	0.71
											10 yr	6.98	1.33	0.88
											100 yr	12.5	1.71	1.02
4	105	175	1.1	C530	70	0.50%	3	2	1.59	100	2 yr	3.01	0.61	1.28
											10 yr	6.98	0.92	1.6
											100 yr	12.5	1.2	1.86
5	175	229.2	1.1	C530	54.2	0.50%	3	2	1.55	100	2 yr	3.01	0.77	0.91
											10 yr	6.98	1.13	1.14
											100 yr	12.5	1.47	1.32

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
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4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2022.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 50 100
1:1,000 METRES

0 10 20
1:200 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D01C

PROJECT NO. 2257554004 | CONTROL | REV. A | 46 of 75 | DRAWING C502

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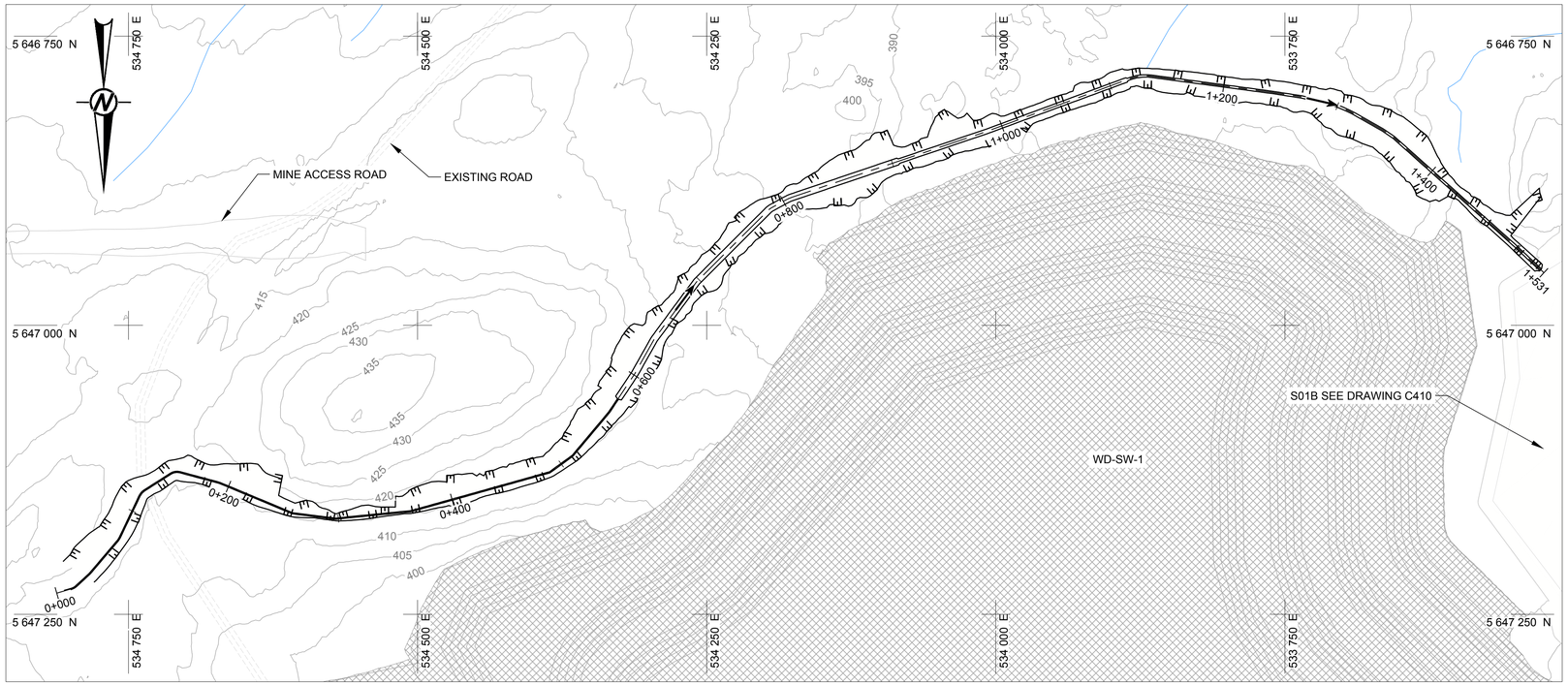
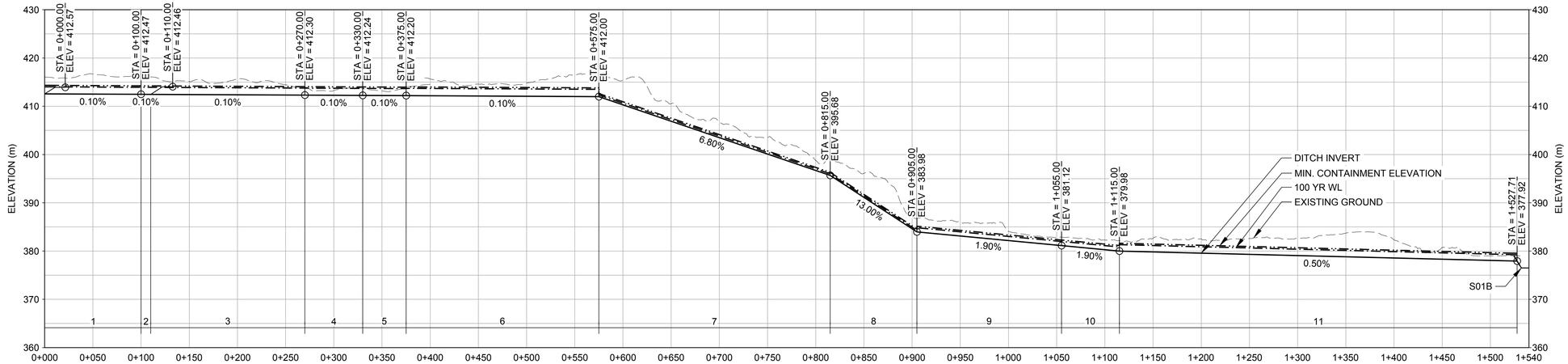
0 25 mm



PLAN - CONTACT WATER DITCH - D02
SCALE 1:2,000



PROFILE - CONTACT WATER DITCH - D02
SCALE 1:2,500
VERTICAL SCALE 1:500

D02													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m^3/s)*	*(m)*	*(m/s)*
1	0	100	1.2	C530	100	0.10%	3	1	4.64	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.12	0.80
											100 yr	7.64	1.46	1.04
2	100	110	1.2	C530	10	0.10%	3	1	4.24	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.12	0.80
											100 yr	7.64	1.46	1.04
3	110	270	1.2	C530	160	0.10%	3	1	4.59	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.12	0.80
											100 yr	7.64	1.46	1.04
4	270	330	4	C532	60	0.10%	3	1	6.06	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.12	0.80
											100 yr	7.64	1.46	1.04
5	330	375	4	C532	45	0.10%	3	1	5.72	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.12	0.80
											100 yr	7.64	1.46	1.04
6	375	575	1.1	C530	200	0.10%	3	1	5.01	100	2 yr	1.42	0.74	0.59
											10 yr	3.91	1.15	0.76
											100 yr	7.64	1.52	0.91
7	575	815	1.1	C530	240	6.80%	3	6	2.09	300	2 yr	1.42	0.12	1.78
											10 yr	3.91	0.23	2.58
											100 yr	7.64	0.33	3.26
8	815	905	1.1	C530	90	13.00%	3	6	3.28	500	2 yr	1.42	0.12	1.92
											10 yr	3.91	0.21	2.78
											100 yr	7.64	0.31	3.52
9	905	1055	1.1	C530	150	1.90%	3	4	2.15	300	2 yr	2.45	0.31	1.59
											10 yr	7.64	0.59	2.27
											100 yr	15.84	0.86	2.80
10	1055	1115	1.1	C530	60	1.90%	3	4	1.91	300	2 yr	2.45	0.31	1.59
											10 yr	7.64	0.59	2.27
											100 yr	15.84	0.86	2.80
11	1115	1515.3	1.1	C530	400	0.50%	3	2	2.90	100	2 yr	2.45	0.55	1.21
											10 yr	7.64	0.96	1.64
											100 yr	15.84	1.33	1.98

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO EN

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

0 100 200
1:2,500 METRES

0 20 40
1:500 METRES

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp
CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D02

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	47 of 75	C503

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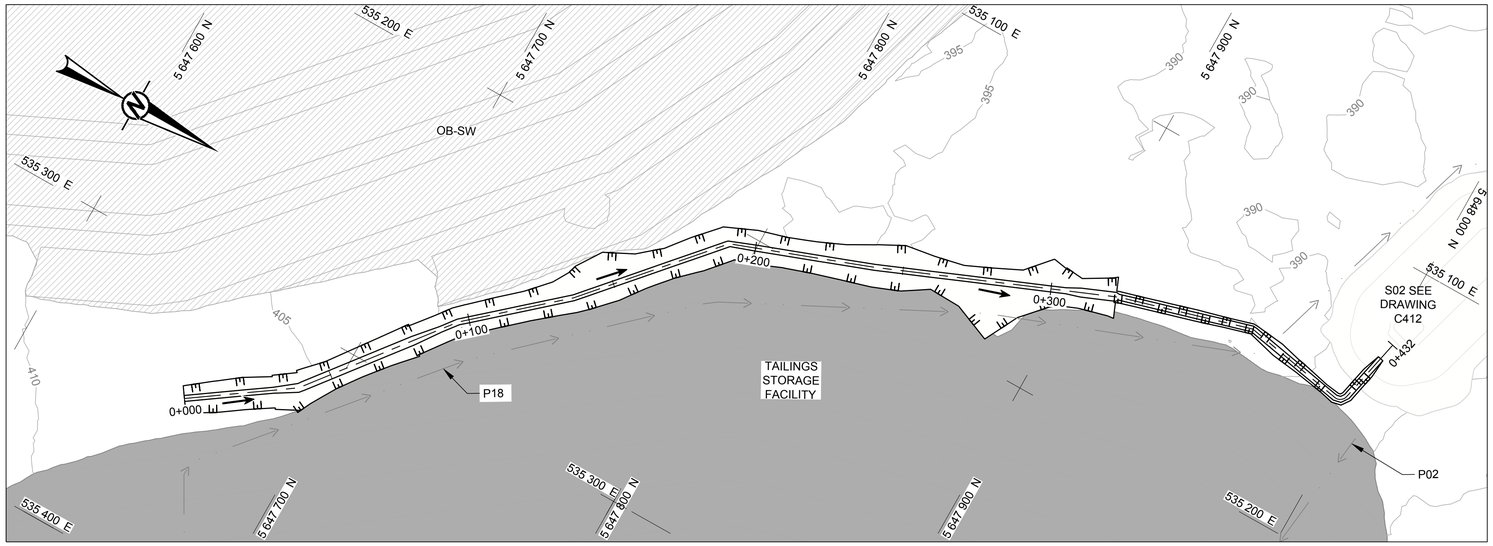
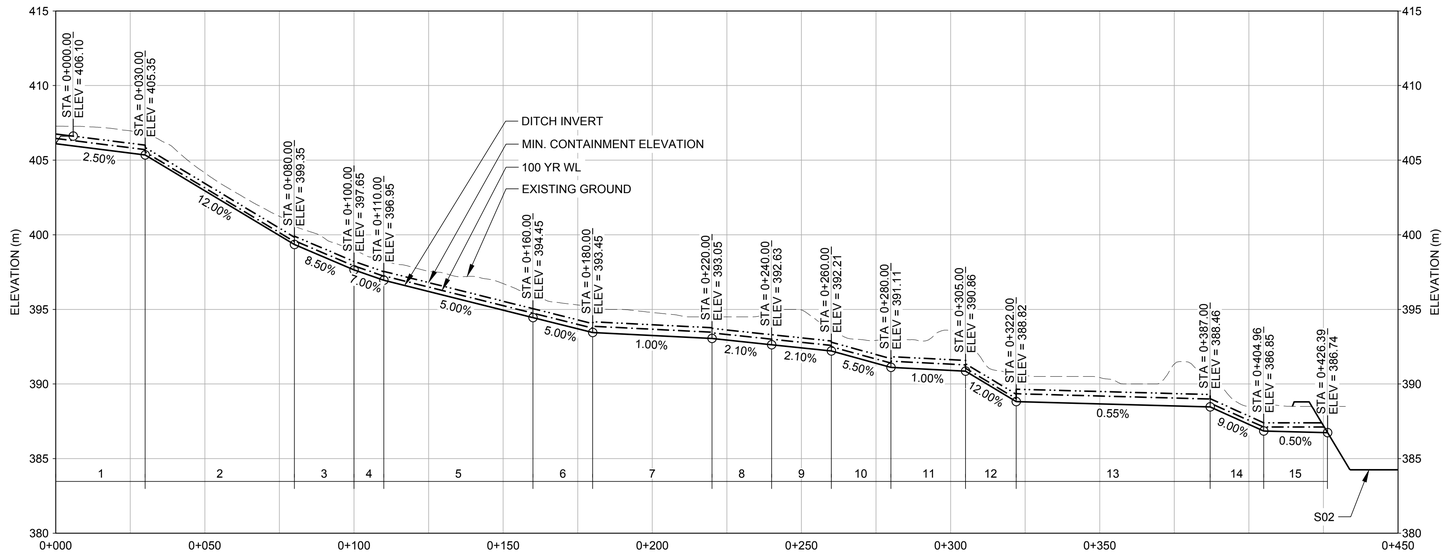
0 25 mm



PLAN - CONTACT WATER DITCH - D03

SCALE 1:1,000



PROFILE - CONTACT WATER DITCH - D03

SCALE 1:1,000

VERTICAL SCALE 1:200

D03													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
1	0.0	30.0	1.2	C530	30	2.50%	3	2	1.45	300	2 yr	0.59	0.18	1.26
											10 yr	1.23	0.27	1.58
											100 yr	2	0.36	1.83
2	30.0	80.0	1.2	C530	50	12.00%	3	3	1.61	300	2 yr	0.59	0.09	1.92
											10 yr	1.23	0.14	2.49
											100 yr	2.00	0.19	2.94
3	80.0	100.0	1.2	C530	20	8.50%	3	2	1.37	300	2 yr	0.59	0.13	1.91
											10 yr	1.23	0.20	2.42
											100 yr	2.00	0.26	2.81
4	100.0	110.0	1.2	C530	10	7.00%	3	2	1.35	300	2 yr	0.59	0.14	1.79
											10 yr	1.23	0.21	2.27
											100 yr	2.00	0.27	2.63
5	110.0	160.0	1.2	C530	50	5.00%	3	2	1.59	300	2 yr	0.59	0.15	1.60
											10 yr	1.23	0.23	2.02
											100 yr	2.00	0.30	2.34
6	160.0	180.0	1.2	C530	20	5.00%	3	2	1.52	300	2 yr	0.59	0.15	1.60
											10 yr	1.23	0.23	2.02
											100 yr	2.00	0.30	2.34
7	180.0	220.0	1.2	C530	40	1.00%	3	2	1.61	100	2 yr	0.59	0.22	1.03
											10 yr	1.23	0.32	1.28
											100 yr	2.00	0.42	1.47
8	220.0	260.0	1.2	C530	40	2.10%	3	2	2.09	300	2 yr	0.59	0.19	1.19
											10 yr	1.23	0.29	1.49
											100 yr	2.00	0.37	1.72
9	260.0	280.0	1.2	C530	20	5.50%	3	2	1.37	300	2 yr	0.59	0.15	1.65
											10 yr	1.23	0.22	2.08
											100 yr	2.00	0.29	2.42
10	280.0	305.0	1.2	C530	25	1.00%	3	2	2.18	100	2 yr	0.59	0.22	1.03
											10 yr	1.23	0.32	1.28
											100 yr	2.00	0.42	1.47
11	305.0	322.0	1.2	C530	17	12.00%	3	3	1.69	300	2 yr	0.59	0.09	1.92
											10 yr	1.23	0.14	2.49
											100 yr	2.00	0.19	2.94
12	322.0	387.0	1.2	C530	65	0.0055	3	2	1.82	100	2 yr	0.59	0.28	0.75
											10 yr	1.23	0.41	0.93
											100 yr	2.00	0.53	1.06
13	387.0	405.0	1.2	C530	18	9.00%	3	2	1.64	300	2 yr	0.59	0.13	1.95
											10 yr	1.23	0.19	2.47
											100 yr	2.00	0.25	2.87
14	405.0	432.6	1.2	C530	28	0.50%	3	2	1.72	100	2 yr	0.59	0.29	0.72
											10 yr	1.23	0.42	0.89
											100 yr	2.00	0.54	1.02

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

0 50 100
1:1,000 METRES

0 10 20
1:200 METRES

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D03

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	48 of 75	C504

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

25 mm

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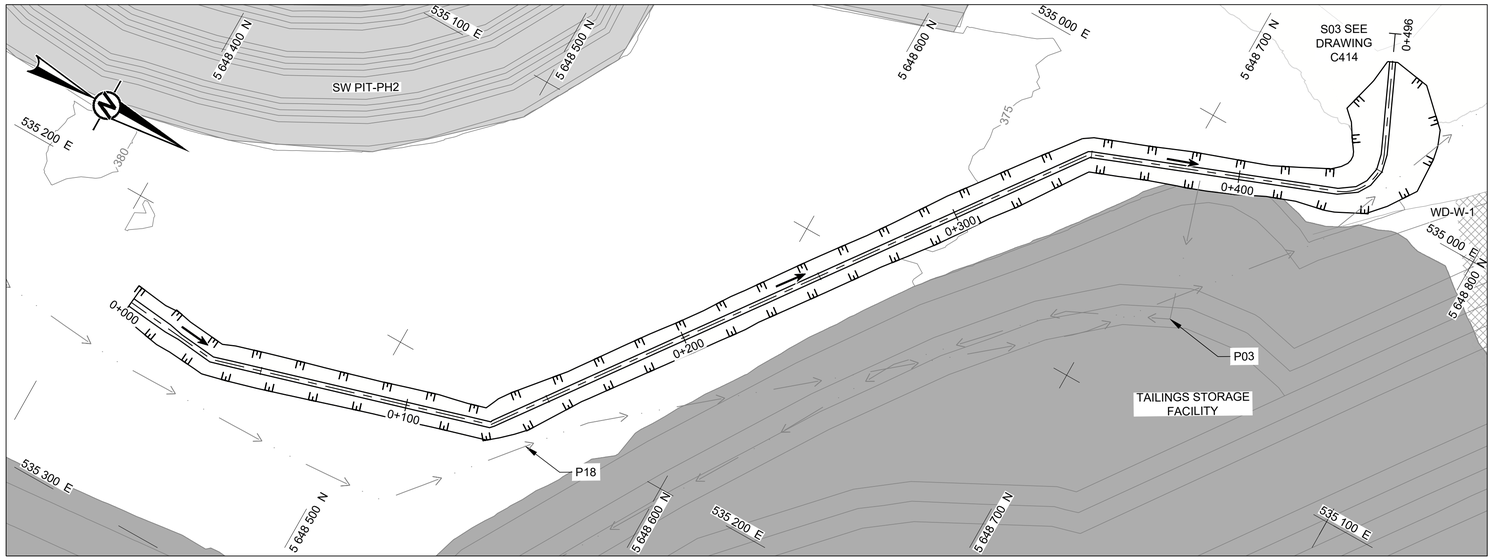
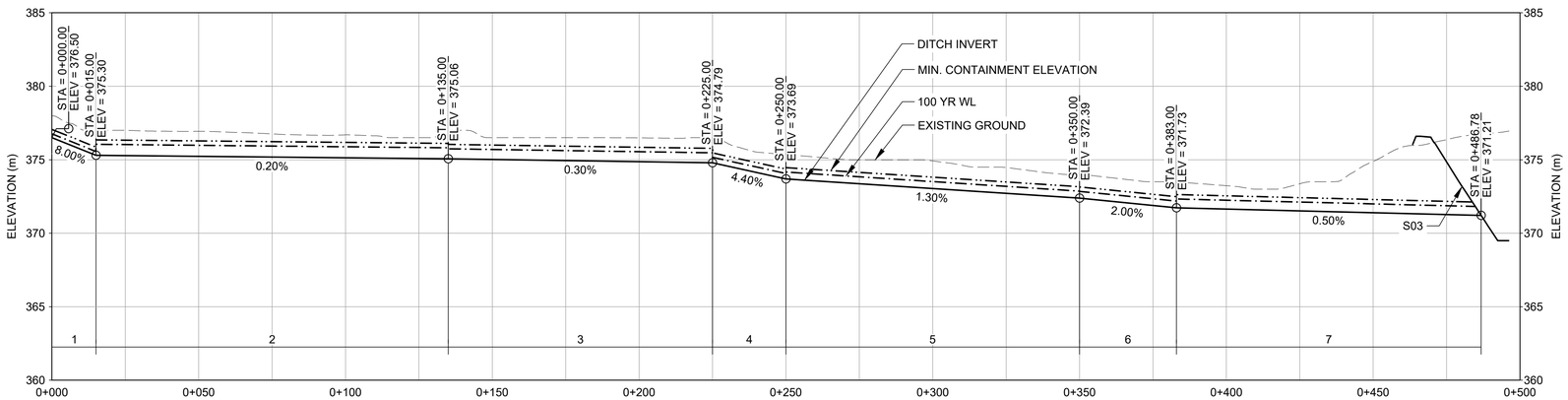


PLAN - CONTACT WATER DITCH - D04

SCALE 1:1,000



PROFILE - CONTACT WATER DITCH - D04

SCALE 1:1,000

VERTICAL SCALE 1:200

D04

Segment #	Station From	Station To	Typical Cross-Section	Reference Drawing	Segment Length (m)	Bed Slope %	Side Slope (H:1V)	Bottom Width (m)	Average Excavation Depth (m)	Erosion Protection Material D50 (mm)	Return Period (Years)	Design Flow (m3/s)	Channel Flow Depth (m)	Channel Flow Velocity (m/s)
1	0	15	1.1	C530	15	8.00%	3	3	1.60	300	2 yr	0.75	0.12	1.84
											10 yr	1.65	0.19	2.41
											100 yr	2.9	0.26	2.90
2	15	135	1.1	C530	120	0.20%	3	2	1.55	100	2 yr	0.75	0.38	0.63
											10 yr	1.65	0.57	0.78
											100 yr	2.90	0.75	0.91
3	135	225	1.1	C530	90	0.30%	3	2	1.59	100	2 yr	0.75	0.34	0.72
											10 yr	1.65	0.52	0.90
											100 yr	2.90	0.68	1.05
4	225	250	1.1	C530	25	4.40%	3	2	1.56	300	2 yr	0.75	0.18	1.65
											10 yr	1.65	0.28	2.11
											100 yr	2.90	0.37	2.49
5	250	350	1.1	C530	100	1.30%	3	2	1.72	100	2 yr	0.75	0.23	1.21
											10 yr	1.65	0.35	1.53
											100 yr	2.90	0.47	1.79
6	350	383	1.1	C530	33	2.00%	3	2	1.57	300	2 yr	0.75	0.22	1.26
											10 yr	1.65	0.34	1.60
											100 yr	2.90	0.46	1.87
7	383	486.8	1.1	C530	104	0.50%	3	2	1.51	100	2 yr	0.75	0.30	0.87
											10 yr	1.65	0.45	1.09
											100 yr	2.90	0.60	1.27

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 50 100
1:1,000 METRES

0 10 20
1:200 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D04

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	49 of 75	C505

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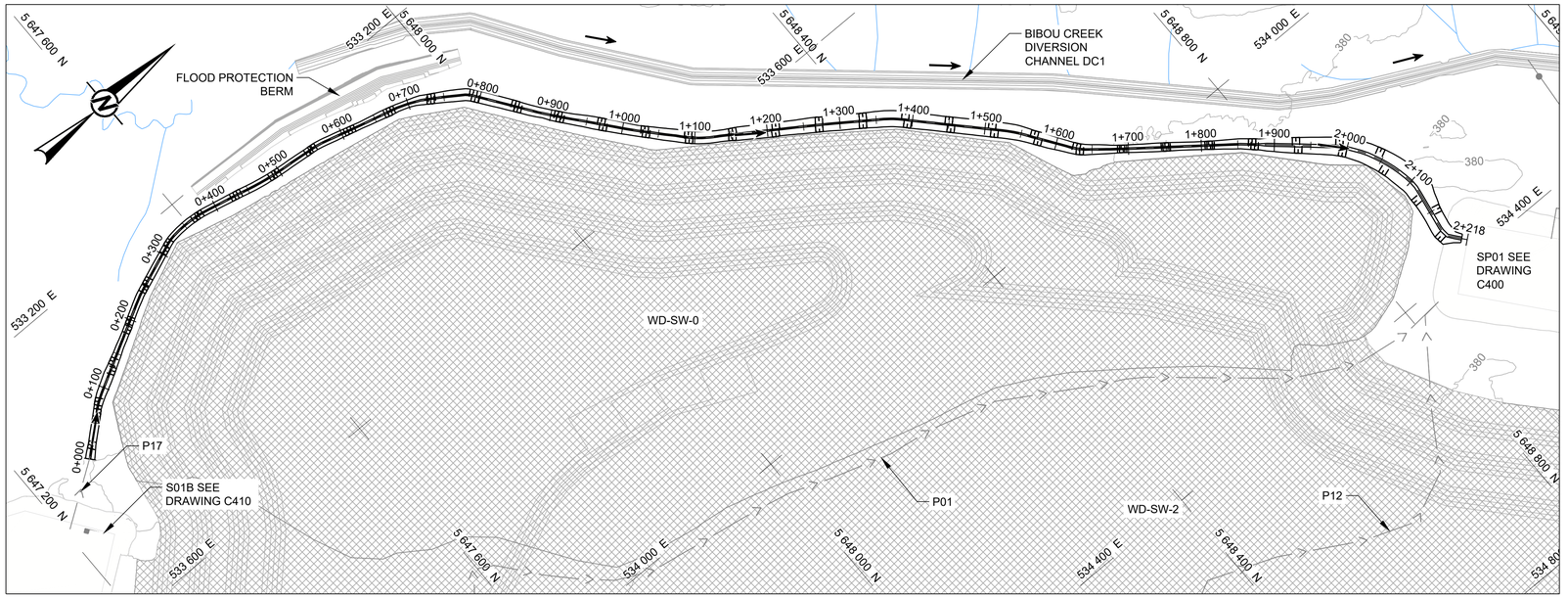
0 25 mm



PLAN - CONTACT WATER DITCH - D05

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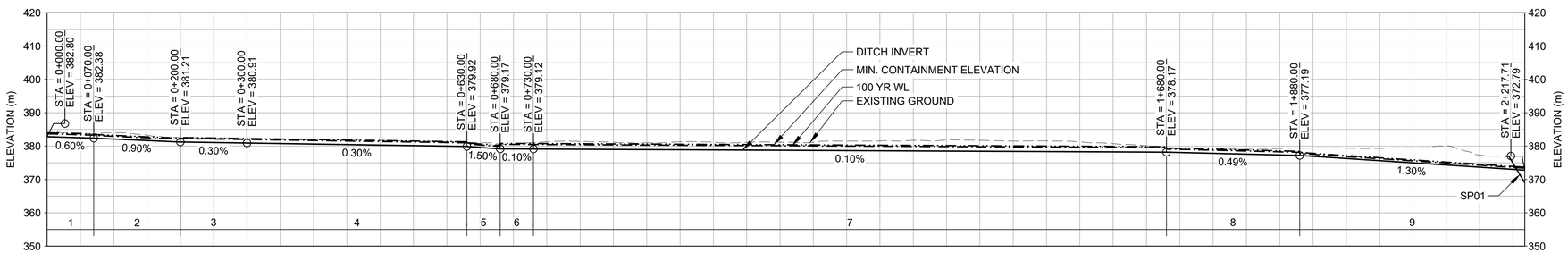

PROFILE - CONTACT WATER DITCH - D05

SCALE 1:4,000

VERTICAL SCALE 1:800

D05													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	To			(m)	%	(H:1V	(m)	(m)	(mm)	(Years)	(m^3/s)	(m)	(m/s)
1	0	70	1.1	C530	70	0.60%	3	2	1.43	100	2 yr	0.9	0.31	0.97
											10 yr	3.28	0.61	1.40
											100 yr	7.4	0.90	1.74
2	70	200	1.1	C530	130	0.90%	3	2	1.62	100	2 yr	0.90	0.28	1.12
											10 yr	3.28	0.55	1.62
											100 yr	7.40	0.82	2.02
3	200	300	1.1	C530	100	0.30%	3	2	1.34	100	2 yr	0.90	0.38	0.76
											10 yr	3.28	0.72	1.09
											100 yr	7.40	1.06	1.34
4	300	630	1.1	C530	330	0.30%	3	2	1.44	100	2 yr	0.90	0.38	0.76
											10 yr	3.28	0.72	1.09
											100 yr	7.40	1.06	1.34
5	630	680	1.1	C530	50	1.50%	3	2	1.53	300	2 yr	0.90	0.24	1.34
											10 yr	3.28	0.49	1.95
											100 yr	7.40	0.73	2.43
6	680	730	1.1	C530	50	0.10%	3	2	1.56	100	2 yr	0.90	0.50	0.51
											10 yr	3.28	0.94	0.72
											100 yr	7.40	1.36	0.89
7	730	1680	1.1	C530	950	0.10%	3	2	2.63	100	2 yr	0.90	0.50	0.51
											10 yr	3.28	0.94	0.72
											100 yr	7.40	1.36	0.89
8	1680	1880	1.1	C530	200	0.49%	3	2	1.63	100	2 yr	0.90	0.33	0.91
											10 yr	3.28	0.64	1.30
											100 yr	7.40	0.95	1.61
9	1880	2193.2	1.1	C530	313	1.30%	3	4	3.86	300	2 yr	0.90	0.18	1.11
											10 yr	3.28	0.37	1.71
											100 yr	7.40	0.59	2.19

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
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4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 200 400
1:4,000 METRES

0 40 80
1:800 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D05

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	50 of 75	C506

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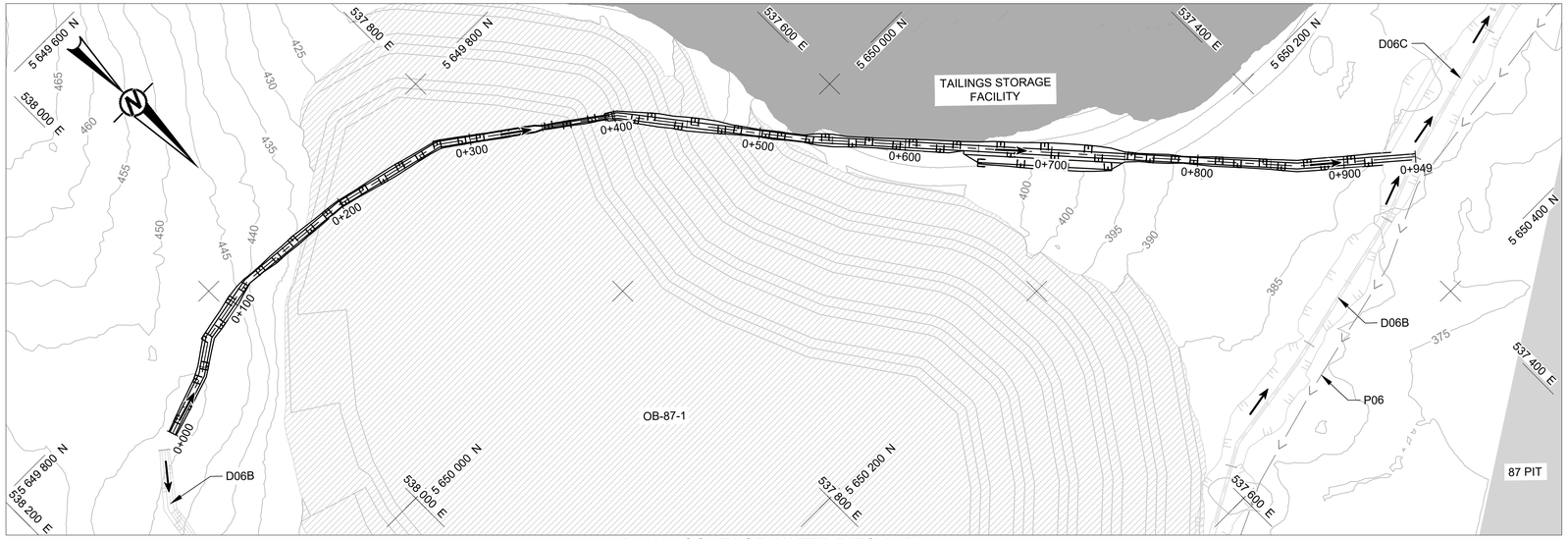
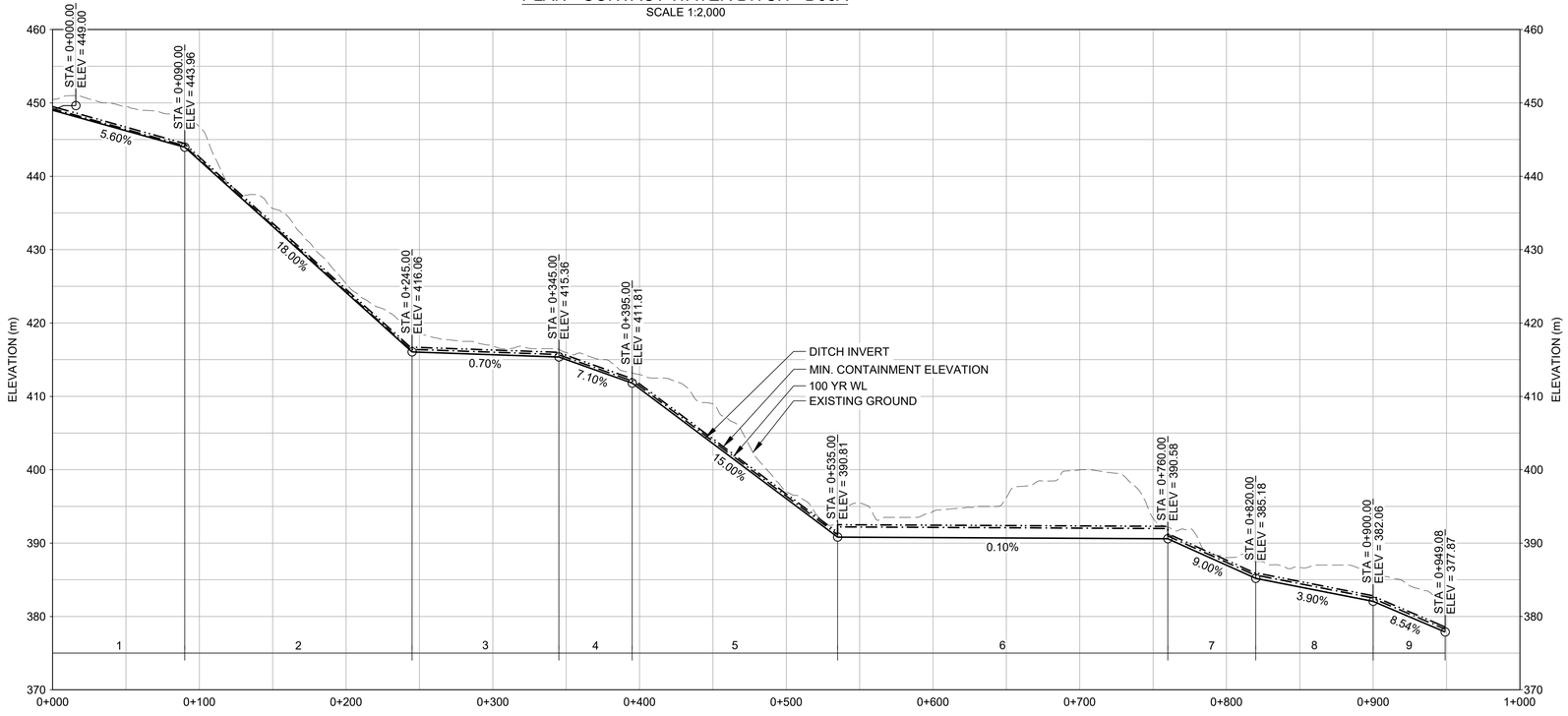
0 25 mm



PLAN - CONTACT WATER DITCH - D06A

SCALE 1:2,000



PROFILE - CONTACT WATER DITCH - D06A

SCALE 1:2,000

VERTICAL SCALE 1:400

D06A													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
1	0	90	2.2	C531	90	5.60%	0.5	4	3.21	300	2 yr	0.41	0.08	1.24
											10 yr	0.97	0.14	1.74
											100 yr	1.79	0.20	2.19
2	90	245	2.2	C531	155	18.00%	0.5	4	2.50	300	2 yr	0.41	0.06	1.77
											10 yr	0.97	0.10	2.48
											100 yr	1.79	0.14	3.14
3	245	345	2.2	C531	100	0.70%	0.5	4	1.54	100	2 yr	0.41	0.14	0.72
											10 yr	0.97	0.24	1.00
											100 yr	1.79	0.34	1.25
4	345	395	2.2	C531	50	7.10%	0.5	2	1.50	300	2 yr	0.41	0.12	1.70
											10 yr	0.97	0.20	2.34
											100 yr	1.79	0.29	2.89
5	395	535	2.2	C531	140	15.00%	0.5	4	3.19	500	2 yr	1.27	0.14	2.26
											10 yr	3.04	0.23	3.15
											100 yr	5.60	0.34	3.93
6	535	760	5	C533	225	0.10%	0.5	4	5.43	100	2 yr	1.27	0.56	0.53
											10 yr	3.04	0.96	0.71
											100 yr	5.60	1.39	0.85
7	760	820	2.2	C531	60	9.00%	0.5	4	1.79	500	2 yr	1.27	0.16	1.99
											10 yr	3.04	0.27	2.76
											100 yr	5.60	0.39	3.44
8	820	900	2.2	C531	80	3.90%	0.5	4	3.28	300	2 yr	1.27	0.18	1.72
											10 yr	3.04	0.31	2.37
											100 yr	5.60	0.45	2.95
9	900	949.4	2.2	C531	49	8.48%	0.5	4	4.42	500	2 yr	1.27	0.16	1.98
											10 yr	3.04	0.27	2.75
											100 yr	5.60	0.39	3.43

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 100 200
1:2,000 METRES

0 20 40
1:400 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D06A

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	51 of 75	C507

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
0 25 mm

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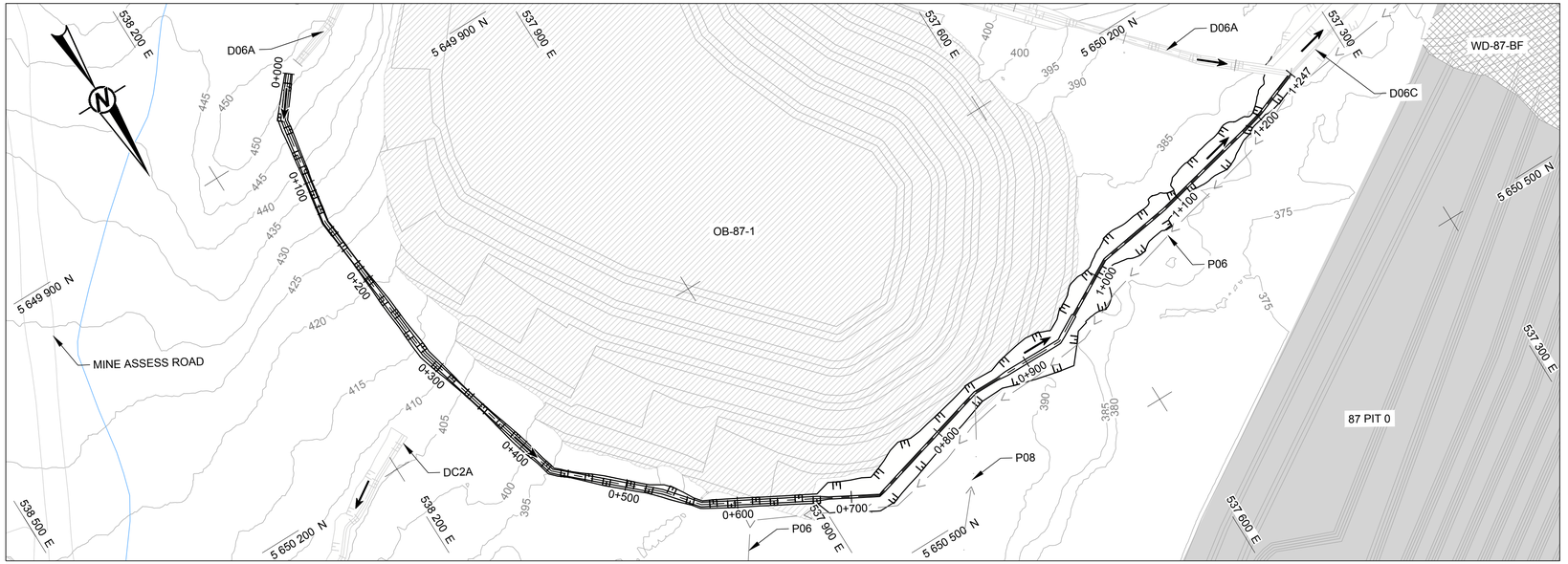
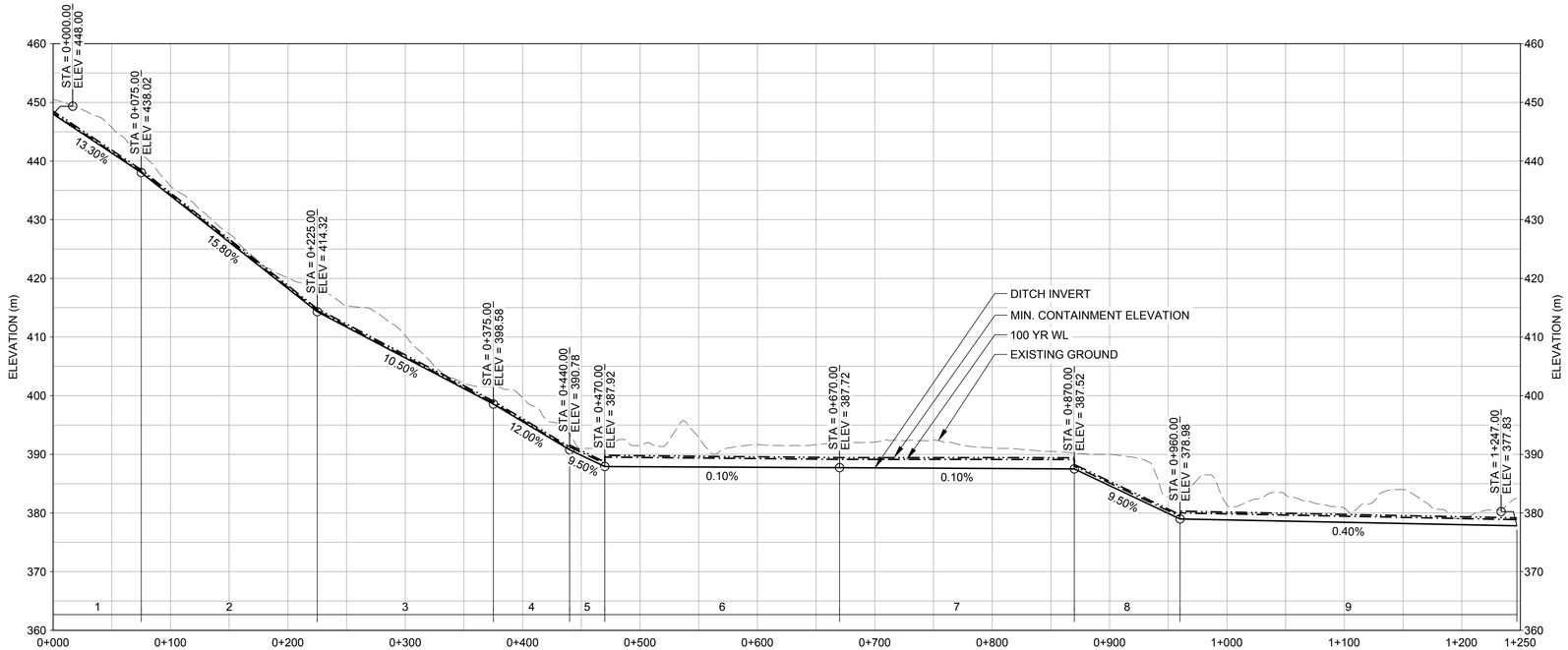


PLAN - CONTACT WATER DITCH - D06B
SCALE 1:2,500



PROFILE - CONTACT WATER DITCH - D06B
SCALE 1:2,500
VERTICAL SCALE 1:500

D06B														
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	To			(m)	%	(H:1V	(m)	(m)	(mm)	(Years)	(m3/s)	(m)	(m/s)
1	0	75	2.1	C531	75	13.30%	0.5	4	4.08	300	2 yr	0.75	0.09	2.04
											10 yr	1.47	0.14	2.65
											100 yr	2.68	0.20	3.34
2	75	225	2.1	C531	150	15.80%	0.5	4	1.99	500	2 yr	0.75	0.09	1.99
											10 yr	1.47	0.14	2.58
											100 yr	2.68	0.20	3.24
3	225	375	2.1	C531	150	10.50%	0.5	4	3.18	300	2 yr	0.75	0.10	1.90
											10 yr	1.47	0.15	2.47
											100 yr	2.68	0.21	3.10
4	375	440	2.1	C531	65	12.00%	0.5	4	3.60	300	2 yr	0.75	0.09	1.98
											10 yr	1.47	0.14	2.57
											100 yr	2.68	0.20	3.23
5	440	470	2.1	C531	30	9.50%	0.5	4	2.05	500	2 yr	2.28	0.23	2.45
											10 yr	4.48	0.34	3.14
											100 yr	8.20	0.50	3.88
6	470	670	2.1	C531	200	0.10%	0.5	4	4.09	100	2 yr	2.28	0.73	0.72
											10 yr	4.48	1.10	0.89
											100 yr	8.20	1.60	1.06
7	670	870	1.2	C530	200	0.10%	3	2	3.94	100	2 yr	2.28	0.79	0.66
											10 yr	4.48	1.09	0.79
											100 yr	8.20	1.42	0.92
8	870	960	1.2	C530	90	9.50%	3	4	4.99	500	2 yr	2.28	0.23	2.45
											10 yr	4.48	0.32	2.86
											100 yr	8.20	0.44	3.46
9	960	1247	1.2	C530	287	0.40%	3	2	3.97	100	2 yr	2.28	0.56	1.09
											10 yr	4.48	0.78	1.31
											100 yr	8.20	1.04	1.54

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 100 200
1:2,500 METRES

0 20 40
1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D06B

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	52 of 75	C508

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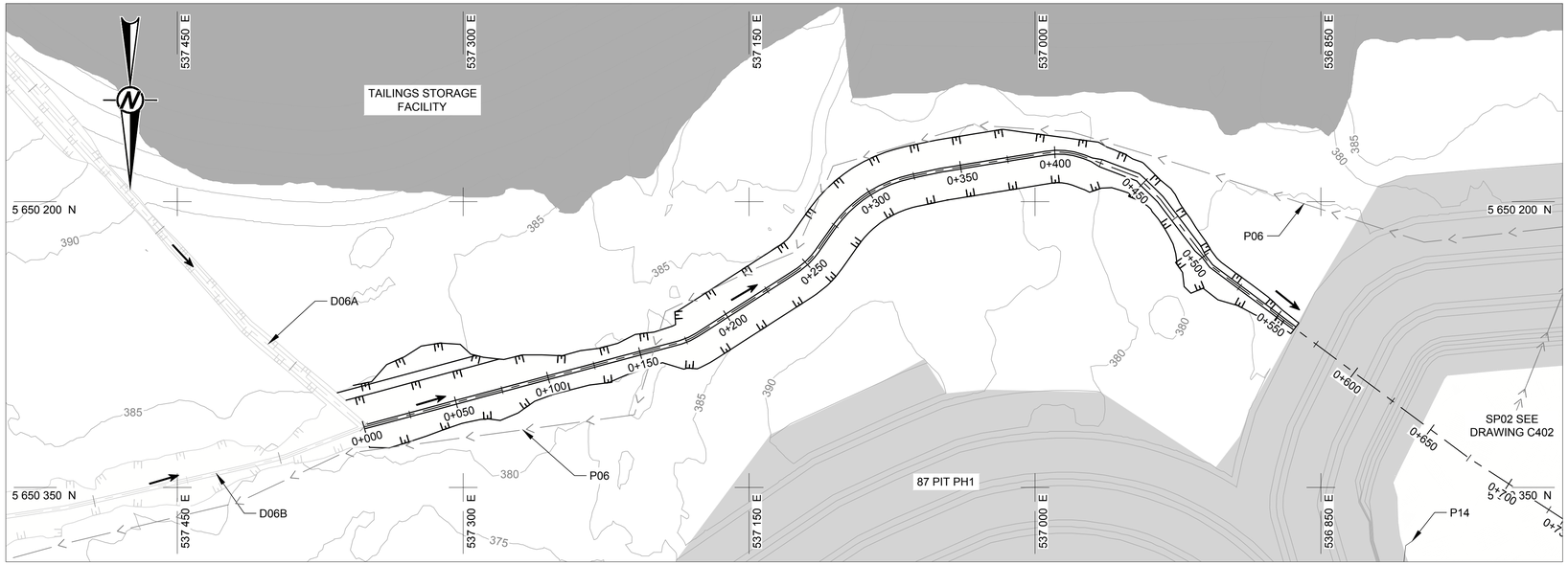
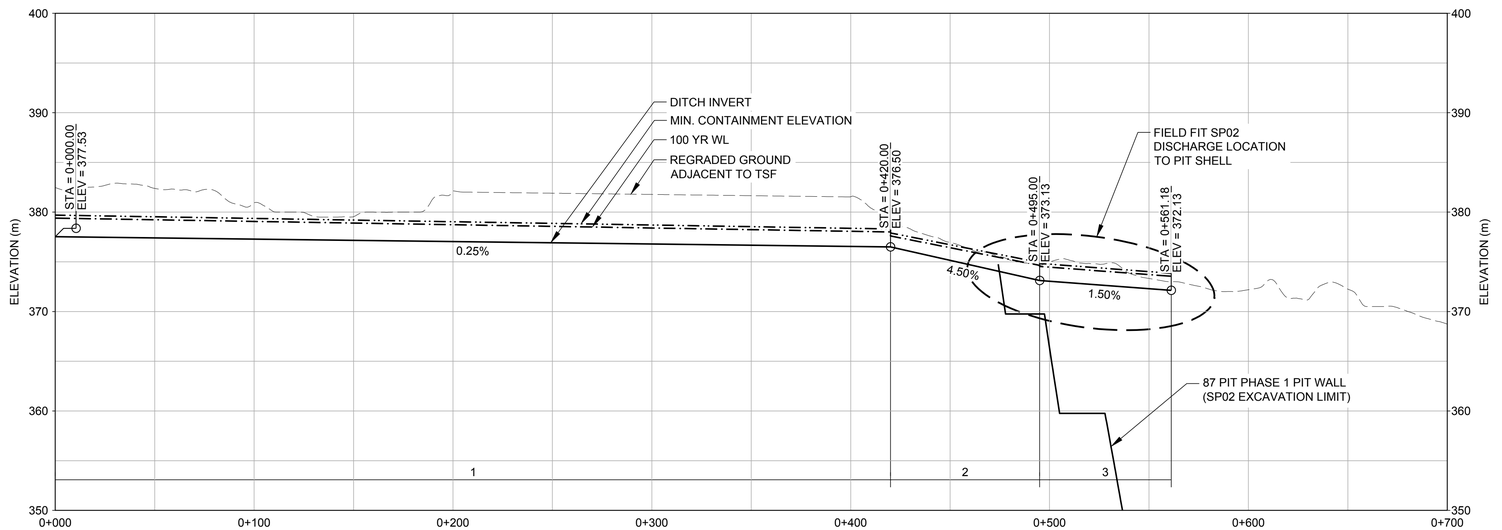
0 25 mm



PLAN - CONTACT WATER DITCH - D06C

SCALE 1:1,500



PROFILE - CONTACT WATER DITCH - D06C

SCALE 1:1,500

VERTICAL SCALE 1:300

D06C

Segment #	Station From	Station To	Typical Cross-Section	Reference Drawing	Segment Length (m)	Bed Slope %	Side Slope (H:1V)	Bottom Width (m)	Average Excavation Depth (m)	Erosion Protection Material D50 (mm)	Return Period (Years)	Design Flow (m3/s)	Channel Flow Depth (m)	Channel Flow Velocity (m/s)
1	0	420	3.1	C531	420	0.25%	3	2	4.26	100	2 yr	3.85	0.82	1.06
											10 yr	8.59	1.18	1.31
											100 yr	15.1	1.52	1.51
2	420	495	1.1	C530	75	4.50%	3	4	1.69	500	2 yr	3.85	0.35	2.15
											10 yr	8.59	0.55	2.75
											100 yr	15.10	0.75	3.25
3	495	561.2	1.1	C530	66	1.50%	3	2	2.12	300	2 yr	3.85	0.57	1.83
											10 yr	8.59	0.84	2.26
											100 yr	15.10	1.09	2.62

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2022.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
3. SP02 SURFACE FROM AGP V9 50 ktpd MINE PLAN. THE SURFACE AND BOUNDARIES SHOWN REPRESENT THE 87 PIT PHASE 0 PIT SHELL, WHICH IS EXCAVATED IN THE EARLY STAGES ON THE MINE PLAN TO ACCOMMODATE CONTACT WATER RUNOFF AND STORAGE.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 50 100
1:1,500 METRES

0 10 20
1:300 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D06C

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	53 of 75	C509

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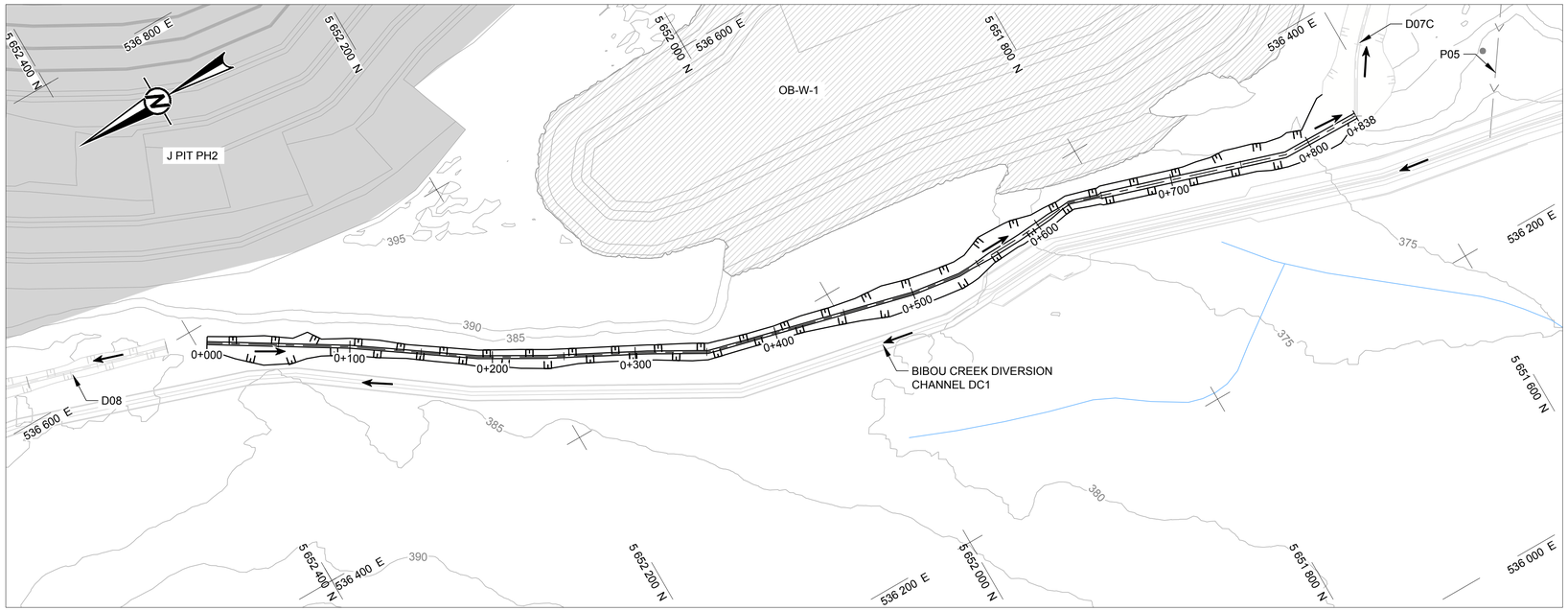
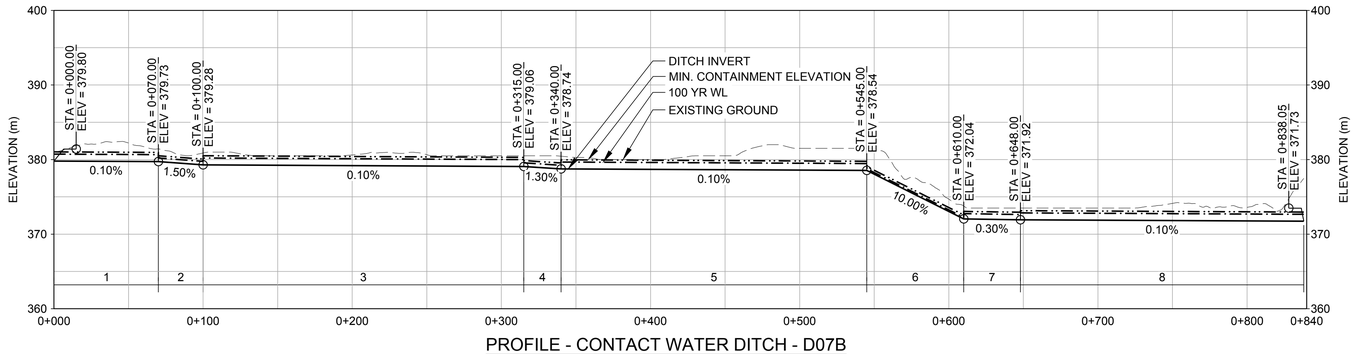


PLAN - CONTACT WATER DITCH - D07B
SCALE 1:2,000



PROFILE - CONTACT WATER DITCH - D07B
SCALE 1:2,000
VERTICAL SCALE 1:400

D07B

Segment #	Station From	Station To	Typical Cross-Section	Reference Drawing	Segment Length (m)	Bed Slope %	Side Slope (H:1V)	Bottom Width (m)	Average Excavation Depth (m)	Erosion Protection Material D50 (mm)	Return Period (Years)	Design Flow (m3/s)	Channel Flow Depth (m)	Channel Flow Velocity (m/s)
1	0	70	1.1	C530	70	0.10%	3	2	2.07	100	2 yr	1.11	0.56	0.54
											10 yr	2.06	0.75	0.64
											100 yr	3.2	0.93	0.72
2	70	100	1.1	C530	30	1.50%	3	2	1.31	100	2 yr	1.11	0.27	1.43
											10 yr	2.06	0.38	1.71
											100 yr	3.20	0.48	1.94
3	100	315	1.1	C530	215	0.10%	3	2	1.39	100	2 yr	1.11	0.56	0.54
											10 yr	2.06	0.75	0.64
											100 yr	3.20	0.93	0.72
4	315	340	1.1	C530	25	1.30%	3	2	1.37	100	2 yr	1.11	0.29	1.36
											10 yr	2.06	0.40	1.63
											100 yr	3.20	0.50	1.84
5	340	545	1.1	C530	205	0.10%	3	2	2.11	100	2 yr	1.11	0.56	0.54
											10 yr	2.06	0.75	0.64
											100 yr	3.20	0.93	0.72
6	545	610	1.1	C530	65	10.00%	3	4	2.00	300	2 yr	1.11	0.12	2.09
											10 yr	2.06	0.17	2.61
											100 yr	3.20	0.23	3.03
7	610	648	1.1	C530	38	0.30%	3	2	1.25	100	2 yr	1.11	0.42	0.81
											10 yr	2.06	0.58	0.96
											100 yr	3.20	0.72	1.08
8	648	838	3.1	C531	190	0.10%	3	2	1.93	100	2 yr	1.11	0.56	0.54
											10 yr	2.06	0.75	0.64
											100 yr	3.20	0.93	0.72

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 100 200
1:2,000 METRES

0 20 40
1:400 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D07B

PROJECT NO. 2257554004 | CONTROL | REV. A | | DRAWING C510

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
0 25 mm

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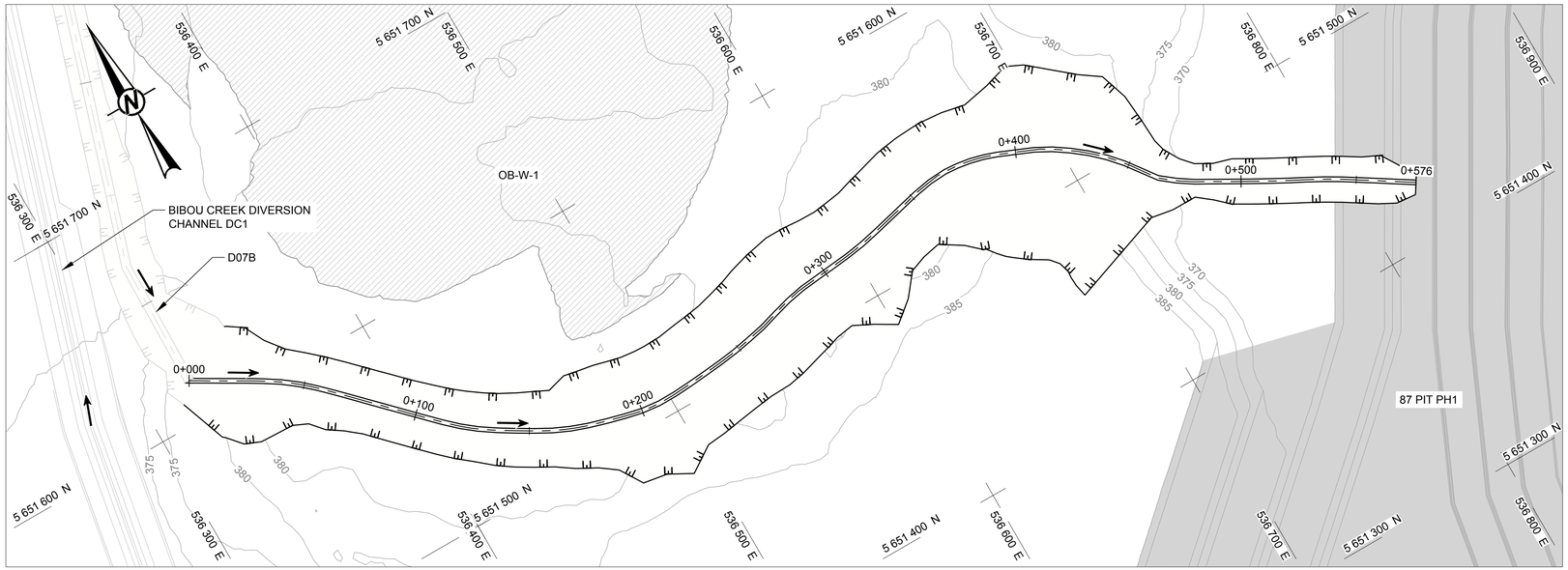
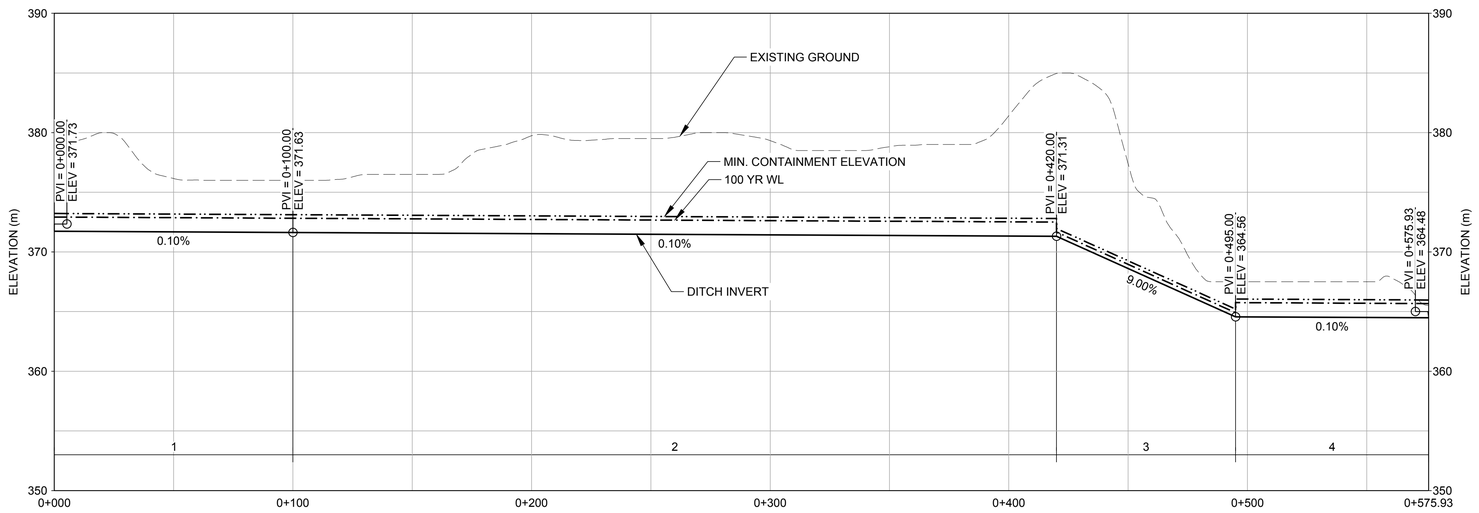


PLAN - CONTACT WATER DITCH - D07C

SCALE 1:1,250



PROFILE - CONTACT WATER DITCH - D07C

SCALE 1:1,250

VERTICAL SCALE 1:250

D07c												
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m^3/s)*	*(m)*	*(m/s)*
1	0	100	1.2	C530	100	0.10%	3	2	5.51	100	2 yr	1.73	0.69	0.61
											10 yr	3.4	0.96	0.73
											100 yr	5.5	1.19	0.83
2	100	420	1.2	C530	320	0.10%	3	2	7.54	100	2 yr	1.73	0.69	0.61
											10 yr	3.4	0.96	0.73
											100 yr	5.5	1.19	0.83
3	420	495	1.2	C530	75	9.00%	3	4	5.59	500	2 yr	1.73	0.18	2.14
											10 yr	3.4	0.26	2.69
											100 yr	5.5	0.35	3.15
4	495	567.2	1.2	C530	72	0.10%	3	2	2.59	100	2 yr	1.73	0.69	0.61
											10 yr	3.4	0.96	0.73
											100 yr	5.5	1.19	0.83

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
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4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2022.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 50 100
1:1,250 METRES

0 10 20
1:250 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D07C

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	55 of 75	C511

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

0 25 mm

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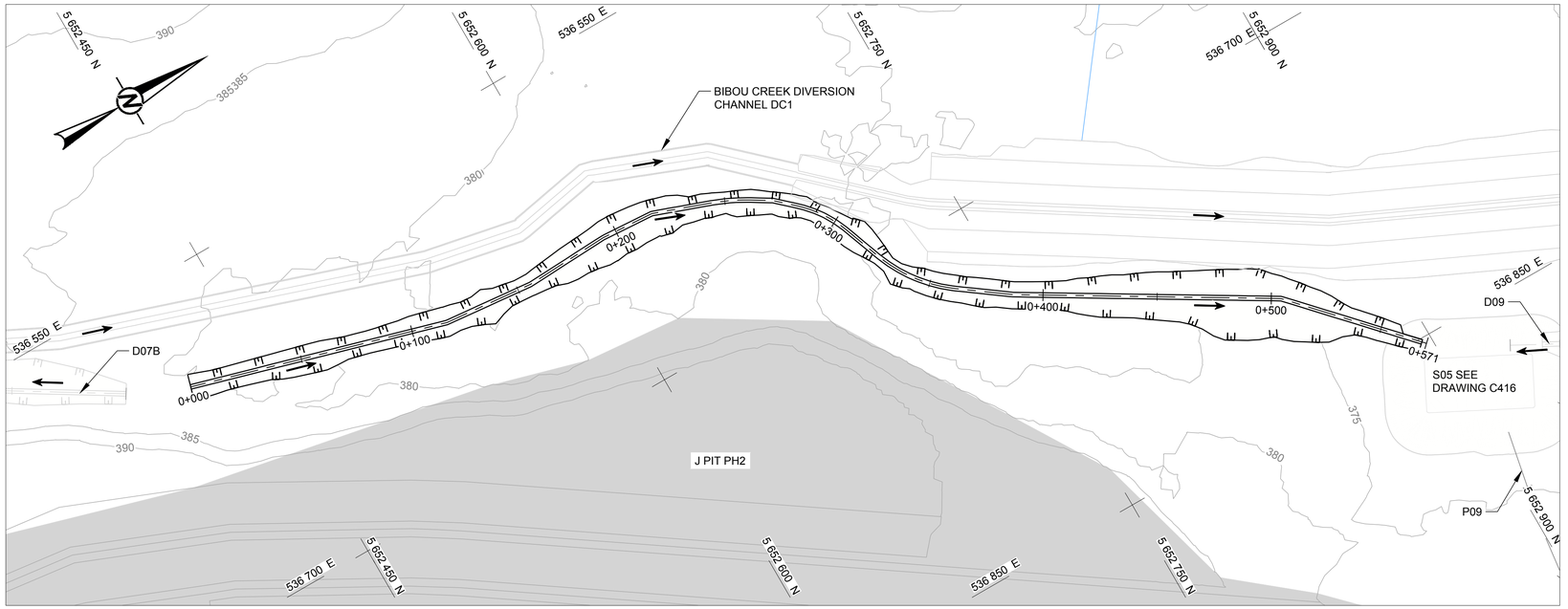
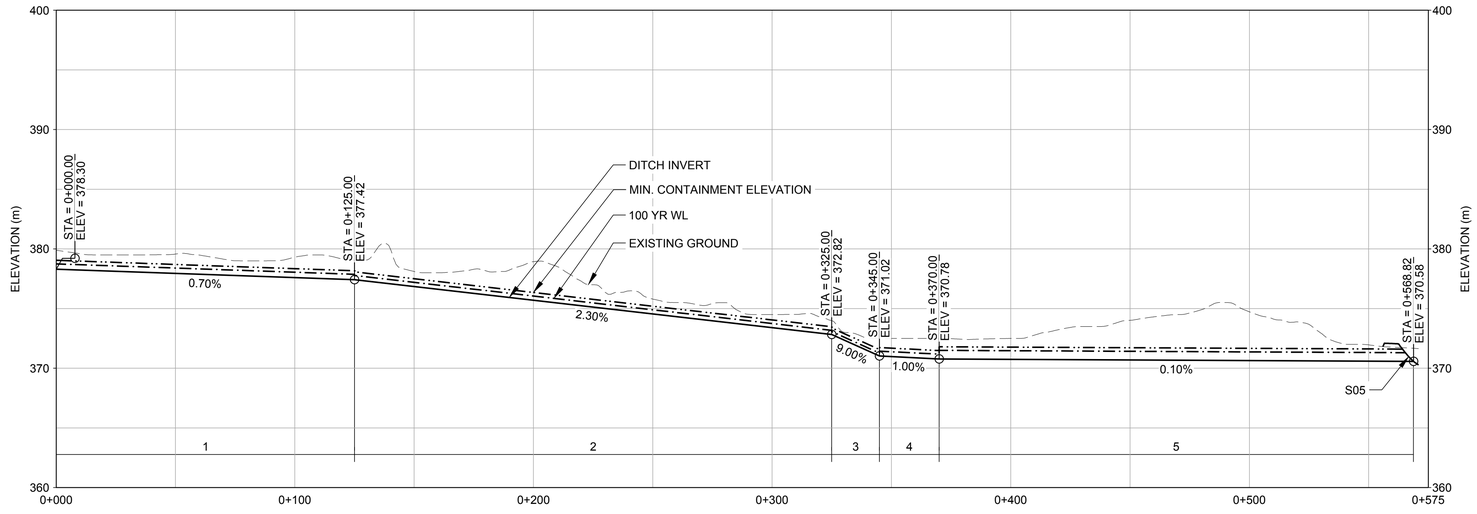


PLAN - CONTACT WATER DITCH - D08

SCALE 1:1,250



PROFILE - CONTACT WATER DITCH - D08

SCALE 1:1,250

VERTICAL SCALE 1:250

D08													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	To			(m)	%	(H:1V	(m)	(m)	(mm)	(Years)	(m3/s)	(m)	(m/s)
1	0	125	1.1	C530	125	0.70%	3	2	1.52	100	2 yr	0.37	0.18	0.78
											10 yr	0.98	0.32	1.05
											100 yr	1.9	0.45	1.27
2	125	325	1.1	C530	200	2.30%	3	2	1.97	300	2 yr	0.37	0.14	1.06
											10 yr	0.98	0.25	1.44
											100 yr	1.90	0.35	1.75
3	325	345	1.1	C530	20	9.00%	3	2	1.70	300	2 yr	0.37	0.10	1.66
											10 yr	0.98	0.17	2.30
											100 yr	1.90	0.25	2.83
4	345	370	1.1	C530	25	1.00%	3	2	1.40	100	2 yr	0.37	0.17	0.88
											10 yr	0.98	0.29	1.20
											100 yr	1.90	0.41	1.45
5	370	571	1.1	C530	201	0.10%	3	2	2.70	100	2 yr	0.37	0.32	0.40
											10 yr	0.98	0.52	0.53
											100 yr	1.90	0.72	0.63

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 50 100
1:1,250 METRES

0 10 20
1:250 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D08

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	56 of 75	C512

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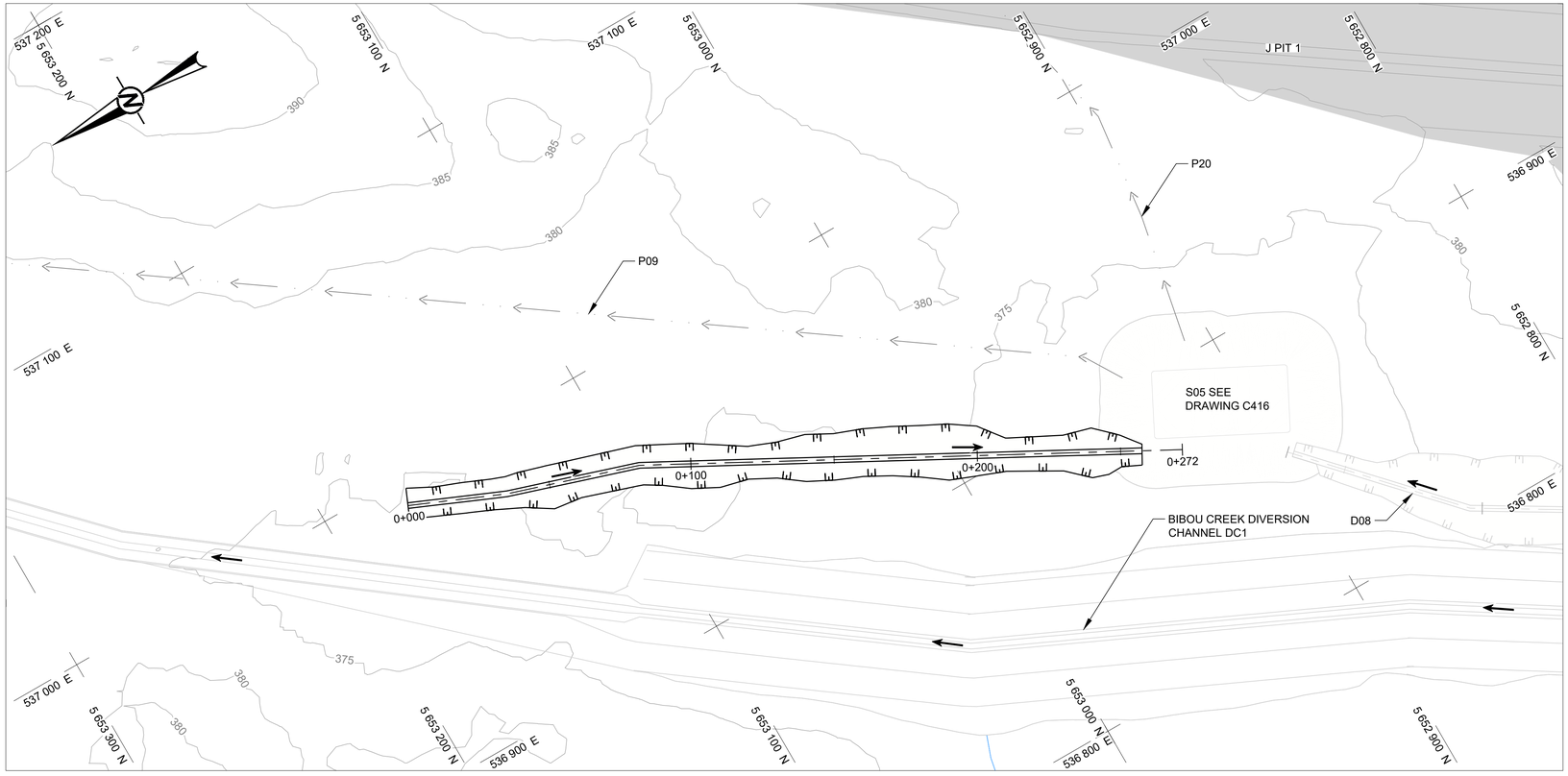
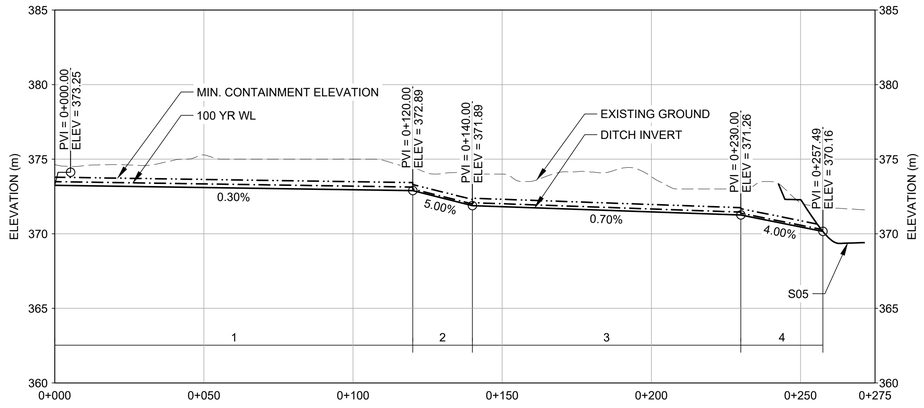
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm



PLAN - CONTACT WATER DITCH - D09

SCALE 1:1,000



PROFILE - CONTACT WATER DITCH - D09

SCALE 1:1,000

VERTICAL SCALE 1:200

D09													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m3/s)*	*(m)*	*(m/s)*
1	0	120	2.1	C531	120	0.30%	3	2	1.78	100	2 yr	0.01	0.03	0.17
											10 yr	0.14	0.14	0.43
											100 yr	0.4	0.24	0.60
2	120	140	2.1	C531	20	5.00%	3	2	1.77	100	2 yr	0.01	0.01	0.39
											10 yr	0.14	0.06	1.07
											100 yr	0.40	0.11	1.56
3	140	230	2.1	C531	90	0.70%	3	2	2.15	100	2 yr	0.01	0.02	0.22
											10 yr	0.14	0.11	0.57
											100 yr	0.40	0.19	0.80
4	230	257.5	2.1	C531	28	4.00%	3	2	1.90	100	2 yr	0.01	0.01	0.37
											10 yr	0.14	0.06	1.00
											100 yr	0.40	0.12	1.44

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 50 100
1:1,000 METRES

0 10 20
1:200 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D09

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	57 of 75	C513

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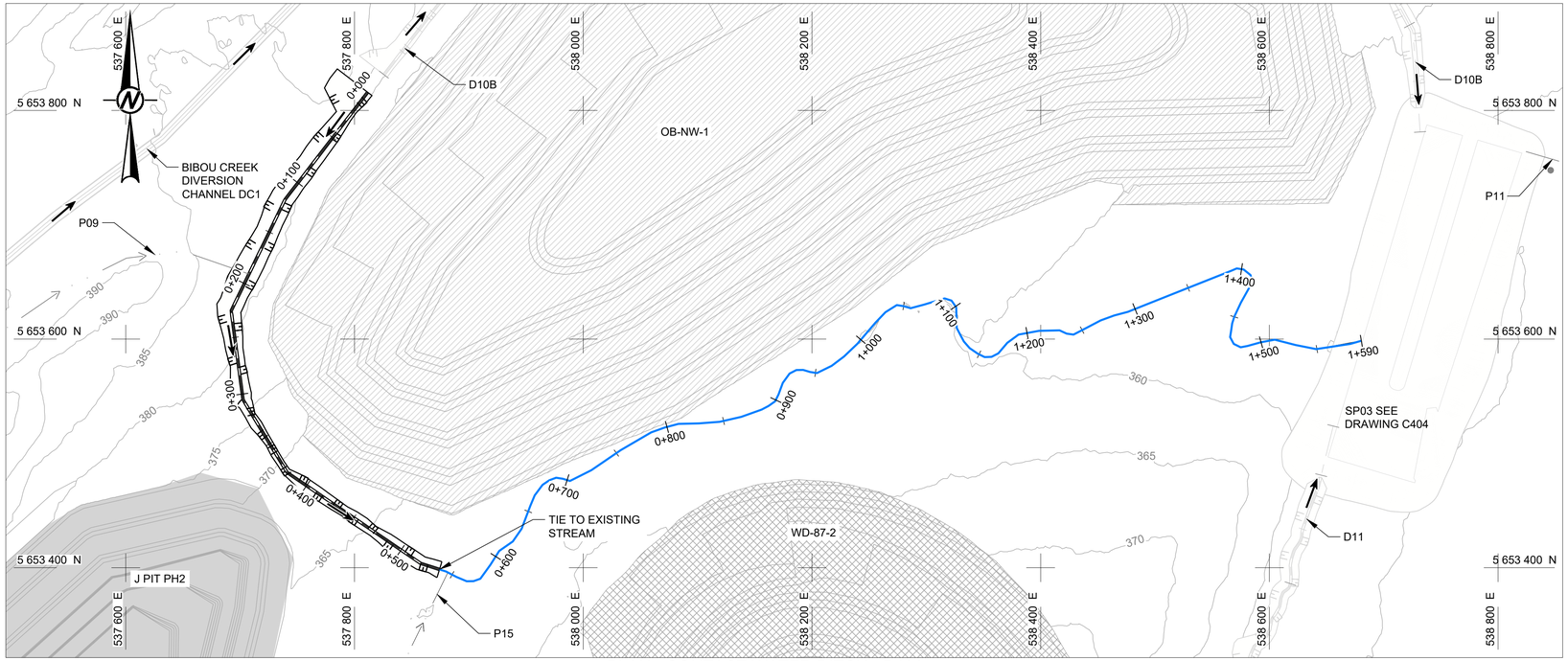
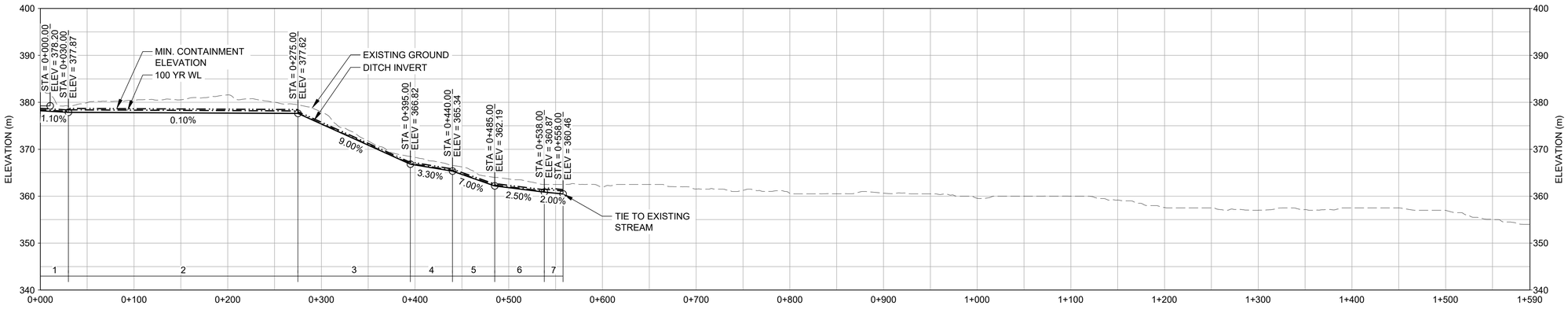
0 25 mm



PLAN - CONTACT WATER DITCH - D10A

SCALE 1:2,500



PROFILE - CONTACT WATER DITCH - D10A

SCALE 1:2,500

VERTICAL SCALE 1:500

D10A												
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	To			(m)	%	(H:1V	(m)	(m)	(mm)	(Years)	(m3/s)	(m)	(m/s)
1	0	30	1.2	C530	30	1.10%	3	2	2.32	100	2 yr	0.41	0.17	0.95
											10 yr	1.04	0.29	1.26
											100 yr	1.93	0.40	1.51
2	30	270	1.2	C530	240	0.10%	3	2	2.84	100	2 yr	0.41	0.33	0.41
											10 yr	1.04	0.54	0.53
											100 yr	1.93	0.73	0.63
3	270	390	1.2	C530	120	9.00%	3	2	2.05	300	2 yr	0.41	0.12	1.50
											10 yr	1.04	0.20	2.03
											100 yr	1.93	0.28	2.45
4	390	435	1.2	C530	45	3.30%	3	2	1.85	300	2 yr	0.41	0.15	1.13
											10 yr	1.04	0.25	1.50
											100 yr	1.93	0.35	1.81
5	435	480	1.2	C530	45	7.00%	3	2	1.93	300	2 yr	0.41	0.13	1.38
											10 yr	1.04	0.21	1.86
											100 yr	1.93	0.30	2.25
6	480	533	1.2	C530	53	2.50%	3	2	2.18	300	2 yr	0.41	0.17	0.99
											10 yr	1.04	0.28	1.32
											100 yr	1.93	0.39	1.58
7	533	553	1.1	C530	20	2.00%	3	2	1.81	300	2 yr	2.05	0.38	1.70
											10 yr	5.16	0.61	2.19
											100 yr	9.60	0.83	2.59

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

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4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

0 100 200
1:2,500 METRES

0 20 40
1:500 METRES

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT: TROILUS

CONSULTANT: WSP

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D10A

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	58 of 75	C514

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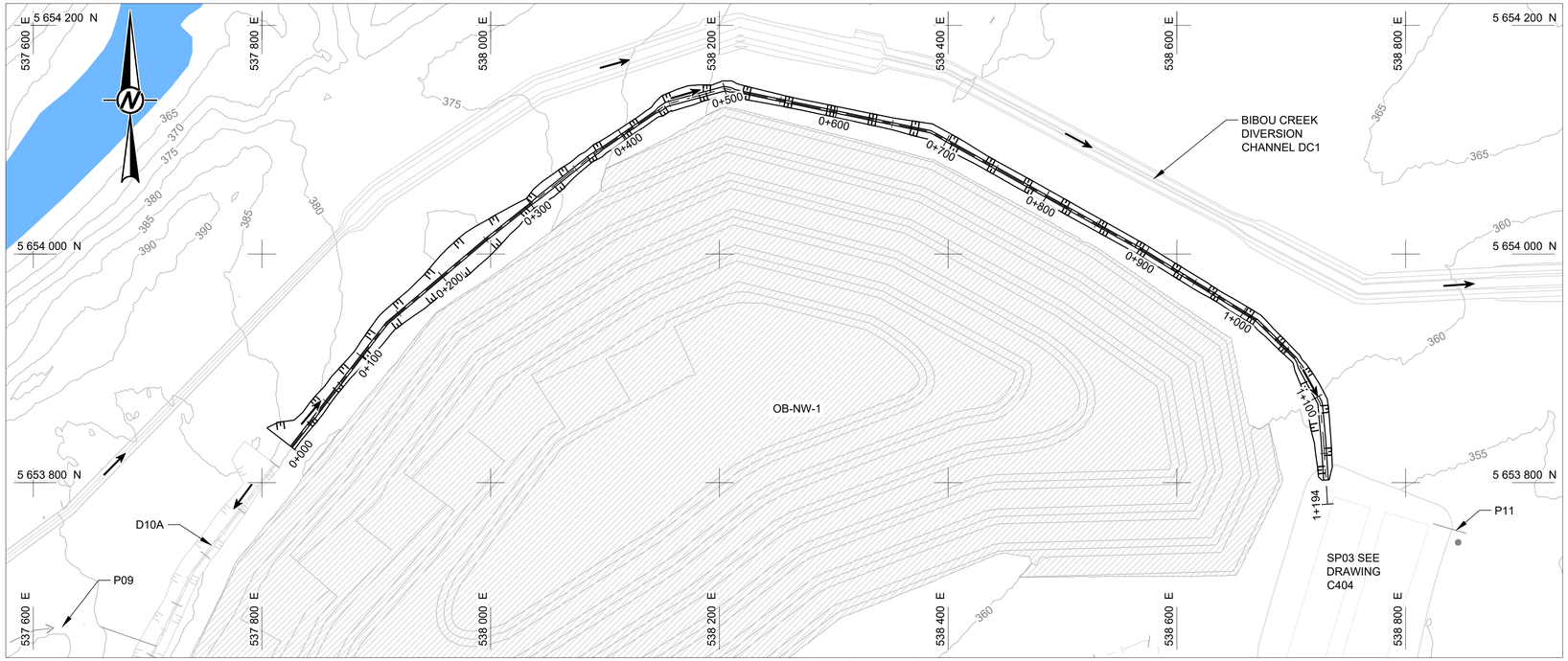
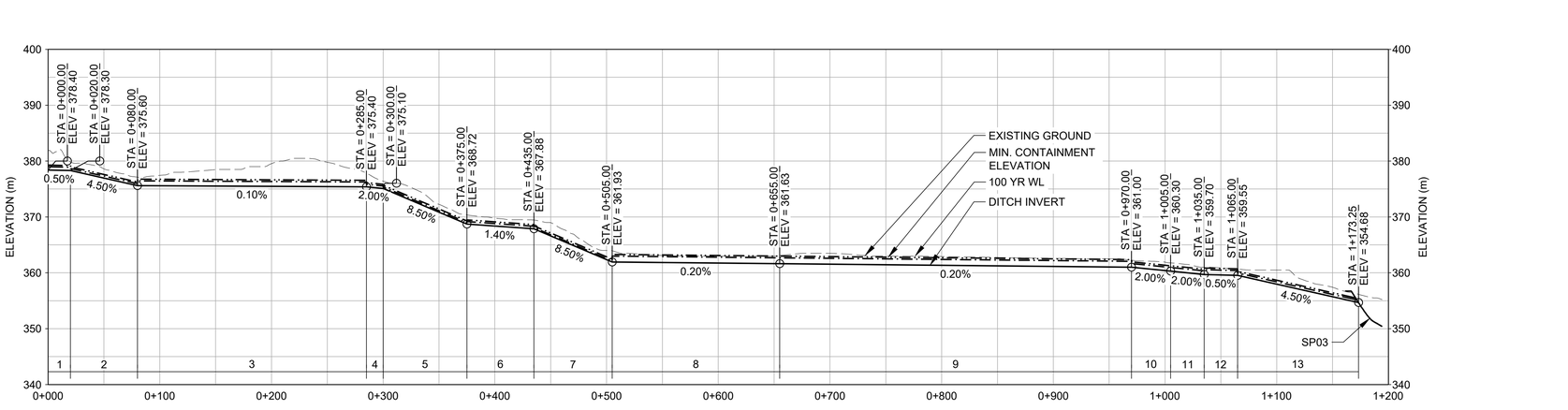
0 25 mm



PLAN - CONTACT WATER DITCH - D10B
SCALE 1:2,500



PROFILE - CONTACT WATER DITCH - D10B
SCALE 1:2,500
VERTICAL SCALE 1:500

D10B													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	To			(m)	%	(H:1V	(m)	(m)	(mm)	(Years)	(m3/s)	(m)	(m/s)
1	0	20	1.2	C530	20	0.50%	3	2	2.45	100	2 yr	0.87	0.32	0.90
											10 yr	1.71	0.46	1.10
											100 yr	2.74	0.58	1.25
2	20	80	1.2	C530	60	4.50%	3	2	1.53	300	2 yr	0.87	0.19	1.75
											10 yr	1.71	0.28	2.15
											100 yr	2.74	0.36	2.47
3	80	285	1.2	C530	205	0.10%	3	2	3.26	100	2 yr	0.87	0.49	0.51
											10 yr	1.71	0.69	0.61
											100 yr	2.74	0.86	0.69
4	285	300	1.2	C530	15	2.00%	3	2	1.86	300	2 yr	0.87	0.24	1.32
											10 yr	1.71	0.35	1.61
											100 yr	2.74	0.45	1.84
5	300	375	1.2	C530	75	8.50%	3	3	1.74	300	2 yr	0.87	0.14	1.78
											10 yr	1.71	0.21	2.24
											100 yr	2.74	0.27	2.61
6	375	435	1.2	C530	60	1.40%	3	2	1.46	100	2 yr	0.87	0.25	1.30
											10 yr	1.71	0.35	1.58
											100 yr	2.74	0.45	1.81
7	435	505	1.2	C530	70	8.50%	3	4	1.78	300	2 yr	0.87	0.11	1.82
											10 yr	1.71	0.16	2.31
											100 yr	2.74	0.22	2.73
8	505	655	1.2	C530	150	0.20%	3	2	1.45	100	2 yr	1.91	0.61	0.81
											10 yr	3.74	0.85	0.97
											100 yr	6.00	1.06	1.10
9	655	970	1.2	C530	315	0.20%	3	2	1.58	100	2 yr	1.91	0.61	0.81
											10 yr	3.74	0.85	0.97
											100 yr	6.00	1.06	1.10
10	970	1005	1.2	C530	35	2.00%	3	2	1.40	300	2 yr	1.91	0.37	1.67
											10 yr	3.74	0.52	2.01
											100 yr	6.00	0.66	2.29
11	1005	1035	1.2	C530	30	2.00%	3	2	1.45	300	2 yr	1.91	0.37	1.67
											10 yr	3.74	0.52	2.01
											100 yr	6.00	0.66	2.29
12	1035	1065	1.2	C530	30	0.50%	3	2	1.21	100	2 yr	1.91	0.49	1.13
											10 yr	3.74	0.68	1.36
											100 yr	6.00	0.85	1.54
13	1065	1173.3	1.2	C530	108	4.50%	3	4	1.77	300	2 yr	1.91	0.21	1.95
											10 yr	3.74	0.31	2.45
											100 yr	6.00	0.40	2.84

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
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- ORE STOCKPILE
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REFERENCE(S)

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5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

0 100 200
1:2,500 METRES

0 20 40
1:500 METRES

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D10B

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	59 of 75	C515

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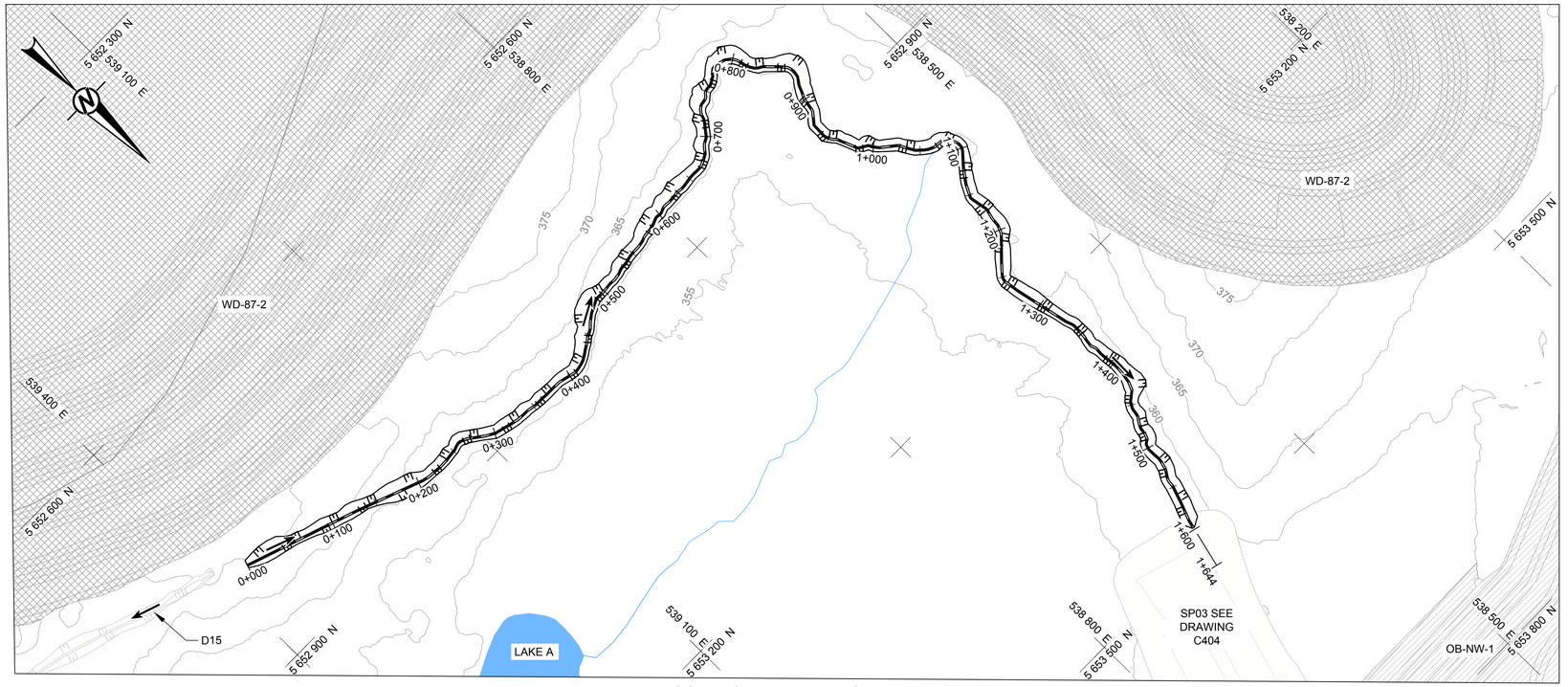
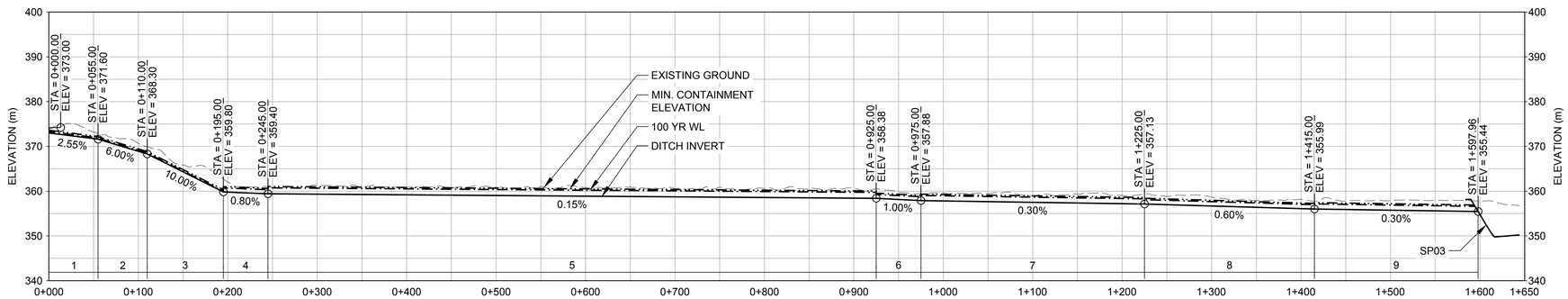
0 25 mm



PLAN - CONTACT WATER DITCH - D11
SCALE 1:3,000



PROFILE - CONTACT WATER DITCH - D11
SCALE 1:3,000
VERTICAL SCALE 1:600

D11

Segment #	Station From	Station To	Typical Cross-Section	Reference Drawing	Segment Length (m)	Bed Slope (%)	Side Slope (H:1V)	Bottom Width (m)	Average Excavation Depth (m)	Erosion Protection Material D50 (mm)	Return Period (Years)	Design Flow (m3/s)	Channel Flow Depth (m)	Channel Flow Velocity (m/s)
1	0	55	1.2	C530	55	2.55%	3	2	2.15	300	2 yr	0.19	0.10	0.87
											10 yr	0.66	0.19	1.32
											100 yr	1.43	0.30	1.67
2	55	110	1.2	C530	55	6.00%	3	2	1.76	300	2 yr	0.19	0.07	1.15
											10 yr	0.66	0.15	1.76
											100 yr	1.43	0.23	2.25
3	110	195	1.2	C530	85	10.00%	3	2	2.47	300	2 yr	0.19	0.06	1.36
											10 yr	0.66	0.13	2.09
											100 yr	1.43	0.20	2.68
4	195	245	1.2	C530	50	0.80%	3	2	1.73	100	2 yr	1.16	0.33	1.16
											10 yr	4.04	0.63	1.65
											100 yr	8.70	0.91	2.02
5	245	925	1.2	C530	680	0.15%	3	2	2.02	100	2 yr	1.16	0.51	0.64
											10 yr	4.04	0.94	0.89
											100 yr	8.70	1.34	1.08
6	925	975	1.2	C530	50	1.00%	3	2	1.87	100	2 yr	1.16	0.31	1.26
											10 yr	4.04	0.60	1.78
											100 yr	8.70	0.87	2.19
7	975	1225	1.2	C530	250	0.30%	3	2	1.86	100	2 yr	1.16	0.43	0.82
											10 yr	4.04	0.80	1.15
											100 yr	8.70	1.14	1.40
8	1225	1415	1.2	C530	190	0.60%	3	2	1.93	100	2 yr	1.16	0.36	1.05
											10 yr	4.04	0.68	1.48
											100 yr	8.70	0.97	1.81
9	1415	1597.9	1.2	C530	183	0.30%	3	2	2.20	100	2 yr	1.16	0.43	0.82
											10 yr	4.04	0.80	1.15
											100 yr	8.70	1.14	1.40

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 100 200
1:3,000 METRES

0 20 40
1:600 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D11

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	60 of 75	C516

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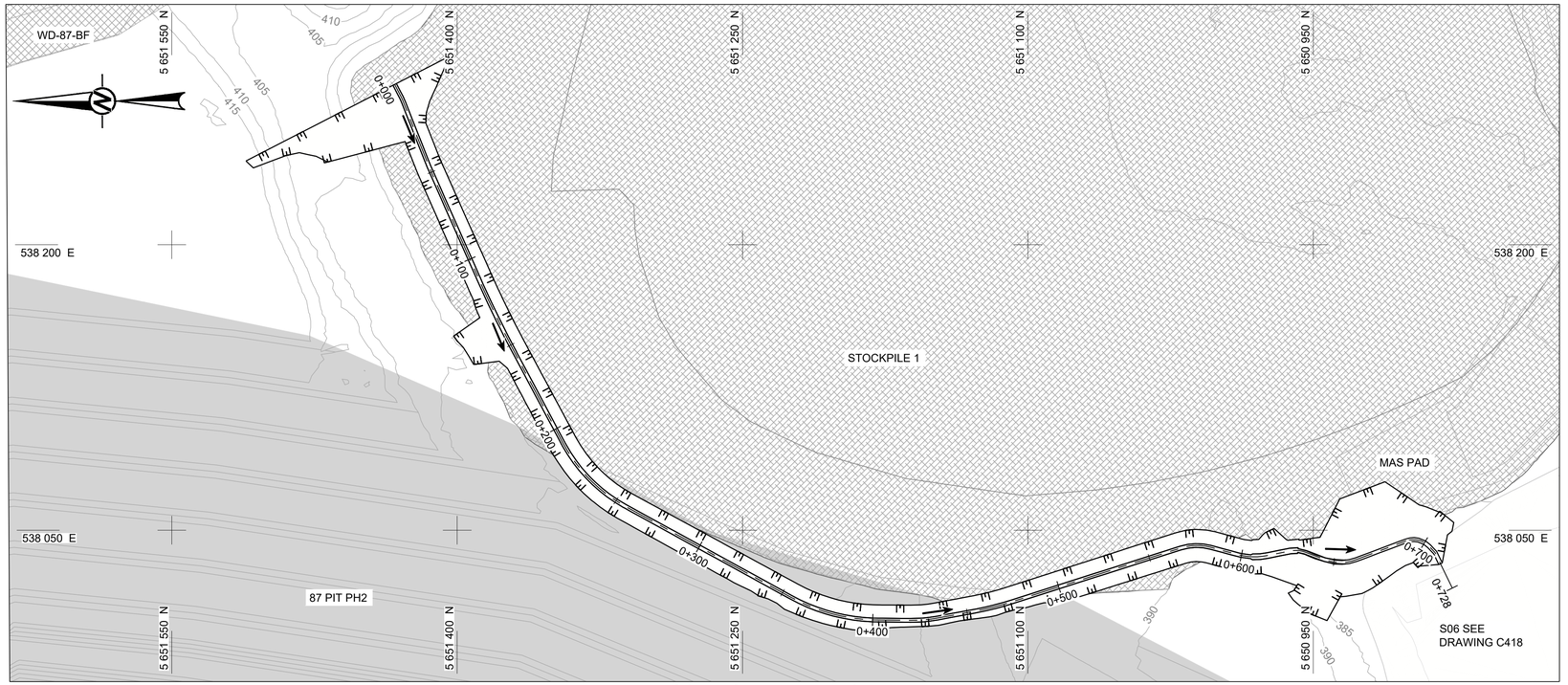
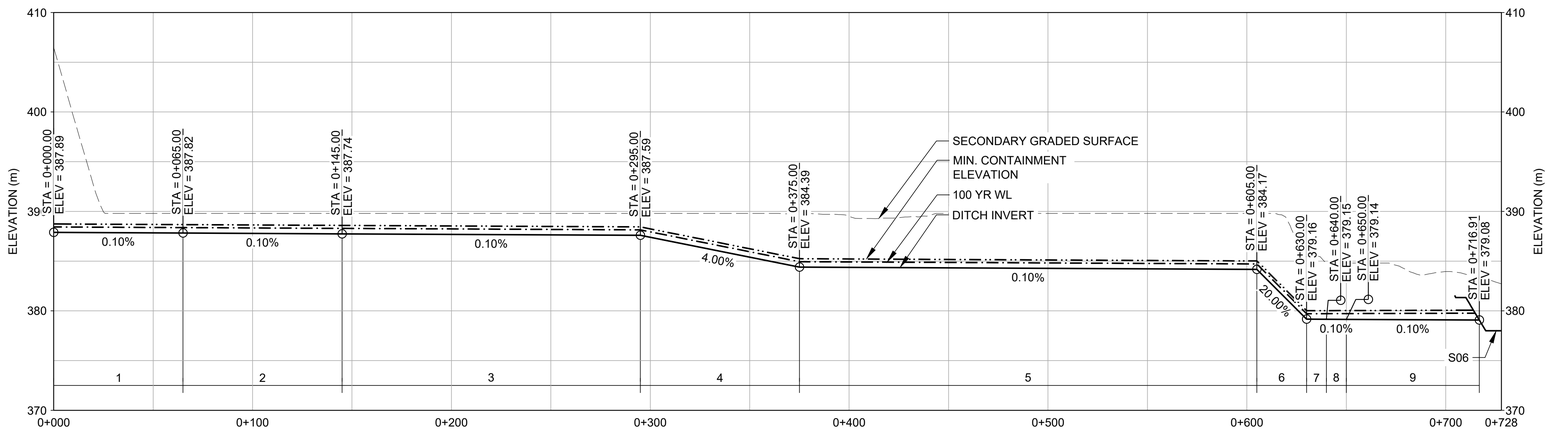
0 25 mm



PLAN - CONTACT WATER DITCH - D12

SCALE 1:1,500



PROFILE - CONTACT WATER DITCH - D12

SCALE 1:1,500

VERTICAL SCALE 1:300

D12													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m^3/s)*	*(m)*	*(m/s)*
1	0	65	1.2	C530	65	0.10%	3	2	1.80	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
2	65	145	1.2	C530	80	0.10%	3	2	1.87	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
3	145	295	1.2	C530	150	0.10%	3	2	1.76	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
4	295	375	1.2	C530	80	4.00%	3	2	0.80	300	2 yr	0.16	0.08	0.95
											10 yr	0.54	0.15	1.44
											100 yr	1.1	0.23	1.8
5	375	605	3.2	C532	230	0.10%	3	2	3.03	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
6	605	630	1.2	C530	25	20.00%	3	3	2.00	300	2 yr	0.16	0.04	1.39
											10 yr	0.54	0.08	2.19
											100 yr	1.1	0.12	2.83
7	630	640	1.2	C530	10	0.10%	3	2	1.88	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
8	640	650	1.2	C530	10	0.10%	3	2	1.63	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54
9	650	716.79	1.2	C530	67	0.10%	3	2	1.98	100	2 yr	0.16	0.2	0.31
											10 yr	0.54	0.39	0.44
											100 yr	1.1	0.55	0.54

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 50 100
1:1,500 METRES

0 10 20
1:300 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D12

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	61 of 75	C517

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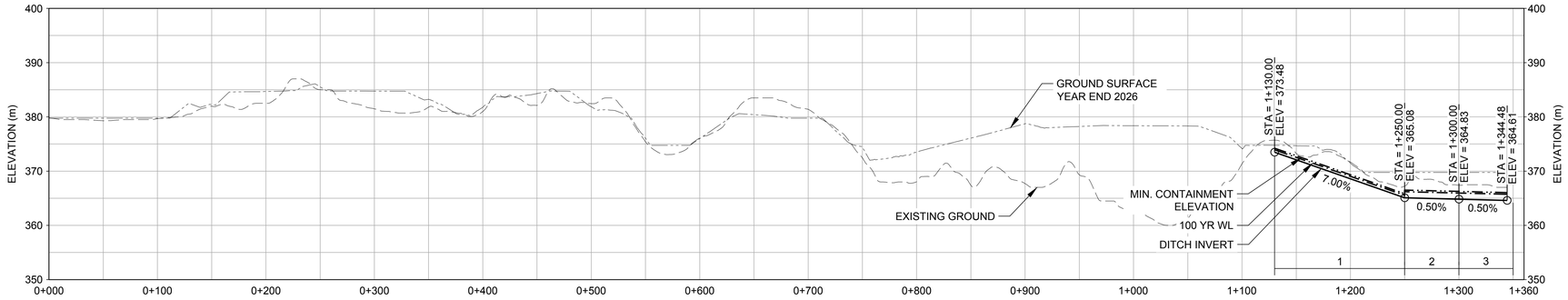
PLAN - CONTACT WATER DITCH - D14A

SCALE 1:2,500



PROFILE - CONTACT WATER DITCH - D14A

SCALE 1:2,500

VERTICAL SCALE 1:500

Segment #	Station From	Station To	Typical Cross-Section	Reference Drawing	Segment Length (m)	Bed Slope %	Side Slope (H:1V)	Bottom Width (m)	Average Excavation Depth (m)	Erosion Protection Material D50 (mm)	Return Period (Years)	Design Flow (m^3/s)	Channel Flow Depth (m)	Channel Flow Velocity (m/s)
D14A														
N/A	MANAGEMENT OF CONTACT WATER RUNOFF WILL BE INCORPORATED INTO THE FUTURE STOCKPILE AND DUMP DESIGN													
1	1130	1250	3.1	C531	120	7.00%	3	6	2.05	500	2 yr	1.39	0.14	1.59
											10 yr	4.92	0.29	2.51
											100 yr	10.9	0.45	3.28
2	1250	1300	3.1	C531	50	0.50%	3	2	3.18	100	2 yr	1.39	0.41	1.03
											10 yr	4.92	0.78	1.46
											100 yr	10.9	1.13	1.8
3	1300	1347	3.1	C531	47	0.50%	3	2	2.53	100	2 yr	1.39	0.41	1.03
											10 yr	4.92	0.78	1.46
											100 yr	10.9	1.13	1.8

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ADDITIONAL DRAINAGE FEATURE AROUND THE PROCESS PLANT WILL BE DEFINED, IF REQUIRED, AFTER THE CONFIRMATION OF THE PLANT LAYOUT.
2. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
3. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 100 200
1:2,500 METRES

0 20 40
1:500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D14A

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	62 of 75	C518

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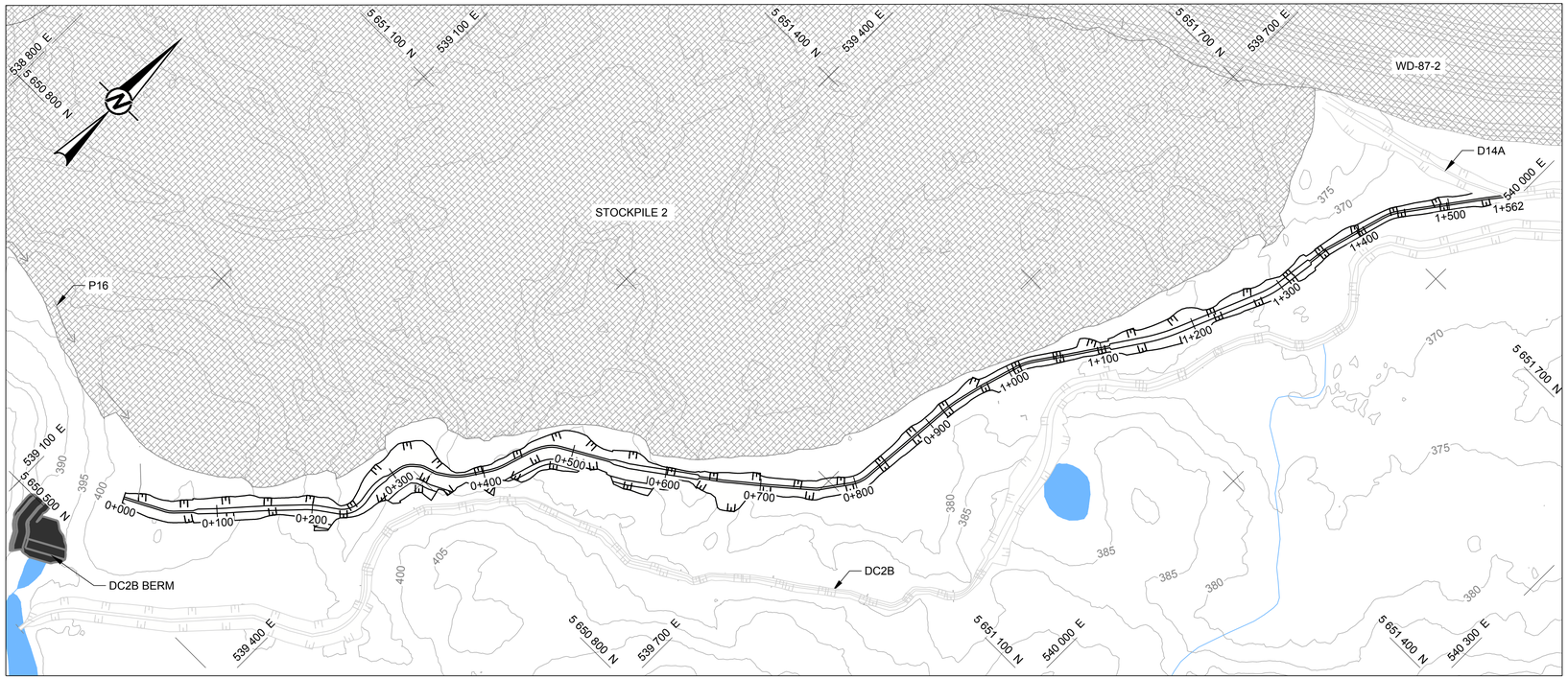
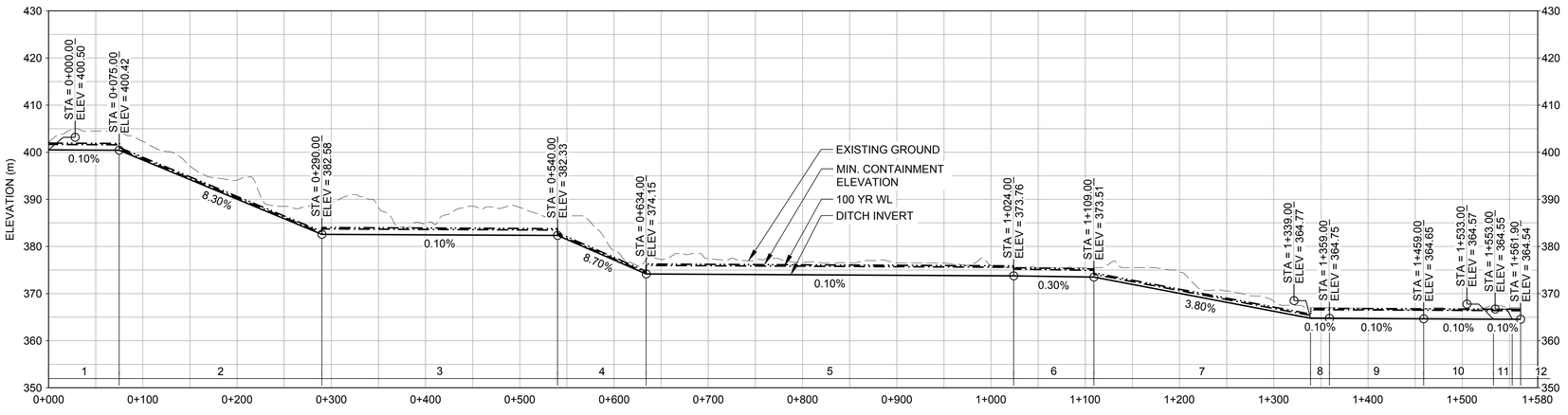
0 25 mm



PLAN - CONTACT WATER DITCH - D14B

SCALE 1:3,000



PROFILE - CONTACT WATER DITCH - D14B

SCALE 1:3,000

VERTICAL SCALE 1:600

D14B

Segment #	Station From	Station To	Typical Cross-Section	Reference Drawing	Segment Length (m)	Bed Slope %	Side Slope (H:1V)	Bottom Width (m)	Average Excavation Depth (m)	Erosion Protection Material D50 (mm)	Return Period (Years)	Design Flow (m^3/s)	Channel Flow Depth (m)	Channel Flow Velocity (m/s)
1	0	75	1.2	C530	75	0.10%	2.5	2	4.18	100	2 yr	1.945477	0.76	0.65
											10 yr	3.184156	0.97	0.74
											100 yr	4.533496	1.14	0.82
2	75	290	3.2	C532	215	8.30%	2.5	5	3.74	300	2 yr	1.95	0.17	2.09
											10 yr	3.18	0.23	2.50
											100 yr	4.53	0.28	2.83
3	290	540	3.2	C532	250	0.10%	2.5	2	5.19	100	2 yr	1.95	0.76	0.65
											10 yr	3.18	0.97	0.74
											100 yr	4.53	1.14	0.82
4	540	634	3.2	C532	94	8.70%	2.5	5	4.04	300	2 yr	1.95	0.17	2.13
											10 yr	3.18	0.23	2.54
											100 yr	4.53	0.28	2.87
5	634	1024	1.2	C530	390	0.10%	2.5	2	2.38	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.70	1.82	1.06
6	1024	1109	1.2	C530	85	0.30%	2.5	2	1.72	100	2 yr	5.45	0.96	1.28
											10 yr	8.92	1.21	1.46
											100 yr	12.70	1.43	1.60
7	1109	1339	1.2	C530	230	3.80%	2.5	6	3.21	500	2 yr	5.45	0.36	2.23
											10 yr	8.92	0.47	2.63
											100 yr	12.70	0.58	2.95
8	1339	1359	1.2	C530	20	0.10%	2.5	2	2.03	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.70	1.82	1.06
9	1359	1459	1.2	C530	100	0.10%	2.5	2	1.90	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.70	1.82	1.06
10	1459	1533	1.2	C530	74	0.10%	2.5	2	2.20	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.70	1.82	1.06
11	1533	1553	1.2	C530	20	0.10%	2.5	2	2.71	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.70	1.82	1.06
12	1553	1561.9	3.2	C532	9	0.10%	2.5	2	2.37	100	2 yr	5.45	1.25	0.86
											10 yr	8.92	1.56	0.97
											100 yr	12.70	1.82	1.06

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 100 200
1:3,000 METRES

0 20 40
1:600 METRES

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH D14B

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	63 of 75	C519

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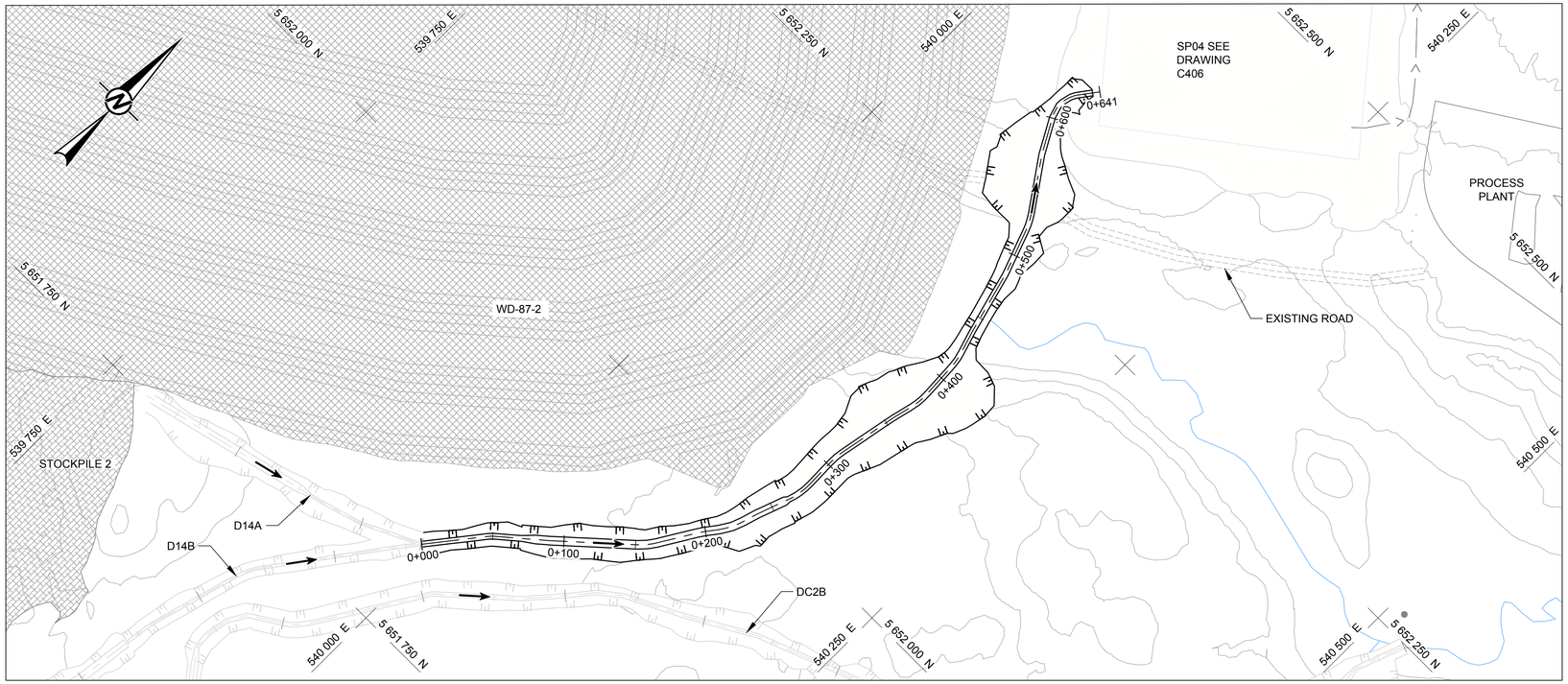
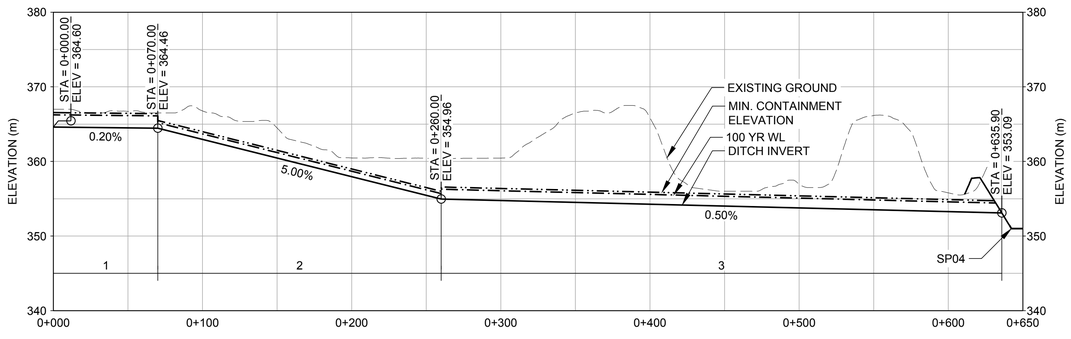
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm



PLAN - CONTACT WATER DITCH - D14C
SCALE 1:2,000



PROFILE - CONTACT WATER DITCH - D14C
SCALE 1:2,000
VERTICAL SCALE 1:400

D14C

Segment #	Station From	Station To	Typical Cross-Section	Reference Drawing	Segment Length (m)	Bed Slope %	Side Slope (H:1V)	Bottom Width (m)	Average Excavation Depth (m)	Erosion Protection Material D50 (mm)	Return Period (Years)	Design Flow (m^3/s)	Channel Flow Depth (m)	Channel Flow Velocity (m/s)
1	0	70	1.2	C530	70	0.20%	2.5	4	2.15	100	2 yr	6.13	0.89	1.10
											10 yr	12.07	1.27	1.33
											100 yr	20.5	1.65	1.53
2	70	260	1.2	C530	190	5.00%	2.5	6	3.56	500	2 yr	6.13	0.37	2.42
											10 yr	12.07	0.54	3.04
											100 yr	20.50	0.73	3.59
3	260	635.9	3.1	C531	376	0.50%	2.5	4	6.23	100	2 yr	6.13	0.70	1.52
											10 yr	12.07	1.00	1.85
											100 yr	20.50	1.31	2.14

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 M RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING, DECEMBER 18, 2023.
3. PROCESS PLANT LAYOUT FROM LYCOPODIUM, NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25 2022.
5. EXISTING AND FUTURE ROADS FROM TROILUS GOLD, MAY 25 2022 (FUTURE ROADS SUBJECT TO CHANGE).

NOTE(S)

1. ADDITIONAL DRAINAGE FEATURE AROUND THE PROCESS PLANT WILL BE DEFINED, IF REQUIRED, AFTER THE CONFIRMATION OF THE PLANT LAYOUT.
2. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
3. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 100 200
1:2,000 METRES

0 20 40
1:400 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp
CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D14C

PROJECT NO. 2257554004 | CONTROL | REV. A | 64 of 75 | DRAWING C520

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

0 25 mm

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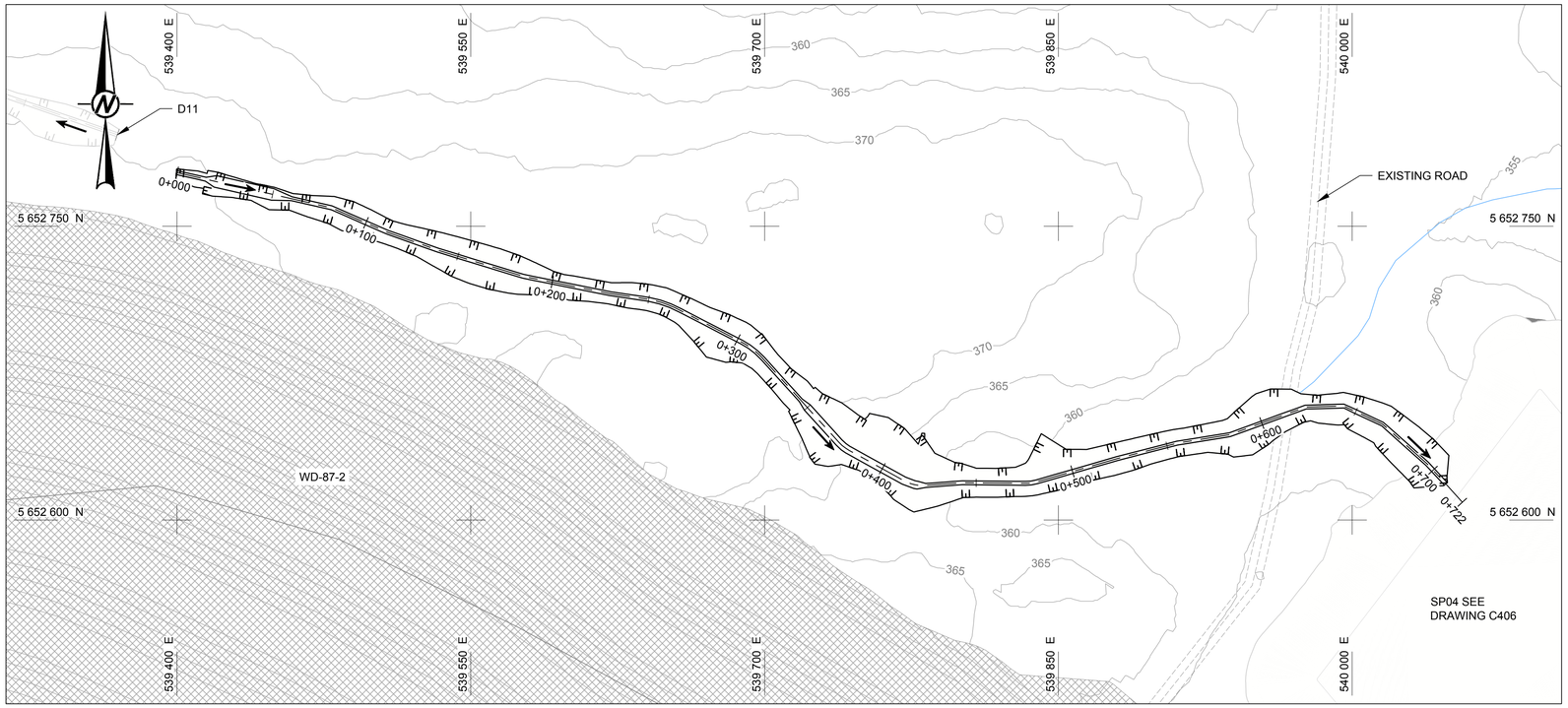
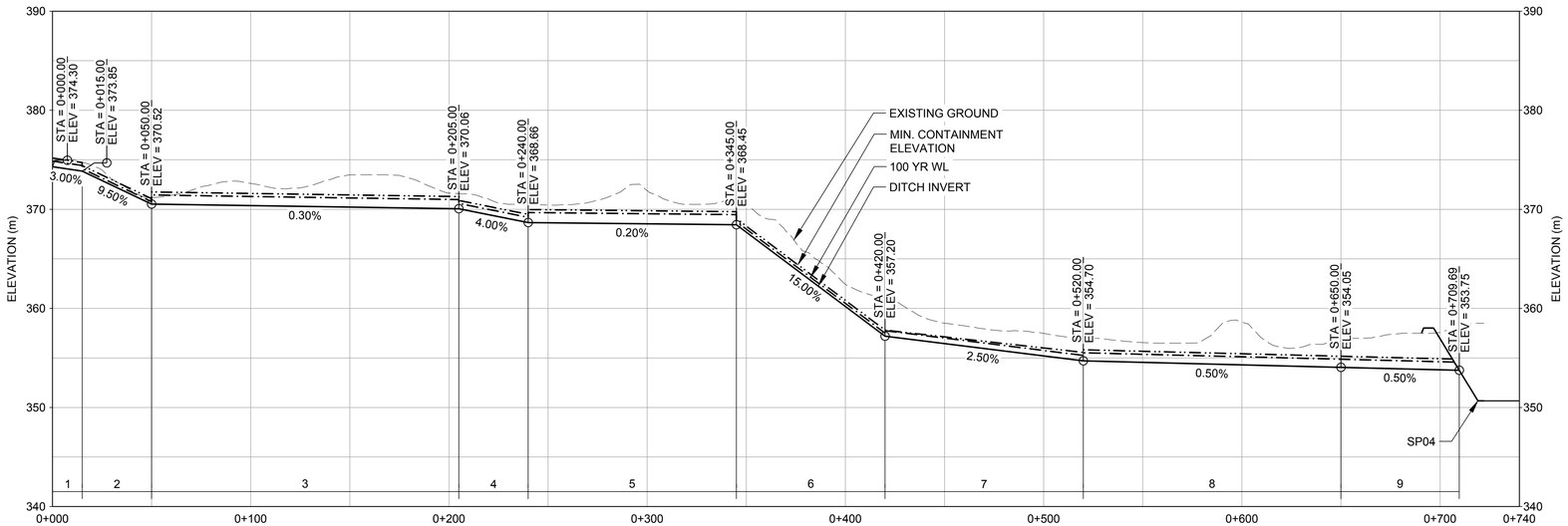


PLAN - CONTACT WATER DITCH - D15
SCALE 1:1,500



PROFILE - CONTACT WATER DITCH - D15
SCALE 1:1,500
VERTICAL SCALE 1:300

D15													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m^3/s)*	*(m)*	*(m/s)*
1	0	15	1.2	C530	15	3.00%	3	2	1.32	500	2 yr	0.91	0.22	1.54
											10 yr	2.71	0.40	2.13
											100 yr	5.5	0.57	2.59
2	15	50	1.2	C530	35	9.50%	3	6	0.96	300	2 yr	0.91	0.09	1.68
											10 yr	2.71	0.17	2.52
											100 yr	5.50	0.25	3.24
3	50	205	1.2	C530	155	0.30%	3	2	2.41	100	2 yr	0.91	0.38	0.76
											10 yr	2.71	0.66	1.03
											100 yr	5.50	0.93	1.24
4	205	240	1.2	C530	35	4.00%	3	2	1.49	500	2 yr	0.91	0.20	1.70
											10 yr	2.71	0.37	2.36
											100 yr	5.50	0.53	2.87
5	240	345	1.2	C530	105	0.20%	3	2	1.98	100	2 yr	0.91	0.42	0.66
											10 yr	2.71	0.73	0.89
											100 yr	5.50	1.02	1.07
6	345	420	1.2	C530	75	15.00%	3	4	1.85	500	2 yr	0.91	0.11	1.97
											10 yr	2.71	0.20	2.90
											100 yr	5.50	0.30	3.68
7	420	520	1.2	C530	100	2.50%	3	2	2.14	300	2 yr	0.91	0.21	1.61
											10 yr	2.71	0.39	2.23
											100 yr	5.50	0.55	2.71
8	520	650	1.2	C530	130	0.50%	3	2	2.58	100	2 yr	0.91	0.33	0.92
											10 yr	2.71	0.58	1.24
											100 yr	5.50	0.82	1.50
9	650	709.7	1.2	C530	60	0.50%	3	2	3.78	100	2 yr	0.91	0.33	0.92
											10 yr	2.71	0.58	1.24
											100 yr	5.50	0.82	1.50

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 50 100
1:1,500 METRES

0 10 20
1:300 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT
TROILUS

CONSULTANT
wsp
CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
PLAN AND PROFILE – CONTACT WATER DITCH D15

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	65 of 75	C521

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

0 25 mm

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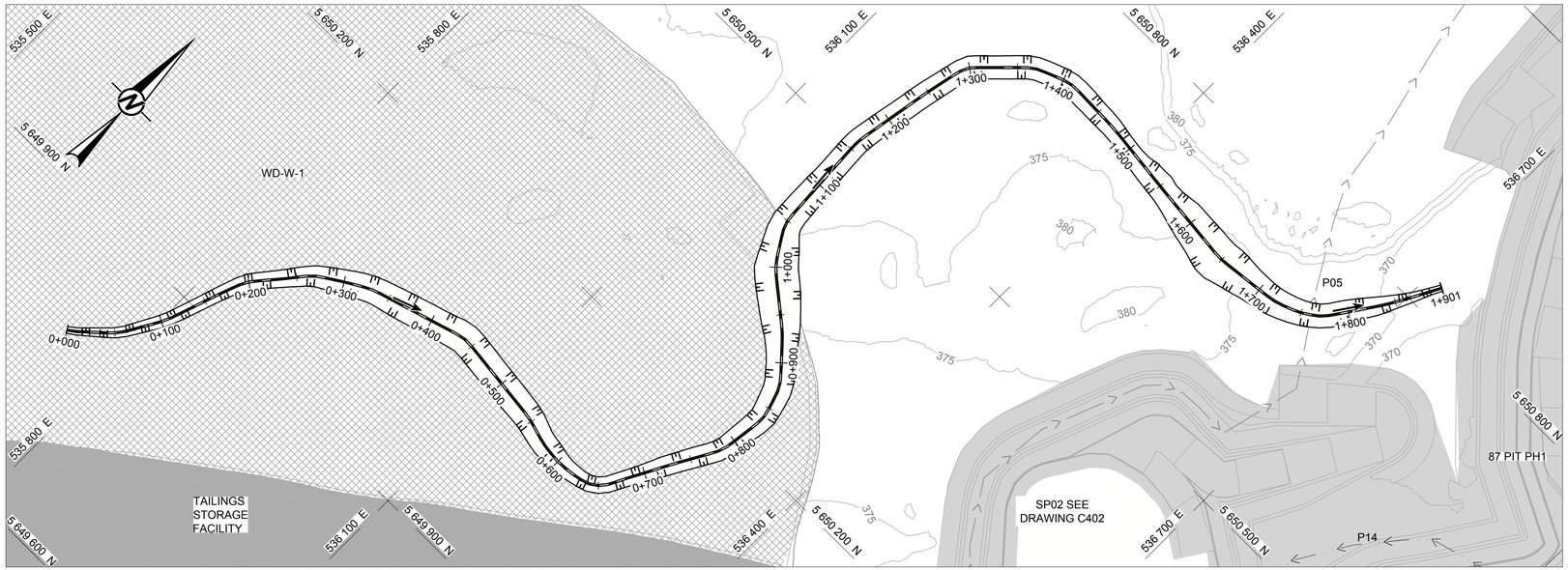
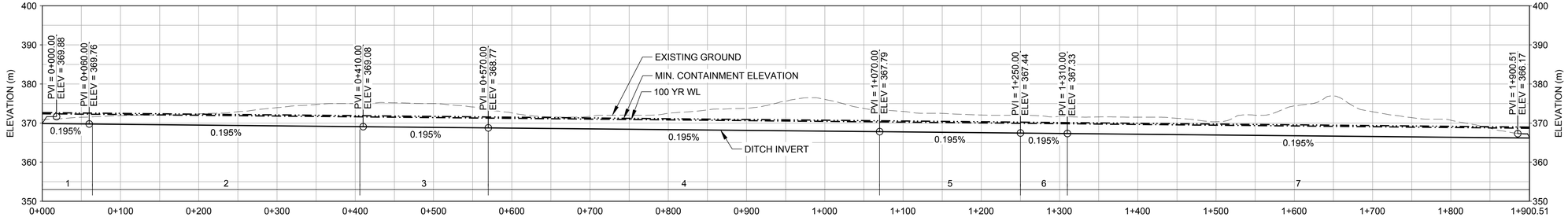


PLAN - CONTACT WATER DITCH - DCB

SCALE 1:3,000



PROFILE - CONTACT WATER DITCH - DCB

SCALE 1:3,000

VERTICAL SCALE 1:600

DCB													
Segment #	Station		Typical Cross-Section	Reference Drawing	Segment Length	Bed Slope	Side Slope	Bottom Width	Average Excavation Depth	Erosion Protection Material D50	Return Period	Design Flow	Channel Flow Depth	Channel Flow Velocity
	From	*To*			*(m)*	*%*	*(H:1V*	*(m)*	*(m)*	*(mm)*	*(Years)*	*(m^3/s)*	*(m)*	*(m/s)*
1	0	60	1.1	C530	60	0.195%	2.5	2	1.28	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
2	60	410	1.1	C530	350	0.195%	2.5	2	3.71	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
3	410	570	1.1	C530	160	0.195%	2.5	2	5.84	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
4	570	1070	1.1	C530	500	0.195%	2.5	2	4.95	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
5	1070	1250	1.1	C530	180	0.195%	2.5	2	4.84	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
6	1250	1310	1.1	C530	60	0.195%	2.5	2	4.41	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31
7	1310	1901.2	1.1	C530	591	0.195%	2.5	2	5.02	100	2 yr	3.14	1.05	0.65
											10 yr	10.51	1.76	0.94
											100 yr	25.07	2.5	1.31

NOTE(S)

1. ELEVATIONS, DIMENSIONS AND STATIONS IN METERS UNLESS SPECIFIED OTHERWISE.
2. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 10, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. ELECTRICITY TRANSMISSION LINE FROM TROILUS GOLD, MAY 25, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 100 200
1:3,000 METRES

0 20 40
1:600 METRES

LEGEND

- 560 — TOPOGRAPHIC CONTOUR (5 m INTERVAL)
- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES
- CONTACT WATER PIPELINE (PUMPING)
- CLEAN WATER PIPELINE (PUMPING)
- PIT DEWATERING
- MINE PIT
- ORE STOCKPILE
- OVERBURDEN PILE
- TAILINGS STORAGE FACILITY
- WASTE DUMP
- MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – CONTACT WATER DITCH DCB

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	66 of 75	C522

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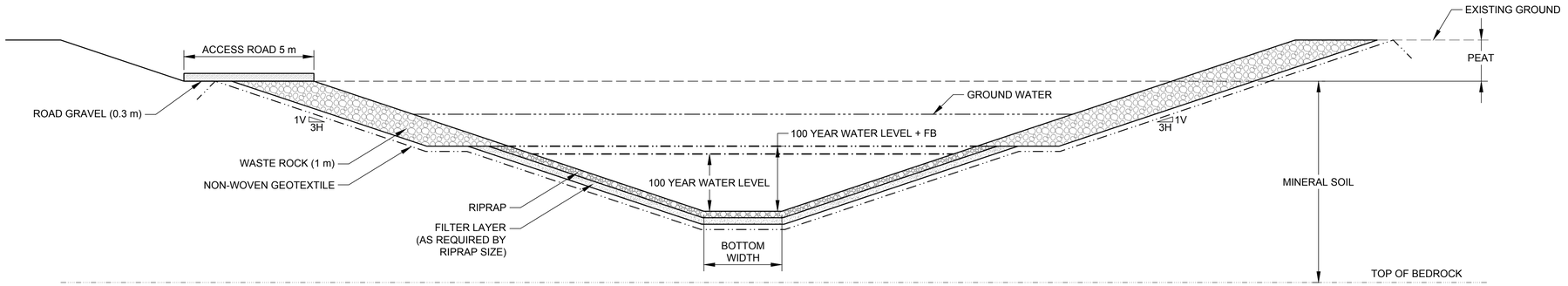
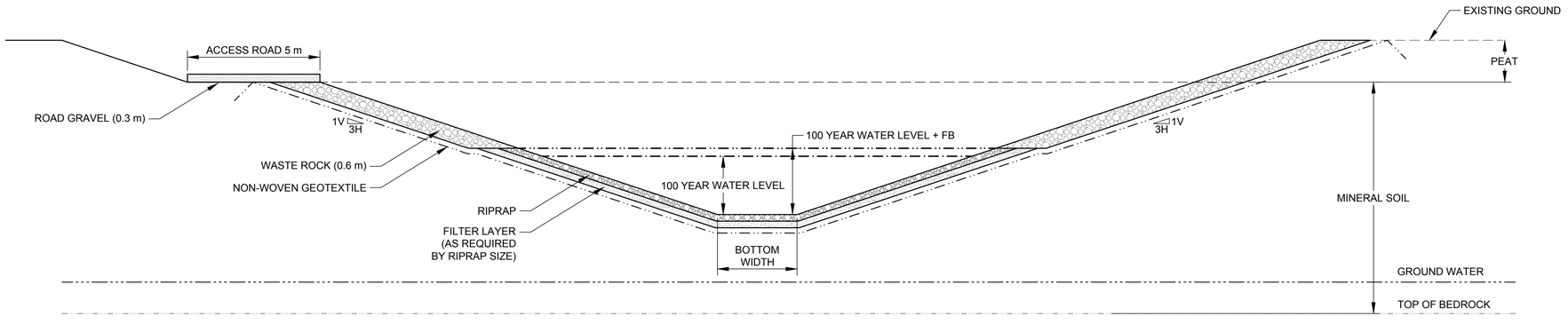
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

LEGEND

- EXISTING GROUND
- STRIPPED PEAT
- GROUND WATER
- 100 YEAR WATER LEVEL + FB
- 100 YEAR WATER LEVEL
- TOP OF BEDROCK
- NON-WOVEN GEOTEXTILE
- WASTE ROCK
- RIPRAP
- FILTER LAYER
- ROAD GRAVEL



SCALE 1:100 A -- TYPICAL - 1.1 - MINERAL SOIL AND EXCAVATION < 5 m



SCALE 1:100 B -- TYPICAL - 1.2 - MINERAL SOIL AND EXCAVATION < 5 m

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 5 10

1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

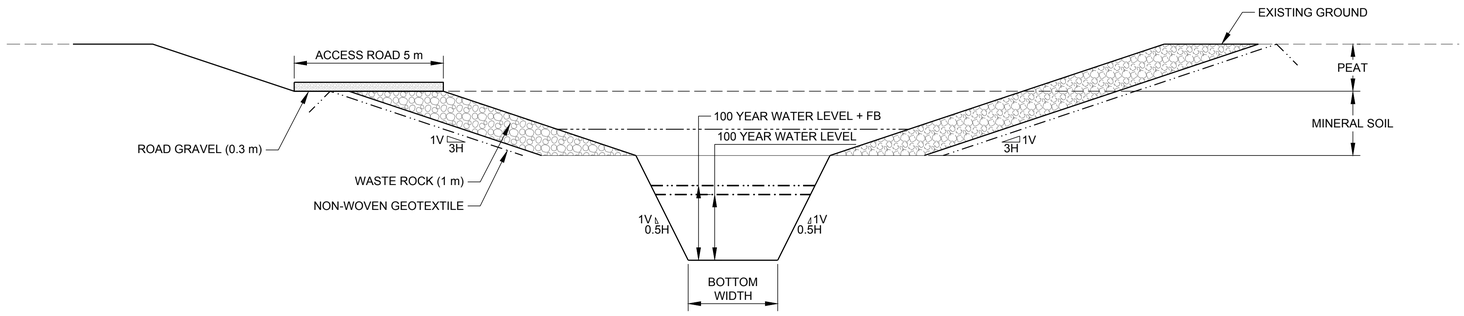
TYPICAL SECTIONS AND DETAILS – CONTACT WATER DITCHES (1 OF 4)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	67 of 75	C530

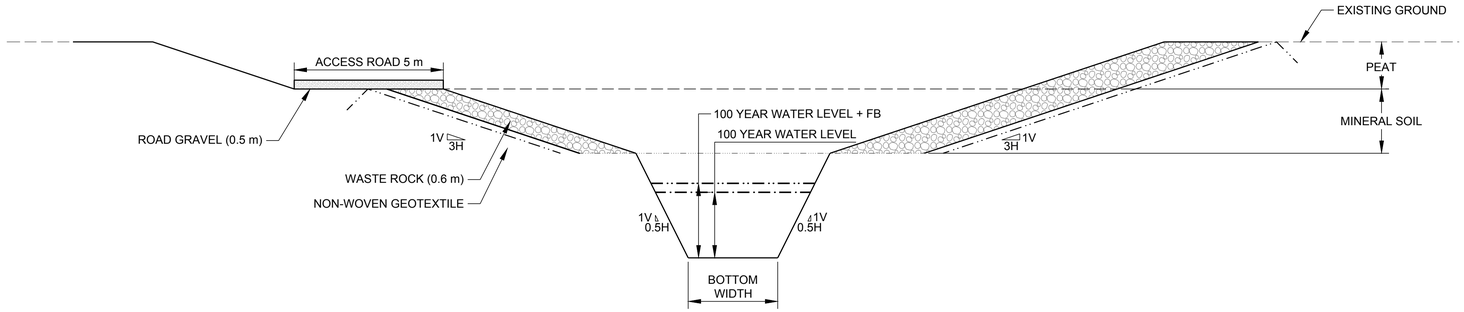
Path: \\golder.gds\gal\Calgary\EDCAD_Clients\TROILUS\09_PROJECTS\CA-GLD-2257554004\02_PRODUCTION\DRAWINGS\ | File Name: 2257554004PDW0050.dwg | Last Edited By: aspuler Date: 2024-05-03 Time:10:40:21 AM | Printed By: TFetene Date: 2024-05-03 Time:4:00:12 PM

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

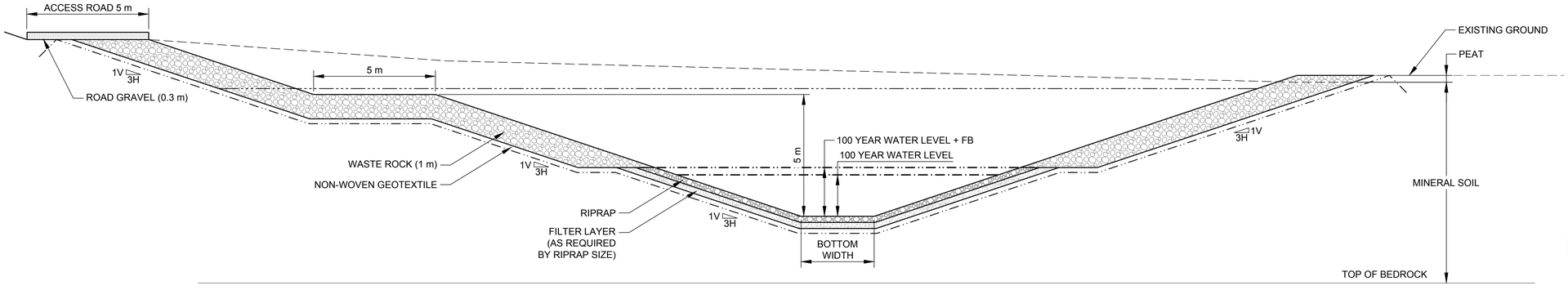
0 25 mm



SCALE 1:100 C -- TYPICAL - 2.1 - 100 YR FLOW IN BEDROCK AND EXCAVATION < 5 m



SCALE 1:100 D -- TYPICAL - 2.2 - 100 YR FLOW IN BEDROCK AND EXCAVATION < 5 m



SCALE 1:100 E -- TYPICAL - 3.1 - > 5 m EXCAVATION IN MINERAL SOIL

LEGEND

- EXISTING GROUND
- STRIPPED PEAT
- GROUND WATER
- 100 YEAR WATER LEVEL + FB
- 100 YEAR WATER LEVEL
- TOP OF BEDROCK
- NON-WOVEN GEOTEXTILE
- WASTE ROCK
- RIPRAP
- FILTER LAYER
- ROAD GRAVEL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 5 10
1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
TYPICAL SECTIONS AND DETAILS – CONTACT WATER DITCHES (2 OF 3)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	68 of 75	C531

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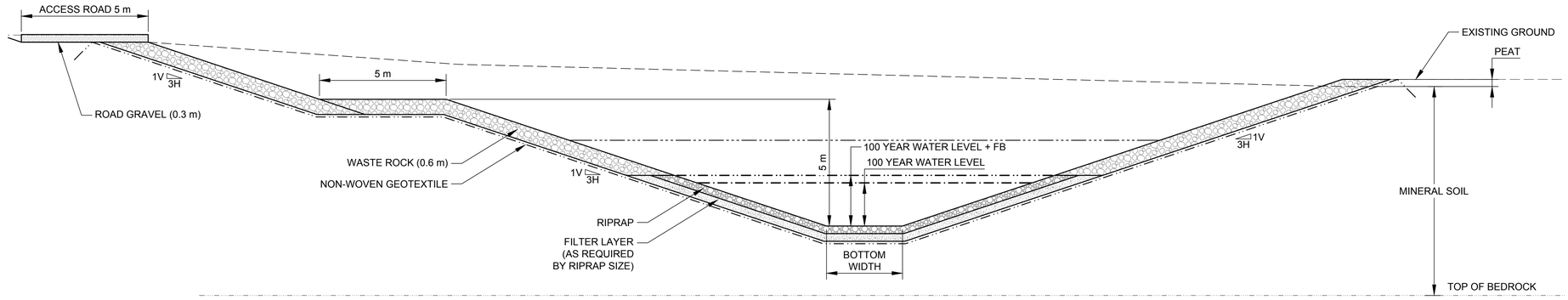
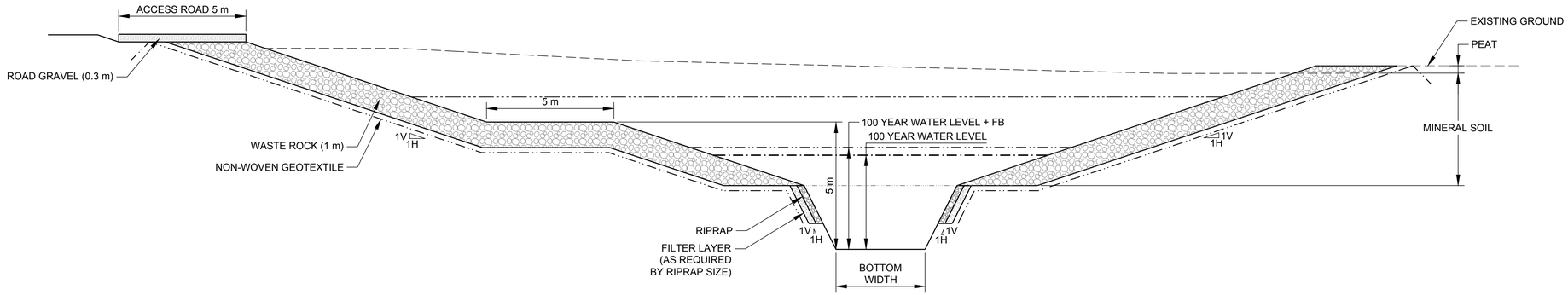
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm



SCALE 1:100 F -- TYPICAL - 3.2 - > 5 m EXCAVATION IN MINERAL SOIL



SCALE 1:100 G -- TYPICAL - 4 - 100 YR DEPTH WITHIN BEDROCK AND > 5 m EXCAVATION (BEDROCK BELOW BENCH)

LEGEND

- EXISTING GROUND
- STRIPPED PEAT
- GROUND WATER
- 100 YEAR WATER LEVEL + FB
- 100 YEAR WATER LEVEL
- TOP OF BEDROCK
- NON-WOVEN GEOTEXTILE
- WASTE ROCK
- RIPRAP
- FILTER LAYER
- ROAD GRAVEL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 5 10
1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
TYPICAL SECTIONS AND DETAILS – CONTACT WATER DITCHES (3 OF 3)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	69 of 75	C532

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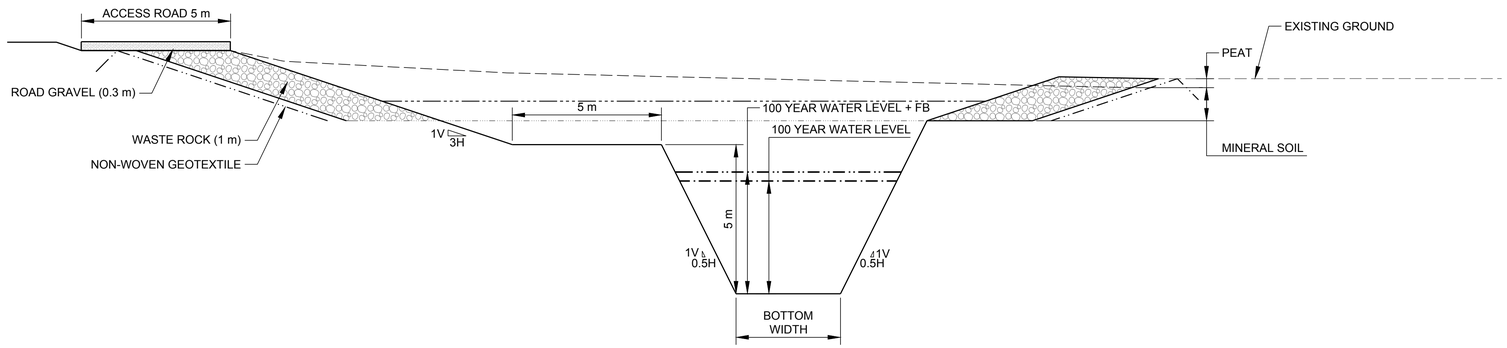
0 25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

LEGEND

- EXISTING GROUND
- STRIPPED PEAT
- GROUND WATER
- 100 YEAR WATER LEVEL + FB
- 100 YEAR WATER LEVEL
- TOP OF BEDROCK
- NON-WOVEN GEOTEXTILE
- WASTE ROCK
- ROAD GRAVEL



SCALE 1:100 H --

TYPICAL - 5 - 100 YR DEPTH WITHIN BEDROCK AND > 5 m EXCAVATION IN BEDROCK BELOW BENCH

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 5 10

1:100 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

SEAL

CLIENT

TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

TYPICAL SECTIONS AND DETAILS – CONTACT WATER DITCHES (4 OF 4)

PROJECT NO.	CONTROL	REV.	70 of 75	DRAWING
2257554004		A		C533

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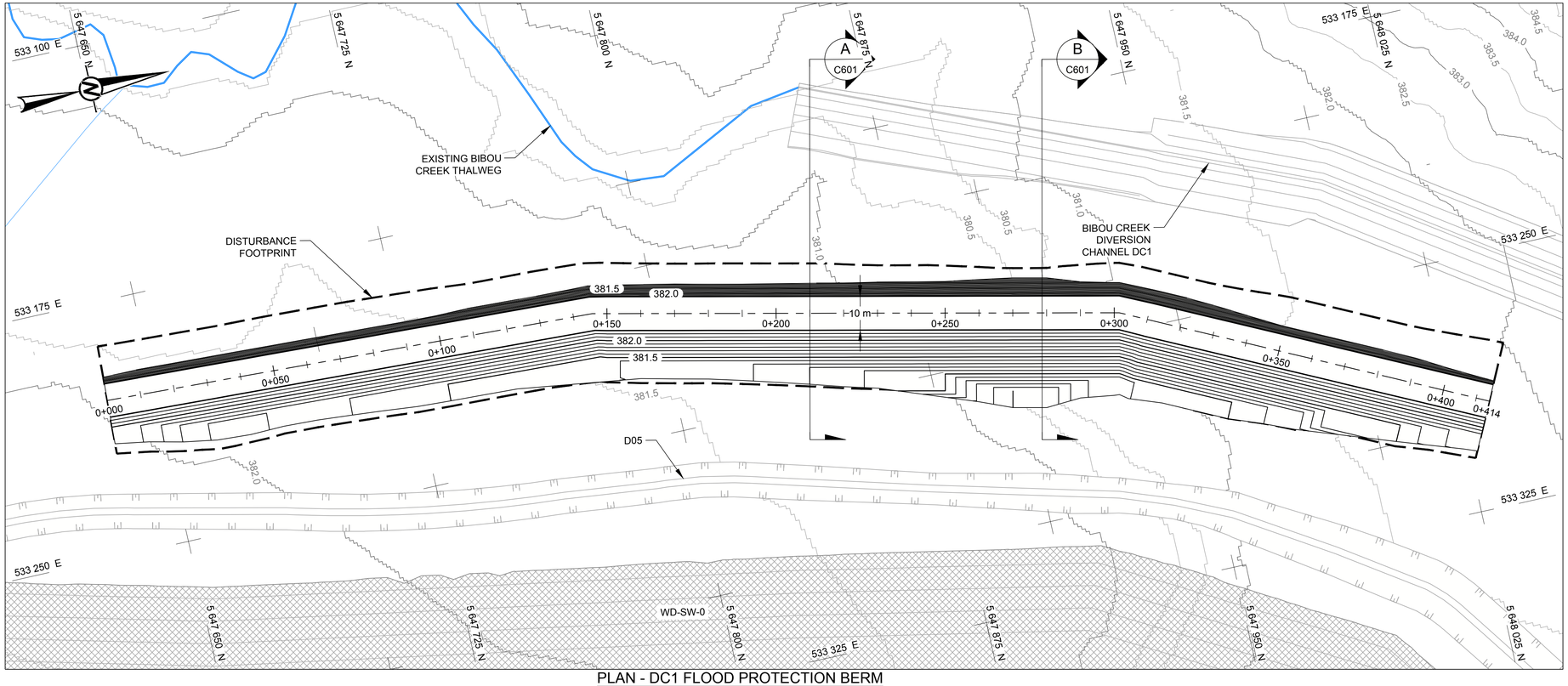
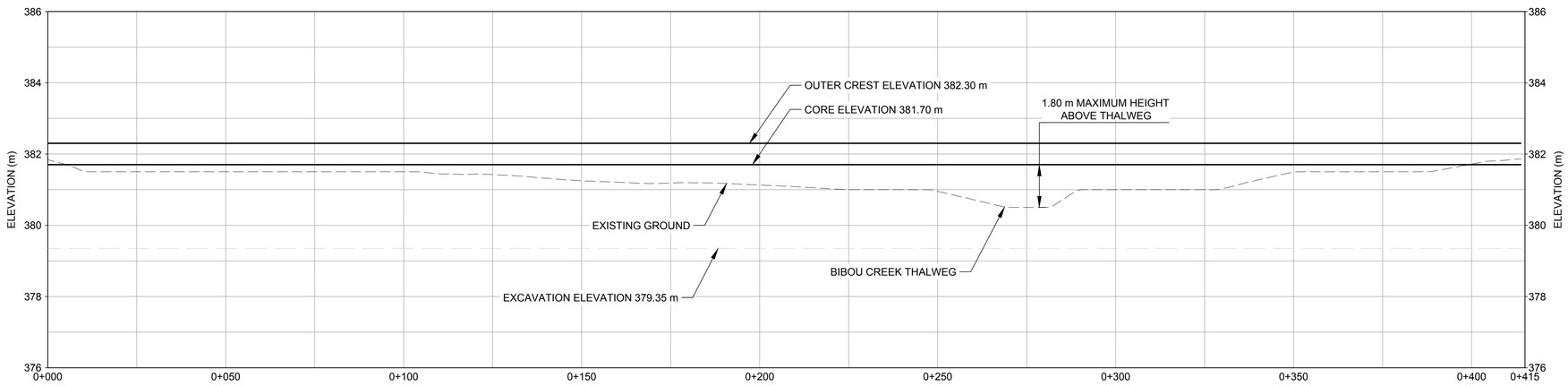
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm



PLAN - DC1 FLOOD PROTECTION BERM

SCALE 1:750



PROFILE - DC1 FLOOD PROTECTION BERM

SCALE 1:750

VERTICAL SCALE 1:75

LEGEND

NATURAL WATERCOURSES

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.

NOTE(S)

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2. THE DRAWING IS A SCHEMATIC REPRESENTATION OF THE END-OF-MINE-LIFE SURFACE WATER MANAGEMENT PLAN.
3. THE EXTENT OF THE SUMP AND POND POLYGONS AND THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

0 25 50
1:750 METRES

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1:75 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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CLIENT

TROILUS

CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN AND PROFILE – DC1 FLOOD PROTECTION BERM

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	71 of 75	C600

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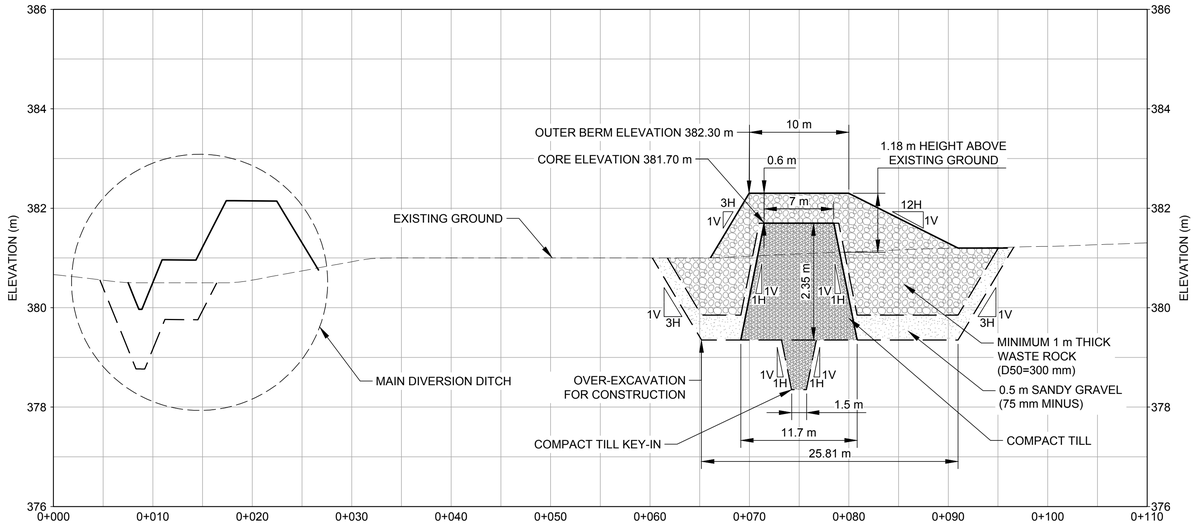
LEGEND

- WASTE ROCK
- FILTER LAYER
- COMPACTED TILL



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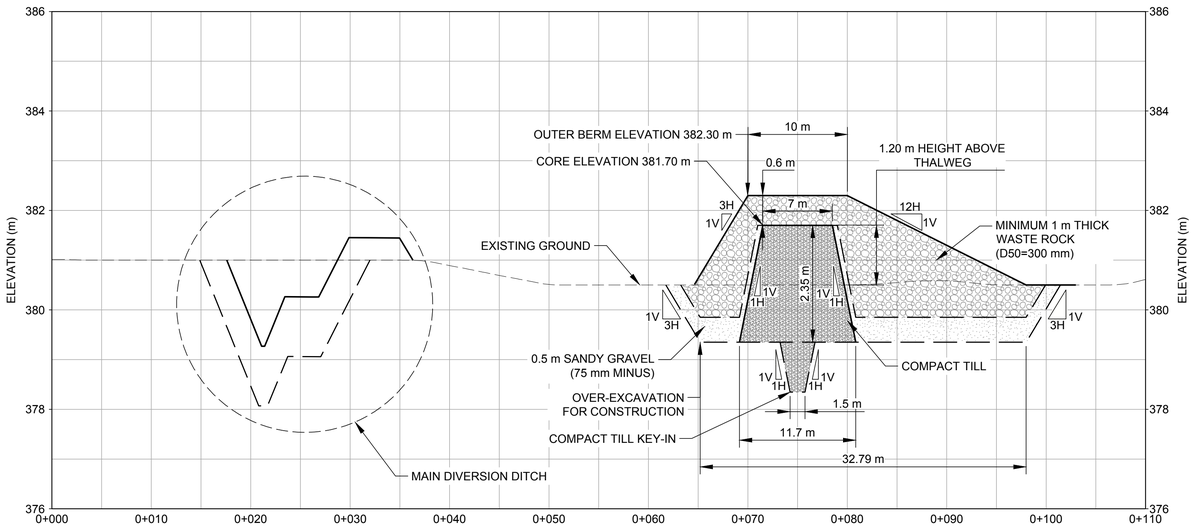

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NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

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REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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TROILUS

CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SECTIONS AND DETAILS – DC1 FLOOD PROTECTION BERM

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	72 of 75	C601

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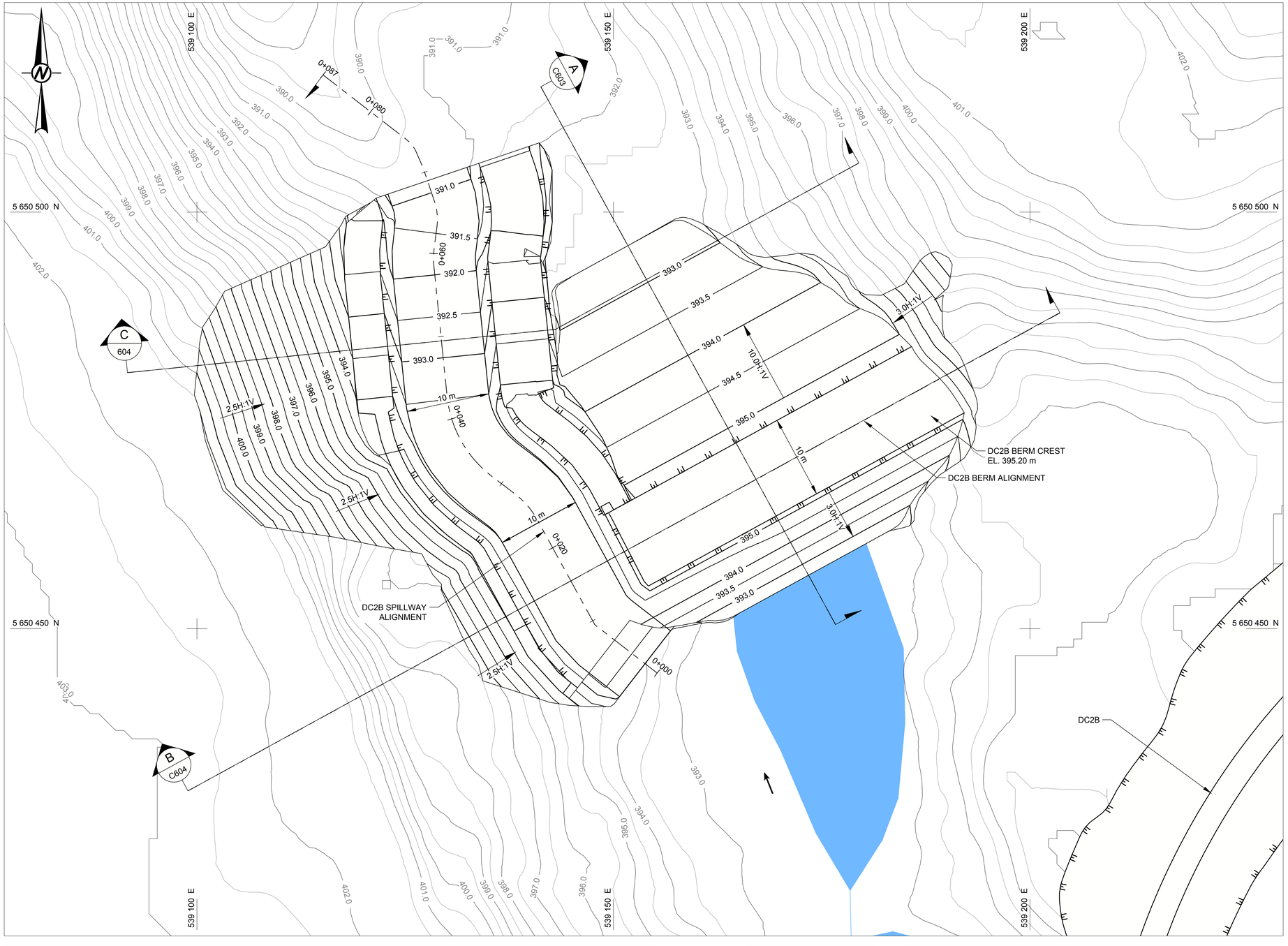

LEGEND

- FLOW DIRECTION
- NATURAL LAKES
- NATURAL WATERCOURSES

REFERENCE(S)

1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
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NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

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REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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CONSULTANT

wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

PLAN - DC2B FLOOD PROTECTION BERM AND SPILLWAY

PROJECT NO.	CONTROL	REV.	DRAWING
2257554004		A	C602

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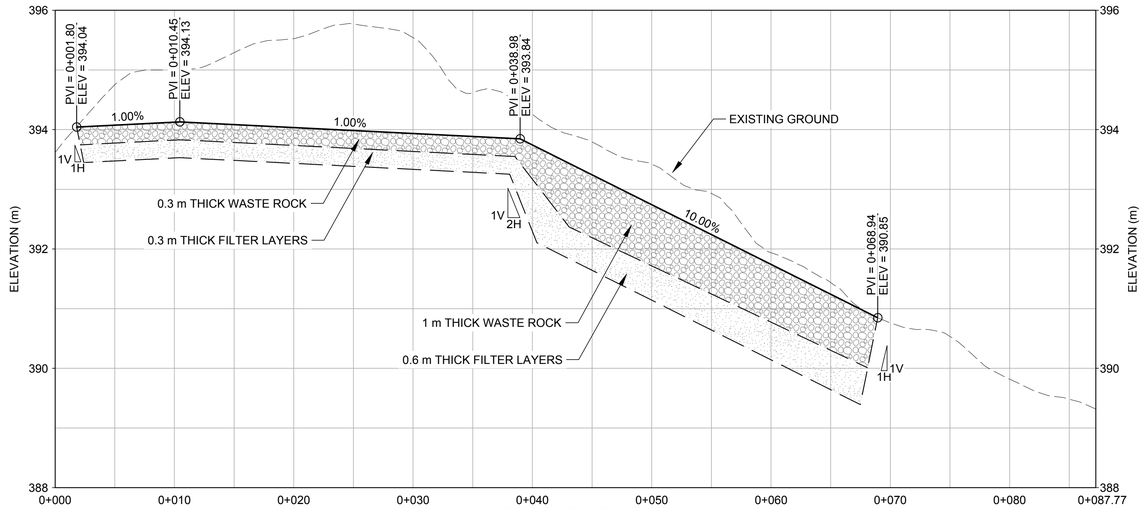
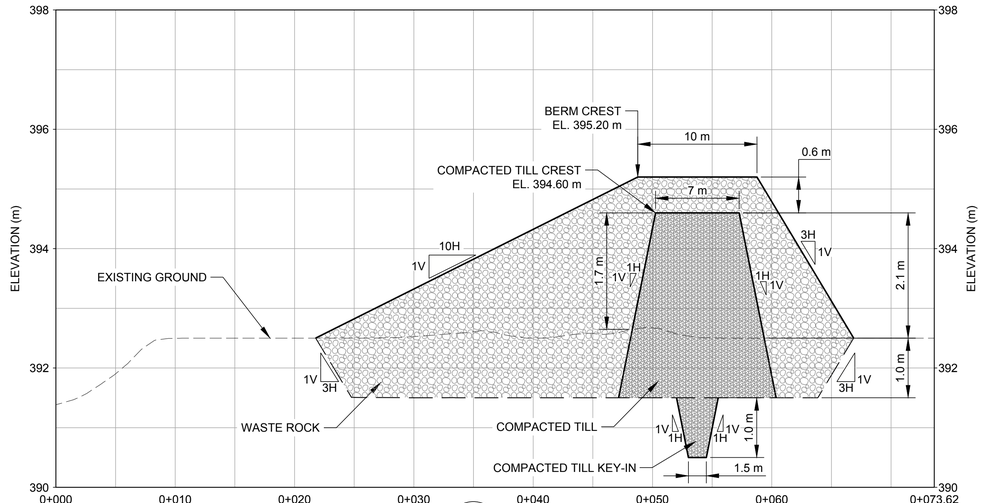


PROFILE - DC2B SPILLWAY

SCALE 1:250

VERTICAL SCALE 1:50



A SECTION - DC2B BERM

SCALE 1:250

VERT. SCALE 1:50

C602

LEGEND

- WASTE ROCK
- FILTER LAYER
- COMPACTED TILL

NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

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1:250 METRES

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1:50 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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CONSULTANT

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT

TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE

SECTIONS - DC2B FLOOD PROTECTION BERM AND SPILLWAY (1 OF 2)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	74 of 75	C603

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LEGEND

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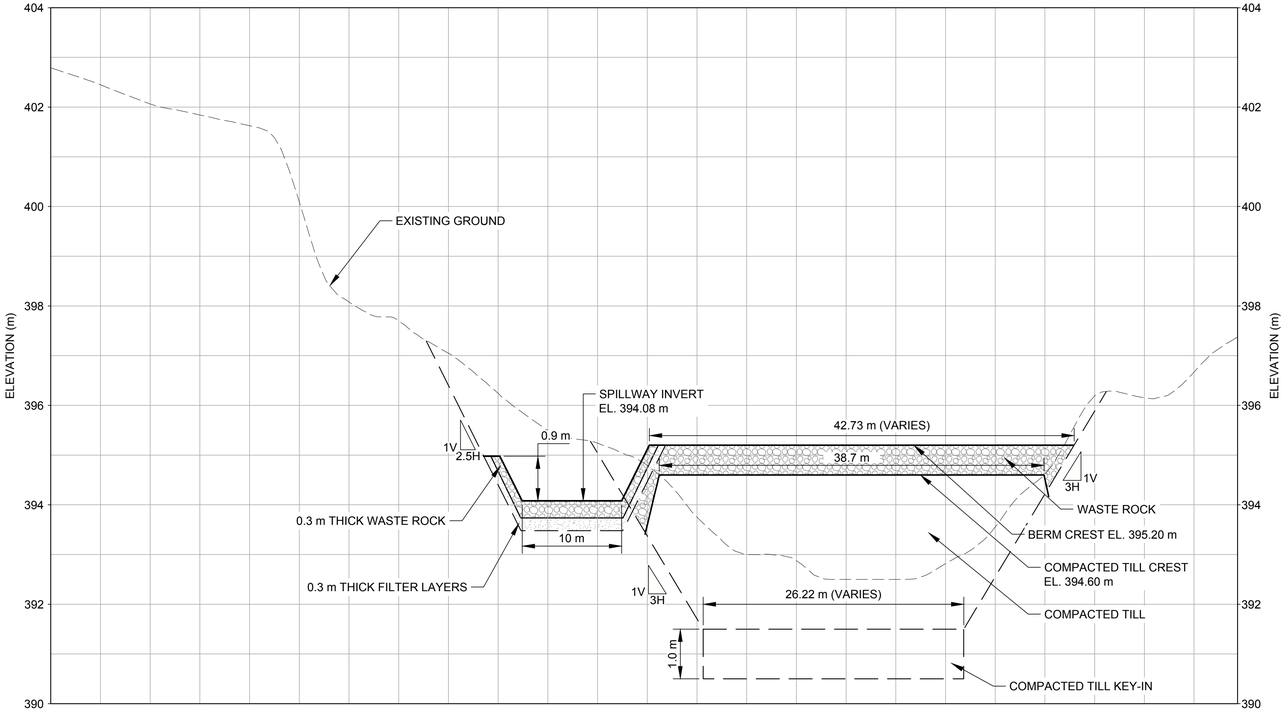

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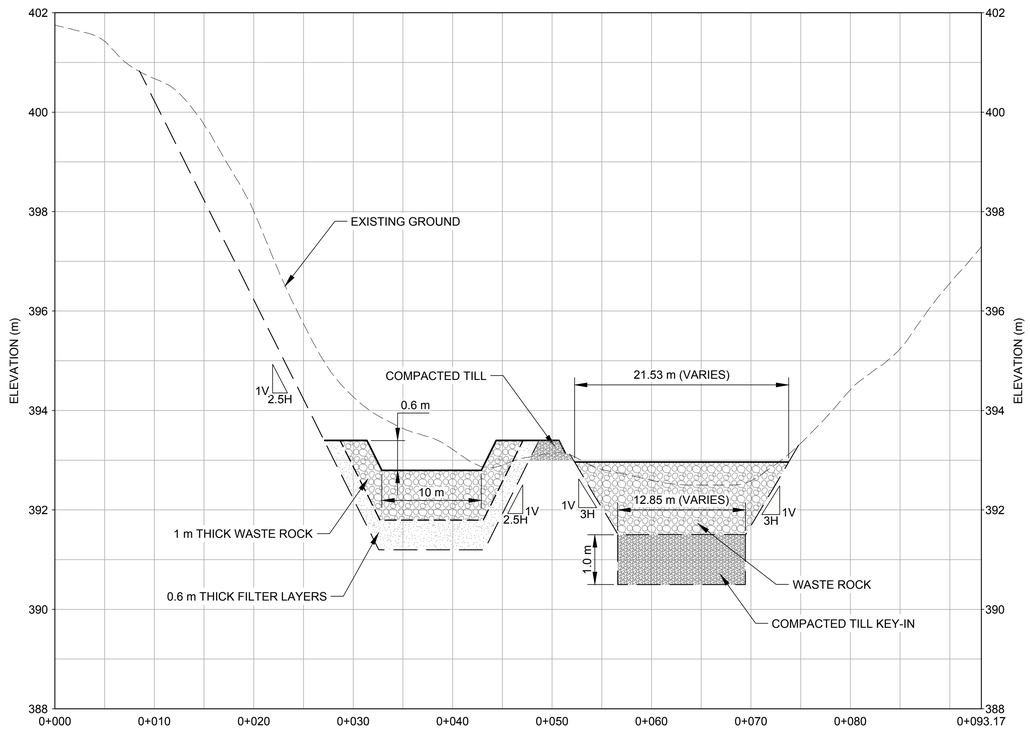

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NOT FOR CONSTRUCTION

ISSUED FOR REVIEW

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REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2024-05-03	ISSUED FOR REVIEW	JF	TF	VR	VR

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TROILUS

CONSULTANT
wsp

CALGARY OFFICE
SUITE 3300, 237 - 4 AVENUE SW
CALGARY, ALBERTA T2P 4K3
CANADA
[+1] (403) 243 8380

PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY

TITLE
SECTIONS - DC2B FLOOD PROTECTION BERM AND SPILLWAY (2 OF 2)

PROJECT NO.	CONTROL	REV.		DRAWING
2257554004		A	75 of 75	C604

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

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APPENDIX K

MTOs

Calculation Cover Sheet

Customer	Troilus Gold Corp.	**Proj No**	2257554004		
Project Title	Troilus Support 2023 - Site Wide WMP - FS	**Calc No**			
Calculation Title	Surface Water Management Plan - MTOs and Operational Requirements, LOM	**Phase/Task**			
Elec File Location	https://golderassociates.sharepoint.com/sites/169483 Project%20Files/5%20Technical%20Work/22575540	**Date**	29-févr-24		
Project File Location		**Page**	1	of	10

Purpose

Quantities for the Troilus Feasibility Study of the Surface Water Management Plan

The quantities are based on the Troilus SWMP as of February 26, 2024. See layout sketches (provided separately)

Limitations: Unprotected digital files are able to be modified after issue. WSP does not take responsibility for issues that may arise following the use of modified digital content.

Calculation Method

CAD calculations supplemented by area-based and geometry-based calculations for volumes of erosion protection and estimates of peat thickness and bedrock depths based on available borehole data

Assumptions and Limitations

General Assumptions

1 The quantities provided herein are for the Troilus Gold Surface Water Management Plan, including Sumps, Ponds, Stream Diversions, and Ditches.
2 No contingency is included in the calculated quantities.
3 Quantities were estimated using Civil 3D based on the channel excavation surface below existing ground (EG). The EG surface was based on 1m provincial LiDAR.
4 The accuracy of the calculations is +/-30% when it comes to total excavation and fill volumes, but it is +/-50% when it comes to peat/till/bedrock separation (because of widely spaced boreholes).
5 Available borehole data was used to estimate peat thickness and bedrock depths along alignments and within excavation footprints. Boreholes were selected based on proximity to structures and similarity in surficial geology.
6 2023 test pits were excavated to refusal. The depth of bedrock at test pit locations was inferred based on surficial geology and available data for nearby boreholes.
7 No shrinkage is accounted for in soil, subsoil, or peat salvage quantities.
8 No bulking factor was accounted for in bulk excavation volumes.
9 Quantities do not include quantities associated with the Tailings Storage Facility, inclusive of current spillway maintenance and construction of future emergency spillways.
10 General fill is defined as a granular material with nominal compaction. Unsorted waste rock is not expected to be suitable for general fill.
11 For the purposes of Erosion and Sediment Control and Care of Water, a unit is defined as either a single discrete berm, sump, pond, or ditch, or as a design segment of diversion channel DC1. Culverts are not considered separately from ditches or channels.
12 Quantities associated with mine closure are not included
13 Quantities associated with drainage within the plant site footprint are not included. It is assumed the plant site will drain to external points at Sump 6 or Ditch D14c.

Assumptions regarding the updates undertaken to accomodate the 50KT v9 (February 10, 2024) mine plan updates.

1 Quantities and schedule are based on a mine plan that includes 3 years of construction and mining pre-operation and 22 years of mining and processing after the starts of operations.
2 For the Revision F MTOs, some optimization was discussed and implemented. This included deferring SP03, D10a, and D10b to year 6. Other optimizations, including deferring D14a, D14b, D14C, DC2a and DC2b were discussed but not implemented.
3 For the Revision F MTOs, the following changes were made:

The Diversion Channel (DC1) is deferred to be constructed by Q2 of Year -1, comissioned in Q3 of Year -1 and operational in Q4 Year -1. For the purpose of the MTO tables it is shown as constructed in Year -1 and operational in Year 1, as a quarterly breakdown of life-of-mine was not completed. Some elements of DC1 may be constructed earlier, however this is not reflected in the Rev F MTO. Mining of the south-west area, and waste placement in the west dumps, is expected to commence in Q1 of Year 1, after DC1 is operational.

A temporary Diversion Channel Bypass (DCB) was added to route flow in the existing diversion around the 87 Pit Phase 0 development, so that Settling Pond SP02 could be constructed in year -2. DCB was extended upstream relative to the Revision E layout so that the TSF buttress could start in Year -1.
SWMP infrastructure in the South-West Pit development area was deferred to be constructed in Q4 of Year -1 (for SP01) and early in year 1 (for sumps and ditches). All infrastructure in the south-west and west areas are expected to be operational before the Year 1 spring freshet. Some pumping of contact water may be required during the winter season, before the sumps and ditches are completed and operational.
S02 and S03 are assumed to be constructed in Q4 year -1 or Q1 year 1, before construction of the TSF buttress, and after construction of DC1.

Assumptions for Stream Diversion Design

1 Peat thickness and bedrock depth was assumed to be constant within each channel design segment, with the exception of Segment 8 which referenced three boreholes
2 Low permeability fill is considered to be compacted till of sufficiently low permeability. Further specifications of this material are not defined for the feasibility-level design.
3 Embankment fill material to be built out of a combination of till and waste rock - information to be provided at later date
4 Non-woven geotextile is not included in calculations for the Bibou Creek Stream Diversion (DC1)
5 Access Roads are included on one side of the diversion with a width of 5 m. The access road is assumed to be located on top of the diversion embankments, where embankments are required.
6 Granular material for access roads is assumed to be 5m wide and 0.3m deep on one side of the entire length of the channel
7 Granular material estimates are classified as "Riprap (500mm)", "Riprap (300mm), "Riprap (100mm)" and "gravel".
8 Over excavation under embankments is assumed to be to the bottom of the existing peat layer
9 Two granular filter layers (bedding gravel and riprap with D50 = 100mm) were included in the design under riprap with D50 of 300mm or 500mm, where riprap is the primary protective layer.
10 One granular filter layer (gravel) is included in the design under riprap with D50 = 100mm, where this small riprap is the primary protective layer.
11 Erosion protection over minor tributary intercepts is not included.
12 Fish habitat features such as boulders, large woody debris, or mild sinuosity of the pilot channel are not reflected in quantities.
13 The Bituminous Geomembrane included in the quantities for diversion DC1 (for the purpose of reducing seepage through embankments and for maintaining flow depth in low flow channels) includes a spoilage factor of 1.5.
14 Seeding of the exposed channel face is not included, as it is assumed this surface will be covered with waste rock for runoff management and slope stability, especially in areas with high ground water table. This applies to slopes above the channel erosion protection (which extends to the 100-yr water surface elevation plus freeboard)
15 Seeding and topsoil quantities on the tops and exterior faces of berms are not included, as other local erosion and sedimentation control strategies may be considered.

Assumptions for Sumps and Ponds

1 All excavation side slopes are assumed to be 3H:1V. This may change once detailed borehole data is available within each pond footprint.
2 Rockfill cover thickness of 1.0m assumed over all exposed overburden and peat, for slope stabilization and erosion protection.
3 Filter layers where required are comprised of 0.5m thick sandy gravel (bedding gravel) on non-woven geotextile.
4 Filter layer requirements were defined through a high level assessment of available bore hole data in representative conditions, including ground water elevations, sub-surficial geology, and bed rock depths.
5 Lining material including Non-woven Geotextile, bedding gravel, and rockfill cover, are not required where the pond is excavated in bedrock.
6 Underdrain systems are estimated to not be required.
7 Access roads are comprised of a 5 meter wide buffer around the perimeter of each pond, covered with 0.3m road gravel. Peat is assumed to be stripped within this area.
8 Peat is assumed to be removed within the pond footprint.

Assumptions for Contact Water Ditches and Secondary Diversions

1 The contact water ditches were modelled based on typical cross sections, defined by typical excavation depth for each reach, depth of bedrock, and estimated ground water elevation. This information should be confirmed with additional borehole data prior to construction.
2 Excavation volumes and clearing footprints are calculated based on Civil 3D models and verified with geometry-based calculations. Riprap volumes are estimated based on typical channel geometries.
3 Riprap D50 sizes for each channel segment are calculated using USACE methods for steep and shallow channel segments.
4 D50 sizes are rounded up to nearest value: 100 mm, 300 mm or 500 mm
5 Riprap thickness is assumed to be 2 x D50 size, with a minimum thickness of 300 mm.
6 Riprap with D50 greater than or equal to 300 mm will require a 300 mm thick filter layer of sandy gravel
7 All sections of riprap with or without filter layer are placed on non-woven geotextile. The non-woven geotextile lines the ditches to top of slope and is keyed-in 1m on each side.
8 Riprap extends to the elevation of the 100 yr design flood plus 300 mm for freeboard.
9 If the ditch excavation is deeper than the 100 yr +FB, waste rock will be place between the top of riprap and channel invert at the same thickness of the riprap + filter.
10 If the ditch is excavated in peat, the thickness of the waste rock is a minimum of 1 m (which may be thicker than the riprap/filter).
11 If ground water elevation is at or near ground, waste rock is placed 1m thick.
12 Waste rock will be placed a minimum of 0.6m thick anywhere there is no bedrock.
13 No waste rock, bedding gravel, non-woven geotextile, or erosion protection are used on areas where ditches are excavated in bedrock.
14 Average excavation depths for each channel segment are assumed to be at the centerline of the channel
15 A 5m wide bench is assumed on any channel segment that has a majority of the channel excavated over 5m deep. Small zones with excavation over 5 m deep do not consider a bench.
16 Road gravel is calculated based on a 5 meter wide buffer on one side of the ditch, with material placed 0.3 m thick.
17 Peat is assumed to be stripped within a 5 meter wide zone on both sides of each ditch.
18 The East Diversion (DC2a and DC2b) are not designed to provide fish passage or fish habitat.

Assumptions for Berm Design

1 The berms are designed with a compacted till core constructed to the maximum water surface elevation of the 100-year flood plus 0.3m freeboard. The core is a maximum of 1.4 m high, with 1H:1V side slopes.
2 Flow across the top crest of the flood protection berm was assumed to be evenly distributed during the PMF event.
3 Erosion protection material requirements were assessed using USACE methods. General waste rock was expected to be sufficient for erosion protection cover on the flood berm. Waste rock over the core is set at 3H:1V on the upstream face and 10H:1v on the downstream face.
4 A filter layer of 0.5m sandy gravel was assumed on both the upsream and downstream faces of the berms.
5 A 5m wide apron was included at the downstream toe of the flood protection berm for energy dissipation.
6 The flood protection berm is designed with a key in to 1.2m depth (the assumed thickness of the fine sand below peat) to a distance of 25m each side of the Bibou Creek thalweg, and to a depth of 0.5m along the rest of the berm alignment.
7 Peat thickness and sand thickness are based on the nearest borehole to the berm alignment. Thicknesses were assumed to be consistent along the full length of the berm.

Assumptions for Culverts

1 Excavation volumes are assumed to be included in excavation of the channel.
2 Culverts were sized using a set of typical geometries and flows to reduce the number of culvert types required, with placement on each ditch and channel based on existing roads and assumed future roads.
3 Four additional culvert crossings were assumed to be constructed during each year when no contact water ditches or diversion are constructed.
4 Two addditional small culvert crossings were assumed to be constructed during each year when contact water ditches or diversions are constructed.
5 Arch culvert crossings on concrete footings were assumed to be constructed on the Bibou Creek diversion (DC1) to facilitate fish passage. Typical geometries were assumed for the concrete footings. No geotechnical or structural assessment was completed.
6 Culverts were assumed to be round CSP pipe. A maximum of 0.3m backwater was targeted for conveyance capacity.
7 Erosion protection was assumed to be required at the culvert inlet and outlet.
8 Culverts were assumed to be bedded in sandy gravel. Remainder of the backfill material was assumed to be general fill.

Assumptions for Operations, Maintenance, and Monitoring

1 Requirements For Stream Diversion Channel Operation and Maintenance:
Assumes 40 man-hours per kilometer of channel per year for maintenance of erosion protection, culverts, embankments, and fish habitat features
Excavation crew with side-cast operations, riprap material supply and placement
Requires excavator, dump truck and possibly a dozer
2 Requirements For Contact Water Ditching Operation and Maintenance
Assumes 14 man-hours per kilometer of ditch per year for maintenance of erosion protection and culverts and sediment removal
Excavation crew with side-cast operations
Requires excavator, dump truck and possibly a dozer
3 Requirements For Polishing Pond Operation and Maintenance
1 day per week monitoring with crew of 1 (with truck)
1 week per year with excavation crew for sediment removal
Requires excavator, dump truck and possibly a dozer
Does not include operations, maintenance, and monitoring of the pumping systems
4 Requirements For Monitoring of the entire SWMP
Half-time crew of 2 with truck (year-round with day shift only)
Includes monitoring of all ditches, diversions, and pipelines.
Includes monitoring of the contact water pipeline system (operations and maintenance not included here)
5 Requirements For In-pit Water Management Operation and Maintenance
Outside of WSP scope

Assumptions for Construction Timing

1 SWMP figures show the sumps/ponds/ditches starting the year they are required
2 Construction costs for ditches and sumps are assumed to be incurred the year they are required by the mine plan, assuming they will be constructed before spring runoff begins.
3 The Diversion Channel Bypass (DCB) is shown to be constructed in year -2. It will be requried to be operational prior to development of 87 Pit Phase 0.
4 Some structures will take longer to construct than Q1 of the first operational year they are required, primarily the diversions and settling ponds
5 Construction costs for the main diversion, east diversion, and settling ponds are assumed to be incurred the year before they are required
6 The main diversion, east diversion, and settling ponds are shown in grey on the SWMP figures as "under construction" the year before they are required
7 Operational costs (man hours) for all structures will start the first year of their operation.
8 Therefore:
The main diversion DC1 will be constructed and commissioned by Q3 of Year -1, prior to disturbance of the west and southwest areas in Q4 of Year -1.
SP04 will be constructed year -3 and will be operational year -2.
SP01 will be constructed in Q4 of Year -1 and will be operational in Q2 of year 1.
SP03 will be constructed year 4 and will be operational year 5.
DC2A and DC2B (east diversion) will be constructed Year -3 and will be operational Year -2. There may be an opportunity to defer construction of the East Diversion by routing contact flows around the processing plant site footprint and designing a number of smaller local ditches. However, this optimization has not been completed for the current estimate.

There may be an opportunity to defer part of the costs of DC1, DC2, and the settling ponds to their first year of operation. However, this is not included in the CAPEX breakdown.

References

Data	File Link
Mine Plan (modified after discussion with AGP)	https://golderassociates.sharepoint.com/sites/169483 Project%20Files/5%20Technical%20Work/2257554004%20-%20Site%20Wide%20WMP%20-%20FS/01%20-%20Mine%20Planning/08%20-%20
Ditches RevC2	https://golderassociates.sharepoint.com/sites/169483 Project%20Files/5%20Technical%20Work/2257554004%20-%20Site%20Wide%20WMP%20-%20FS/12%20-%20Civil%20Design/3.1%20-%20D
Culverts RevD	Troilus FS - Culvert List Rev E.xlsx
Sumps and ponds (revD)	https://golderassociates.sharepoint.com/sites/169483 Project%20Files/5%20Technical%20Work/2257554004%20-%20Site%20Wide%20WMP%20-%20FS/13%20-%20Quantities/Quantities%20Rev%2
DC1	https://golderassociates.sharepoint.com/sites/169483 Project%20Files/5%20Technical%20Work/2257554004%20-%20Site%20Wide%20WMP%20-%20FS/03%20-%20Hydraulics/Stream%20Diversion
Berm RevC	https://golderassociates.sharepoint.com/sites/169483 Project%20Files/5%20Technical%20Work/2257554004%20-%20Site%20Wide%20WMP%20-%20FS/13%20-%20Quantities/Quantities%20Rev%2
Ditches - typical sections	Typical Ditch Sections - presentation for Geotech
CAD files (sumps, ponds, diversion, ditches, berm)	33 - SWMP CAD files for MTOs 01April2024
SWMP Concept Layouts	22 - SWMP for 50kt v9 mine plan
Mine Plan contours	2024.02.10_AGP Mine schedule v9 50ktpd
Mine Plan Polygon export	50 - mine plan polygons 50kt v9 27Feb2024
Borehole summary	Troilus FS Borehole data SWMP design 12Oct2023

Conclusions

Rev	Date	Description	By	Checked	Approved
F	29-02-2024	Troilus Feasibility Study Surface Water Management Plan - Material Take Off Tables	ZZ, JT, JF, JC, FT	JF, VR	VR (ing. OIQ 5000611)
E	22-01-2024	Troilus Feasibility Study Surface Water Management Plan - Material Take Off Tables	ZZ, JT, JF, JC, FT	JF, VR	VR (ing. OIQ 5000611)
D	16-01-2024	Troilus Feasibility Study Surface Water Management Plan - Material Take Off Tables	ZZ, JT, JF, JC, FT	JF, VR	VR (ing. OIQ 5000611)
C	5-01-2024	Troilus Feasibility Study Surface Water Management Plan - Material Take Off Tables	ZZ, JT, JF, JC, FT	JF, VR	VR (ing. OIQ 5000611)
B	17-11-2023	Troilus Feasibility Study Surface Water Management Plan - Material Take Off Tables and SWMP Figures	ZZ, JT, JF, JC, FT	JF, VR	VR (ing. OIQ 5000611)
A	15-11-2023	Troilus Feasibility Study Surface Water Management Plan - Material Take Off Tables	ZZ, JT, JF, JC, FT	JF, VR	VR (ing. OIQ 5000611)

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Data	File Link
Mine Plan (modified after discussion with AGP)	https://golderassociates.sharepoint.com/sites/169483/Project%20Files/5%20Technical%20Work/2257554004%20-%20Site%20Wide%20WMP%20-%20FS/01%20-%20Mine%20Planning/08%20-%20Mine%20sequence/AGP%20v9%2050kT%20mine%20sequence%2015Feb2024.xlsx?web=1
Ditches RevD	https://golderassociates.sharepoint.com/sites/169483/Project%20Files/5%20Technical%20Work/2257554004%20-%20Site%20Wide%20WMP%20-%20FS/12%20-%20Civil%20Design/3.1%20-%20Ditches%20to%20CAD/Ditch%20Design%20Summary%20for%20CAD%20with%20MTO%20RevD%2020Feb2024.xlsx?web=1
Culverts RevE	Troilus FS - Culvert List Rev E.xlsx
Sumps and ponds (revE)	https://golderassociates.sharepoint.com/sites/169483/Project%20Files/5%20Technical%20Work/2257554004%20-%20Site%20Wide%20WMP%20-%20FS/13%20-%20Quantities/Quantities%20Rev%20F%2020February2024/Sumps%20and%20Ponds/Troilus%20FS%20Sumps%20and%20Ponds%20revE.xlsx?web=1
DC1	https://golderassociates.sharepoint.com/sites/169483/Project%20Files/5%20Technical%20Work/2257554004%20-%20Site%20Wide%20WMP%20-%20FS/03%20-%20Hydraulics/Stream%20Diversion/Profile/22575540%20Troilus%20FS%202%25%20DC1%20Profile%20-%20HEC-HMS%20flows%2009Nov2023.xlsm?web=1
Berm RevD	https://golderassociates.sharepoint.com/sites/169483/Project%20Files/5%20Technical%20Work/2257554004%20-%20Site%20Wide%20WMP%20-%20FS/13%20-%20Quantities/Quantities%20Rev%20F%2020February2024/Berm/Troilus%20Berm%20Quantity%20Calculations%20RevD.xlsx?web=1
Ditches - typical sections	Typical Ditch Sections - presentation for Geotech
CAD files (sumps, ponds, diversion, ditches, berm)	33 - SWMP CAD files for MTOs 01April2024
SWMP Concept Layouts	22 - SWMP for 50kt v9 mine plan
Mine Plan contours	2024.02.10 AGP Mine schedule v9 50ktpd
Mine Plan Polygon export	50 - mine plan polygons 50kt v9 27Feb2024
Borehole summary	Troilus FS Borehole data SWMP design 12Oct2023

Item	Unit	Totals		Year																								
		CAPEX (Yr -3 to Yr -1)	Opex (Yr 1 to Yr 22)	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Construction and Site Prep																												
General site preparation (area for clearing and grubbing)	ha	100.2	55.1	18.1	31.0	51.0	21.0	-	-	5.6	12.7	14.6	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Temporary construction access and enablement works	EA	62	123	6	23	33	15	12	2	5	12	10	4	7	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Water management and temporary erosion and sediment controls	EA	62	123	6	23	33	15	12	2	5	12	10	4	7	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Total Excavation volumes																												
Top soil (peat) excavation volume	10^3 m^3	478.5	238.8	9.2	147.3	322.0	109.5	-	-	12.1	65.2	51.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total overburden excavation volume	10^3 m^3	1 865.5	866.2	551.4	545.0	769.2	231.6	-	-	211.0	165.2	241.4	-	17.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bedrock excavation volume	10^3 m^3	390.2	2.8	17.9	52.2	320.1	-	-	-	-	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fill Material																												
General fill volume	10^3 m^3	95.4	51.0	1.3	11.9	82.2	3.5	5.4	0.9	1.8	7.4	2.5	1.8	2.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Low permeability compacted fill volume, for berms or channel lining	10^3 m^3	56.6	-	0.6	-	56.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Granular materials																												
Riprap volume, D50 = 100 mm	10^3 m^3	57.9	36.1	5.1	22.2	30.6	13.1	0.9	0.1	0.2	10.9	6.9	0.2	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Riprap volume, D50 = 300 mm	10^3 m^3	16.0	13.3	4.2	3.7	8.0	4.6	-	-	-	2.8	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Riprap volume, D50 = 500 mm	10^3 m^3	32.4	10.6	6.0	10.2	16.3	7.9	-	-	-	1.5	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand and gravel volume (for filter or bedding material or channel substrate)	10^3 m^3	117.7	40.3	17.5	15.7	84.6	7.2	2.5	0.4	9.8	4.0	4.9	0.7	1.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
General waste rock volume	10^3 m^3	282.6	173.0	40.7	71.0	170.9	44.1	-	-	30.6	29.5	64.8	-	4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Granular fill volume, for access roads	10^3 m^3	41.2	21.7	7.2	13.4	20.7	8.8	-	-	1.5	5.4	5.4	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lining Material																												
Non-woven Geotextile surface area, for filter material	ha	39.7	36.1	9.1	22.9	7.7	12.5	-	-	1.9	9.4	11.9	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bituminous Geomembrane surface area, for channel lining	ha	1.8	-	-	-	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Culverts																												
Culvert length, all diameters (circular or arch culverts)	m	1 310	4 940	120	790	400	430	540	100	180	420	290	180	280	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Concrete	m^3	210	-	210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operations and Maintenance																												
Stream Diversion Channel Operation and Maintenance	hrs/yr	860	13 711	-	237	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623
Contact water Ditching Operation and Maintenance	hrs/yr	191	5 417	-	82	109	170	176	176	176	226	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264
Polishing Pond Operation and Maintenance	hrs/yr	8 580	210 600	-	3 120	5 460	7 800	7 800	7 800	7 800	8 580	9 360	9 360	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140
Monitoring of the entire SWMP	hrs/yr	13 140	96 360	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380

Item		Unit	Totals		Year																							
			CAPEX (Yr -3 to Yr -1)	Opex (Yr 1 to Yr 22)	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Construction and Site Prep																												
	General site preparation (area for clearing and grubbing)	m^2	366 068	-	-	0	366 068	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Temporary construction access and enablement works	EA	16	-	-	0	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Water management and temporary erosion and sediment controls	EA	16	-	-	0	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Excavation volumes																												
	Top soil (peat) excavation volume	m^3	255 800	-	-	0	255 800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total overburden excavation volume	m^3	483 168	-	-	0	483 168	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bedrock excavation volume	m^3	312 172	-	-	0	312 172	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fill Material																												
	General fill volume	m^3	77 751	-	-	0	77 751	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Low permeability compacted fill volume, for berms or channel lining	m^3	50 967	-	-	0	50 967	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Granular materials																												
	Riprap volume, D50 = 100 mm	m^3	27 169	-	-	0	27 169	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Riprap volume, D50 = 300 mm	m^3	4 343	-	-	0	4 343	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Riprap volume, D50 = 500 mm	m^3	14 841	-	-	0	14 841	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sand and gravel volume (for filter or bedding material or channel substrate)	m^3	54 452	-	-	0	54 452	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	General waste rock volume	m^3	105 554	-	-	0	105 554	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Granular fill volume, for access roads	m^3	14 480	-	-	0	14 480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lining Material																												
	Non-woven Geotextile surface area, for filter material below waste rock	m^2	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HDPE membrane surface area, for channel lining	m^2	18 000	-	-	0	18 000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Item		Unit	Totals		Year																							
			CAPEX (Yr -3 to Yr -1)	Opex (Yr 1 to Yr 22)	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Construction and Site Prep																												
	General site preparation (area for clearing and grubbing)	m^2	439 802	379 833	113 972	266 884	58 945	158 972	-	-	-	127 322	93 539	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Temporary construction access and enablement works	EA	14	11	2	8	4	5	-	-	-	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Water management and temporary erosion and sediment controls	EA	14	11	2	8	4	5	-	-	-	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Excavation volumes																												
	Top soil (peat) excavation volume	m^3	170 707	200 005	4 461	143 650	22 595	95 897	-	-	-	65 241	38 868	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total overburden excavation volume	m^3	585 371	413 375	134 389	402 472	48 510	136 219	-	-	-	165 181	111 975	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bedrock excavation volume	m^3	40 146	-	17 914	21 432	800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fill Material																												
	General fill volume	m^3	-	-																								
	Low permeability compacted fill volume, for berms or channel lining	m^3	-	-																								
Granular materials																												
	Riprap volume, D50 = 100 mm	m^3	28 818	29 504	4 424	21 671	2 723	12 607	-	-	-	10 419	6 477	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Riprap volume, D50 = 300 mm	m^3	9 606	13 022	3 525	2 827	3 253	4 475	-	-	-	2 674	5 872	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Riprap volume, D50 = 500 mm	m^3	16 087	10 332	4 714	9 961	1 412	7 651	-	-	-	1 462	1 219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sand and gravel volume, for filter or bedding material	m^3	11 536	12 029	3 344	5 446	2 746	5 695	-	-	-	2 413	3 921	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	General waste rock volume	m^3	81 706	78 533	14 892	54 758	12 056	25 935	-	-	-	29 465	23 133	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Granular fill volume, for access roads	m^3	20 603	16 608	6 039	11 609	2 955	7 116	-	-	-	5 427	4 065	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lining Material																												
	Non-woven Geotextile surface area, for filter material	m^2	304 836	280 073	67 268	197 930	39 639	108 742	-	-	-	93 524	77 807	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HDPE membrane surface area, for channel lining	m^2	-	-																								

Item		Unit	Totals		Year																							
			CAPEX (Yr -3 to Yr -1)	Opex (Yr 1 to Yr 22)	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Construction and Site Prep																												
	General site preparation (area for clearing and grubbing)	ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Temporary construction access and enablement works	EA	22	109	2	13	7	9	12	2	4	9	7	4	6	4	4	4	4	4	4	4	4	4	4	4	4	4
	Water management and temporary erosion and sediment controls	EA	22	109	2	13	7	9	12	2	4	9	7	4	6	4	4	4	4	4	4	4	4	4	4	4	4	4
Total Excavation volumes																												
	Top soil (peat) excavation volume	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total overburden excavation volume	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bedrock excavation volume	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fill Material																												
	General fill volume	m^3	17 340	51 290	1 250	11 930	4 160	3 540	5 400	900	1 790	7 670	2 460	1 790	2 680	1 790	1 790	1 790	1 790	1 790	1 790	1 790	1 790	1 790	1 790	1 790	1 790	1 790
	Low permeability compacted fill volume, for berms or channel lining	m^3	-	-																								
Granular materials																												
	Riprap volume, D50 = 100 mm	m^3	1 470	6 600	200	570	700	540	850	120	240	500	390	240	360	240	240	240	240	240	240	240	240	240	240	240	240	240
	Riprap volume, D50 = 300 mm	m^3	1 930	350	710	910	310	90	-	-	-	180	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Riprap volume, D50 = 500 mm	m^3	220	220	-	220	-	220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sand and gravel volume, for filter or bedding material	m^3	8 910	19 270	1 110	3 780	4 020	1 530	2 500	350	700	1 690	960	700	1 040	700	700	700	700	700	700	700	700	700	700	700	700	700
	General waste rock volume	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Granular fill volume, for access roads	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lining Material																												
	Non-woven Geotextile surface area, for filter material	m^2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HDPE membrane surface area, for channel lining	m^2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Culverts																												
	Culvert length, all diameters (circular or arch culverts)	m	1 270	4 970	120	790	360	430	540	100	180	450	290	180	280	180	180	180	180	180	180	180	180	180	180	180	180	180
	1050 mm	m	180	2 000	-	130	50	50	140	50	90	90	90	90	140	90	90	90	90	90	90	90	90	90	90	90	90	90
	1500 mm	m	40	120	-	-	40	40	-	-	-	40	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2400 mm	m	570	2 720	120	400	50	240	400	50	90	320	130	90	140	90	90	90	90	90	90	90	90	90	90	90	90	90
	3300 mm	m	260	130	-	260	-	100	-	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3510x2340 mm	m	60	-	-	-	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4460x2940 mm	m	160	-	-	-	160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Concrete	m^3	210	-	210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Item		Unit	Totals		Year																						
			CAPEX (Yr -3 to Yr -1)	Opex (Yr 1 to Yr 22)	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Construction and Site Prep																											
	General site preparation (area for clearing and grubbing)	m^2	182 910	170 932	66 282	43 413	73 214	51 491	-	-	55 773	-	52 835	-	10 833	-	-	-	-	-	-	-	-	-	-	-	-	-
	Temporary construction access and enablement works	EA	7	4	1	2	4	1	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Water management and temporary erosion and sediment controls	EA	7	4	1	2	4	1	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Excavation volumes																											
	Top soil (peat) excavation volume	m^3	36 499	38 833	3 765	3 693	29 042	13 616	-	-	12 136	-	13 081	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total overburden excavation volume	m^3	796 315	452 808	416 852	142 490	236 974	95 384	-	-	211 001	-	129 415	-	17 009	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bedrock excavation volume	m^3	37 918	2 763	-	30 762	7 156	-	-	-	-	-	-	-	2 763	-	-	-	-	-	-	-	-	-	-	-	-	-
Fill Material																											
	General fill volume	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Low permeability compacted fill volume, for berms or channel lining	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Granular materials																											
	Riprap volume, D50 = 100 mm	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Riprap volume, D50 = 300 mm	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Riprap volume, D50 = 500 mm	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sand and gravel volume, for filter or bedding material	m^3	35 618	9 100	11 961	6 467	17 189	-	-	-	9 100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	General waste rock volume	m^3	83 050	94 430	24 722	16 257	42 070	18 131	-	-	30 648	-	41 671	-	3 980	-	-	-	-	-	-	-	-	-	-	-	-	-
	Granular fill volume, for access roads	m^3	5 466	5 097	1 061	1 801	2 604	1 733	-	-	1 489	-	1 346	-	529	-	-	-	-	-	-	-	-	-	-	-	-	-
Lining Material																											
	Non-woven Geotextile surface area, for filter material	m^2	92 262	81 071	23 922	30 588	37 751	15 861	-	-	19 200	-	40 871	-	5 140	-	-	-	-	-	-	-	-	-	-	-	-	-
	HDPE membrane surface area, for channel lining	m^2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Culverts																											
	Culvert length, by diameter (circular or arch culverts)	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Item	Unit	Totals		Year																							
			CAPEX (Yr -3 to Yr -1)	Opex (Yr 1 to Yr 22)	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Construction and Site Prep																												
	General site preparation (area for clearing and grubbing)	m^2	13 229	-	1 105	-	12 125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Temporary construction access and enablement works	EA	2	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Water management and temporary erosion and sediment controls	EA	2	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Excavation volumes																												
C7	Top soil (peat) excavation volume	m^3	15 525	-	985	-	14 540	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C9	Total overburden excavation volume	m^3	656	-	130	-	526	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bedrock excavation volume	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fill Material																												
	General fill volume	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C6	Low permeability compacted fill volume, for berms or channel lining	m^3	5 631	-	601	-	5 030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Granular materials																												
C13	Riprap volume, D50 = 100 mm	m^3	441	-	441	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Riprap volume, D50 = 300 mm	m^3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C12	Riprap volume, D50 = 500 mm	m^3	1 243	-	1 243	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C8, C14	Sand and gravel volume, for filter or bedding material	m^3	7 101	-	1 038	-	6 062	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C5	General waste rock volume	m^3	12 298	-	1 085	-	11 213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C10	Granular fill volume, for access roads	m^3	681	-	60	-	621	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lining Material																												
	Non-woven Geotextile surface area, for filter material below waste rock	m^2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HDPE membrane surface area, for channel lining	m^2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Item		Unit	Year																						
			-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Length of ditches		KM	0.00	5.84	7.81	12.12	12.55	12.55	12.55	16.17	18.88	18.88	18.88	18.88	18.88	18.88	18.88	18.88	18.88	18.88	18.88	18.88	18.88	18.88	18.88	18.88	18.88
Number of Active Ponds		EA	0	4	7	10	10	10	10	11	12	12	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Length of Stream Diversions			0.0	5.9	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6
Stream Diversion Channel Operation and Maintenance	40	hrs/km/yr	-	237	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623
Contact Water Ditching Operation and Maintenance	14	hrs/km/yr	-	82	109	170	176	176	176	226	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264	264
Polishing Pond Operation and Maintenance	780	hrs/pond/yr	-	3 120	5 460	7 800	7 800	7 800	7 800	8 580	9 360	9 360	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140	10 140
Monitoring of the entire SWMP	4380	hrs/yr	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380	4 380

Structure	First Year Operational	Year of construction (one year before year required)	Ditch Length	Diversion Length	Pond
			km	*km*	*unit*
DC1	-1	-1	-	9.7	0
DC3	-3	-2	*manually*	1.9	0
DC2a	-3	-3	*manually*	1.4	0
DC2b	-3	-3	*manually*	2.7	0
SP01	1	-1	-		1
SP02	-2	-2	-		1
SP03	5	4	-		1
SP04	-3	-3	-		1
S01	1	1	-		1
S01b	6	6	-		1
S02	-1	-1	-		1
S03	-1	-1	-		1
S04	0	0	-		1
S05	-1	-1	-		1
S06	-2	-2	-		1
S07	8	8	-		1
S09	-2	-2	-		1
D01a	1	1	1.4		0
D01b	1	1	0.4		0
D01c	1	1	0.3		0
D02	6	6	1.5		0
D03	-1	-1	0.4		0
D04	2	1	0.4		0
D05	1	1	2.2		0
D06a	-2	-2	0.9		0
D06b	-2	-2	1.2		0
D06c	-2	-2	0.6		0
D07b	5	5	0.8		0
D07c	5	5	0.6		0
D08	-1	-1	0.6		0
D09	-1	-1	0.3		0
D10a	5	5	0.6		0
D10b	6	6	1.2		0
D11	5	5	1.7		0
D12	-2	-2	0.7		0
D14a	-2	-2	0.2		0
D14b	-2	-2	1.6		0
D14c	-2	-2	0.6		0
D15	-1	-1	0.7		0
D16	-2	-2	-		0
D17a	2	2	-		0
D17b	2	2	-		0
D17c	2	2	-		0

Legend	
DC	diversion channel
D	contact water ditch
S	contact water sump
SP	sedimentation pond

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APPENDIX L

Groundwater Management

TECHNICAL MEMORANDUM

DATE 2 May 2024 **Reference No.** 079-2257554004-TM-RevA DRAFT

TO Vlad Rojanschi, Project Director
WSP Canada Inc.

CC

FROM Mathieu Gosselin **EMAIL Mathieu.gosselin2@wsp.com**

HYDROGEOLOGY TO SUPPORT THE WATER MANAGEMENT PLAN, FEASIBILITY STUDY - TROILUS PROJECT

1.0 SITE CONDITIONS

A conceptual site-scale hydrogeological model was developed (WSP, 2024a). The structure of the stratigraphic horizons of the conceptual model is based on all the information obtained during the investigation campaigns (section 6 of the report).

1.1 Hydrostratigraphy

The hydrogeological characterization works combined with the distribution of surface deposits made it possible to define five natural hydrostratigraphic units and two anthropogenic units (WSP, 2024a):

- Rock outcrop zone.
- Till zone (calibrated hydraulic conductivity of 1 x 10^{-5} m/s and recharge of 128 mm/year).
- Peat zone overlying on till (calibrated hydraulic conductivity of 1 x 10^{-7} m/s and recharge of 35 mm/year).
- Zone of fluvioglacial and juxta-glacial deposits (calibrated hydraulic conductivity of 9 x 10^{-5} m/s and recharge of 219 mm/year).
- Zone of waste rock piles overlying on till (calibrated hydraulic conductivity of 1 x 10^{-3} m/s and recharge of 219 mm/year).
- Mine tailings zone overlying on till (calibrated hydraulic conductivity of 3 x 10^{-6} m/s and recharge of 55 mm/year).
- Rock (calibrated hydraulic conductivity variable from 2 x 10^{-9} m/s to 2 x 10^{-5} m/s which generally decreases with depth and a surface recharge of 55 mm/year).

Groundwater levels are generally near the ground surface and range from -0.6 m (artesian) to 16 m depth. A piezometric map, defined by the measurement of groundwater levels carried out in rock drilling as well as in observation wells screened in sedimentary deposits, is presented in Figure 1. In general, the direction of groundwater flow is controlled by topography and locally influenced by Pit 87. The well area southeast of the

WSP Canada Inc.
1135, boul. Lebourgneuf
Québec (Québec)
G2K 0M5 Canada

tailings pond shows the highest piezometric levels in the region. From this topographic high, the flows head northwest, towards the mining site. In the area of the southwest projected pit, underground flows follow the direction of Bibou Creek towards the northeast. The current levels of pit 87 create a local drawdown of nearly 70 m compared to the surrounding piezometric level, while pit J4 has much less local influence on the groundwater table.

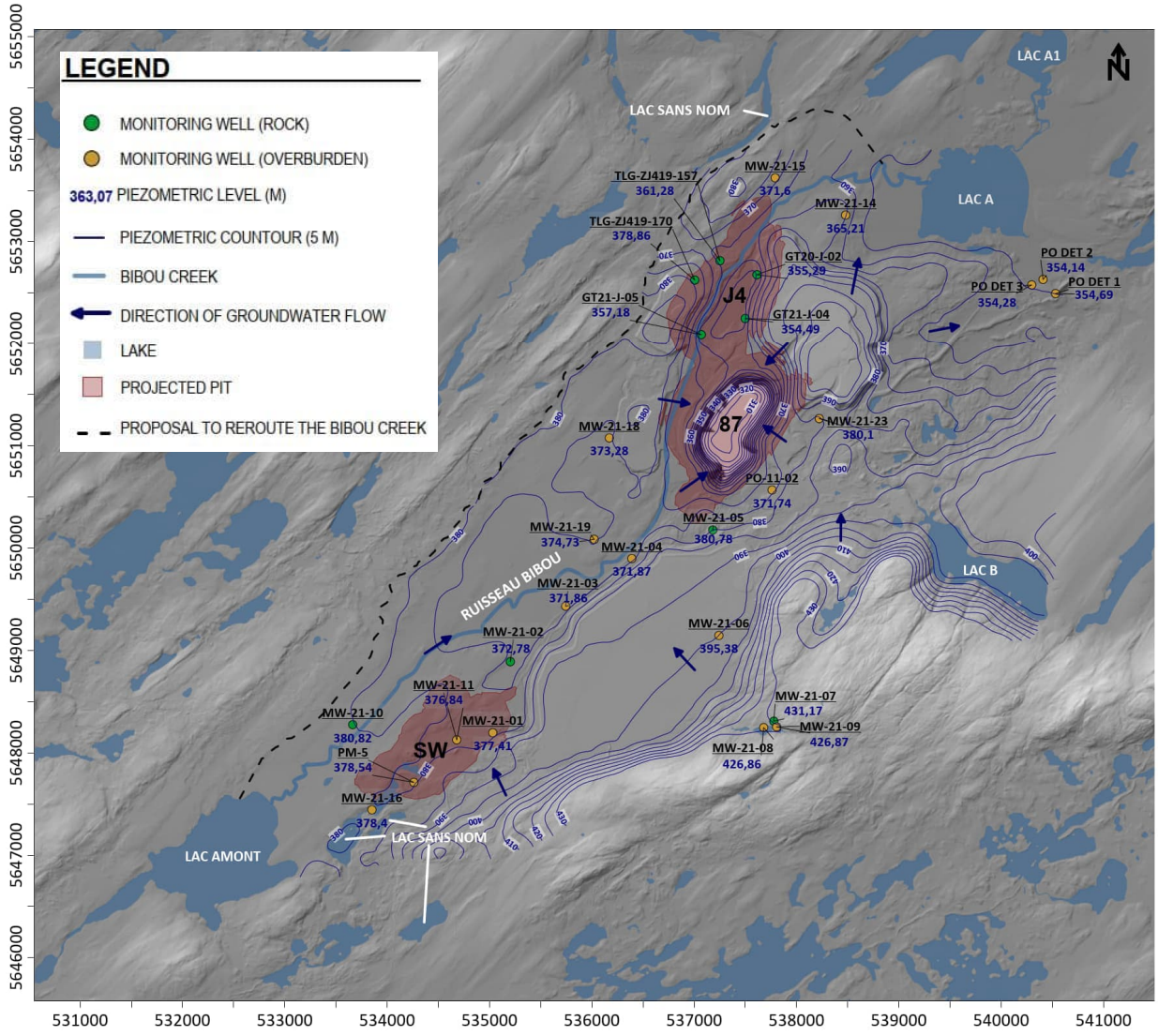

Figure 1: Piezometric Contours and Flow Direction (after WSP, 2024b)

1.2 Groundwater Quality

Several observation wells have been monitored since the closure of the Troilus mining site. They are located upstream and downstream of the TSF; upstream and downstream of the mining site; in the former industrial sector; as well as downstream from the trench burial site. A water well used by the Awashish family is also

monitored to ensure the quality of drinking water. An enhanced monitoring program for the level and quality of groundwater was put in place as part of the impact study (WSP 2024b and 2024c).

Groundwater monitoring at the Troilus mining project site reveals the following main facts (Golder, 2022, WSP 2024b and 2024c):

- The groundwater upstream of the tailings pond is naturally acidic (generally pH less than 6).
- The conductivity of the water upstream of the site is less than 100 µmhos/cm while that downstream of the tailings pond is between 100 and 400 µmhos/cm and that in the former industrial sector is between 200 and 450 µmhos/cm.
- The groundwater upstream of the site is of good quality and does not present any contaminants beyond the values established by the groundwater criteria[1].
- The 2023 campaigns show that the Potable Water (EC) comparison criteria (MELCC, 2021) for groundwater were exceeded and observed for Arsenic, Manganese and Ammoniacal Nitrogen for wells that can be used as water supply. Exceedances of the Resurgence in surface water (RES) comparison criteria for groundwater were also observed for Copper and Sulfides (expressed as H_2S and S^{2-}) for wells that can be used as water supplies.
- The 2023 campaigns show that the RES comparison criteria and Appendix V of the *Règlement sur la protection et la réhabilitation des terrains* (MELCC, 2019) for groundwater were exceeded and were observed for Toluene, Sulfides (expressed in H_2S and S^{2-}) and certain metals (Silver, Cadmium, Copper, Manganese, Mercury, Nickel, Zinc) in several observation wells.
- We can observe a seasonal fluctuation for copper and zinc concentrations by reviewing the groundwater quality analysis data since 2018 for the various post-closure monitoring wells. Indeed, the concentrations of copper and zinc in groundwater appear to be higher during low flow periods in the fall compared to the results obtained during sampling during spring flood periods.
- All observation wells show values below the detection limit for polycyclic aromatic hydrocarbons (PAHs) during the last sampling campaigns carried out in 2023.

2.0 PIT DEWATERING

The information presented in this section is based on WSP (2024a).

2.1 Numerical Model

A three-dimensional numerical hydrogeological model of groundwater flow at the Troilus site was developed using the *FEFLOW* software (DHI, 2021). *FEFLOW* uses the finite element equation to simulate groundwater flow. The

[1] MELCCFP: ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (du Québec) since October 2022; formely known as ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC, from 2018 to 2022), ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC, from 2014 to 2018), ministère du Développement durable, de l'Environnement de la Faune et des Parcs (MDDEFP, from 2012 to 2014), ministère du Développement durable, de l'Environnement et des Parcs (MDDEP, from 2005 to 2012), ministère de l'Environnement (MENV, from 1998 to 2005) and ministère de l'Environnement et de la Faune du Québec (MEF, from 1994 to 1998).

model was developed to assess the effect of dewatering the four pits (87, J4, X22 and Southwest [SW]) planned for the mine site. The various model inputs are based on data from the most recent hydrogeological investigations. The simulations were carried out under steady-state conditions, so the results are representative of the average recharge and the average hydrogeological conditions in the modelled area. The following simulations were carried out:

- Base case representing current site conditions. Case used for model calibration.
- Scenario with the four pits active simultaneously, the final geometry of the waste rock piles before the SW pit is covered by mine waste rock, Bibou Creek is diverted and the water basin in the tailings storage facility is modelled at its ultimate elevation. In this scenario, the boundary condition used to simulate Bibou Creek under current conditions is removed.

The base case represents the site's current hydrogeological and topographical conditions. It is used to calibrate the model. In the final operating scenario, the calibrated base case model has been modified to incorporate the final topography, including the waste rock piles and pit geometry.

2.2 Water balance

In this section, the groundwater inflow and outflow balance simulated by the model is presented for the pits, Bibou Creek and its diversion.

2.2.1 Current Pits (87 and J4)

The water balance of the current pits was extracted from the model representing current conditions (base case). Table 1 shows the volume of water extracted by the boundary conditions used to simulate the artificial control of the level of pits 87 and J4.

Table 1: Groundwater Infiltration Rate in Pits 87 and J4 for Current Hydrogeological Conditions

Pit	Groundwater Infiltration Rate (m^3/d)
Pit 87	3,130
Pit J4	1,310

2.2.2 Planned Pits (87, J4, X22, and SW)

The water balance of the existing pits was extracted from the numerical model representing the final operating conditions of the mine site (final operation scenario).

The complete dewatering of the pits leads to an increase in the rate of infiltration of groundwater into the pits. The results indicate flow rates of 2,450 m^3/d, 2,370 m^3/d, 2,350 m^3/d and 4,010 m^3d for the 87, J4, X22, and SW pits, respectively (Table 2).

Table 2: Simulated Groundwater Infiltration Rate for the Four Pits Under Final Operating Conditions

Pit	Groundwater Infiltration Rate (m³/d)
87 Pit	2,450
J4 Pit	2,370
X22 Pit	2,350
SW Pit	4,010
Total	**11,180**

2.2.3 Bibou Creek and Diversion

The hydrogeological balance of the constant load boundary conditions is used to simulate Bibou Creek, and its future diversion is presented in Table 3. Under the current dewatering conditions for pits 87 and J4, the Bibou stream receives 970 m³ of groundwater daily and loses 1180 m³ of groundwater daily. The net balance is therefore a loss of 210 m³/d. This decrease in flow from upstream to downstream was also observed in the hydrological analysis carried out by Wachiih and HydroRessource (2019).

In its future configuration, the Bibou Creek diversion would receive a groundwater input of 2,670 m³/d and a loss to the aquifer of 4,040 m³/d, for a net balance of -1,370 m³/d.

The higher groundwater input simulated for the diversion is due to the fact that the diversion will be excavated into the bedrock in places. These entrenched sections would be below the current water table, thus encouraging the resurgence of groundwater in the watercourse (diversion). The greater losses are linked to the dewatering of the pits and the resulting lowering of the water table.

It is important to note that this balance includes only the underground portion and does not include the surface water input from upstream of the site and from the various small tributaries that feed the main watercourse. The relative impact should be assessed with the surface water interaction.

Table 3: Hydrogeological Assessment of the Bibou Creek and its Future Diversion

Water body	Gains (m³/d)	Losses (m³/d)	Balance (m³/d)
Bibou Creek and existing diversion channel (current conditions)	970	1,180	-210
Planned Main Diversion Channel (final operating conditions for steady-state scenario)	2,670	4,040	-1,370

2.2.4 Lake Amont

The hydrogeological balance of the constant head boundary conditions, which is used to simulate Lake Amont, is presented in Table 4. Under the current dewatering conditions of pits 87 and J4, Lake Amont receives 1,040 m³ of

groundwater per day without loss toward the aquifer. The drawdown limit of 3 m reaches the northwest limit of Lac Amont (section 2.3). Under the final operating conditions of the four pits, Lake Amont would receive 1,040 m³/d of groundwater and would lose 20 m³/d to the aquifer. The relative impact must be assessed with the surface water components.

Tableau 4: Hydrogeological Balance of Lake Amont

Lake Amont	Gains (m³/d)	Losses (m³/d)	Balance (m³/d)
Calibrated current conditions	1,040	0	1,040
Final operating conditions in steady-state scenario	990	20	970

2.3 Simulated Piezometry and Drawdown

The drawdown induced by the dewatering of the pits was calculated by subtracting the hydraulic loads of the final scenario from the hydraulic loads of the base case (current hydrogeological conditions). A limit value of 3 m of drawdown is used to assess the extent of the drawdown. This value considers the uncertainty associated with the numerical model and the seasonal variation in groundwater levels. Also, given the pumping in the 87 pit, the drawdown caused by the proposed pits will be lower than the conditions that prevailed prior to the dewatering of the J4 and 87 pits. The simulated drawdown is presented in Figure 2.

Under current conditions, the simulated piezometry indicates that the mine site is a zone of convergence and resurgence of groundwater. The water flows towards the site from the topographic highs to the north-west and south-east and then flows north-westwards. Pumping into the 87 pit creates a drawdown of several metres, which diverts the flow of groundwater towards pit 87 over a large section of the valley where the mine site is located.

In the final operating condition of the four pits, the simulated piezometry indicates that groundwater flow in the pit area is mainly towards the pits. The presence of the tailings storage facility (TSF) creates a piezometric mounding between pits 87 and SW. Groundwater arriving from the south-west is diverted towards the SW pit, while groundwater arriving from the topographic highs located to the south-east and north-west is diverted towards the X22, 87 and J4 pits.

A drawdown of more than 3 m is simulated in a NE-SW corridor over the entire mine site between the SW pit and the J4 pit except for the TSF area. In general, the drawdown is limited to less than 500 m from the pits. In northern waste rock dumps sector, the drawdown extends more than 1 km from the J4 pit to the east and south-east. In the SW pit area, the drawdown extends more than 1 km towards the south-east and reaches an (unnamed) lake located just east of lake C5. Finally, the drawdown limit of 3 m reaches the north-west limit of Lac Amont.

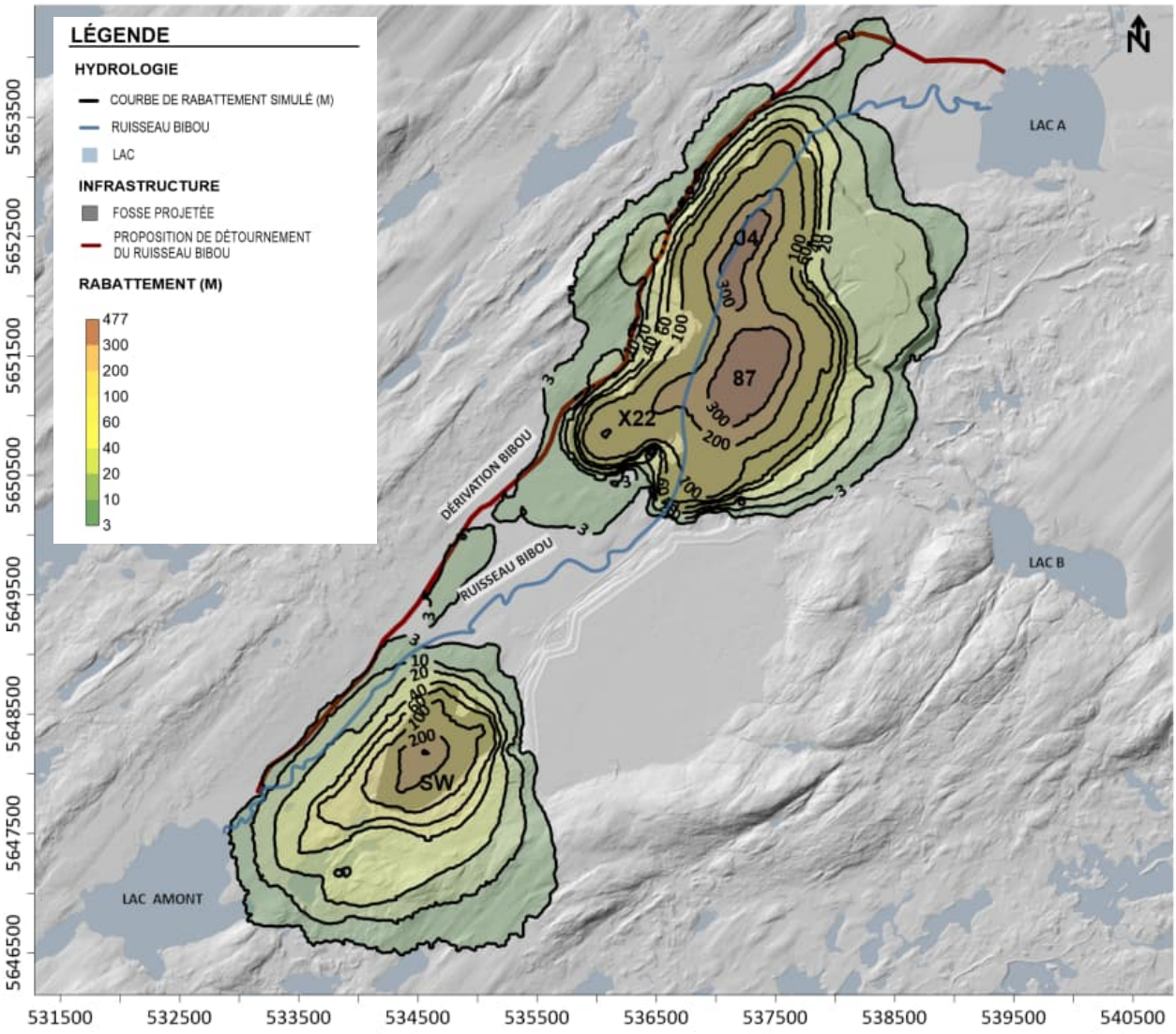

Figure 2: Simulated Drawdown in Steady-State Condition (adapted after WSP, 2024a)

To support the wide-site water balance over the mine planning (AGP, 2024), yearly seepage was estimated for the 87, J4, SW, and X22 pits based on steady-state flow rates (Table 5). Groundwater seepage infiltration flows only, excluding direct precipitation, runoff, and volume to empty the J and 87 pits prior to start operations.

Table 5: Seepage Rates for the 87, J4, SW, and X22 Pits

Years	Tailings deposition location	87 pit Seepage rate (m^3/d)	J4 pit Seepage rate (m^3/d)	SW pit Seepage rate (m^3/d)	X22 pit Seepage rate (m^3/d)	Total seepage (m^3/d)
PP2	-	900	0	0	0	900
PP1	TSF	900	0	0	0	900
Y01	TSF	1,850	0	3,520	0	5,370
Y02	TSF	1,850	0	3,520	0	5,370
Y03	TSF	1,850	0	3,520	0	5,370
Y04	TSF	1,850	0	3,520	0	5,370
Y05	TSF	1,850	1,430	4,010	0	7,290
Y06	TSF	1,850	1,430	4,010	0	7,290
Y07	TSF	1,850	1,430	4,010	0	7,290
Y08	TSF	1,850	1,430	4,010	0	7,290
Y09	TSF	1,850	1,430	4,010	0	7,290
Y10	TSF/SW pit	1,850	1,430	4,010	0	7,290
Y11	SW pit	1,850	1,430	4,010	0	7,290
Y12	SW pit	2,450	1,430	4,010	0	7,890
Y13	SW pit	2,450	1,430	4,010	0	7,890
Y14	SW pit	2,450	1,430	4,010	0	7,890
Y15	SW pit	2,450	1,430	4,010	0	7,890
Y16	J pit	2,450	2,370	0	0	4,820
Y17	J pit	2,450	2,370	0	0	4,820
Y18	J pit/ 87 pit	2,450	2,370	0	1,380	6,200
Y19	87 pit	2,450	2,370	0	2,350	7,170
Y20	87 pit	2,450	2,370	0	2,350	7,170
Y21	87 pit	2,450	2,370	0	2,350	7,170
Y22	87 pit	2,450	2,370	0	2,350	7,170
Steady state (m^3/d)		**2,450**	**2,370**	**4,010**	**2,350**	**11,180**

Legend

- No mining in pit.
- No mining but in-pit deposition (tailings and/or waste); assuming pit must remain dry.
- No mining but assuming pit must remain dry.
- Mining in pit.

3.0 SUMP AND POND INFLOWS

The sumps and sediment control ponds for the surface water management will be excavated but are not currently planned to be lined; interaction with the groundwater is expected.

3.1 Equations

In order to estimate the basin inflows, the Marinelli and Niccoli (2000) equations were used:

$$Q_1 = P\pi({R_0}^2 - {r_w}^2)$$

$$Q_2 = 4\left(\frac{K_{h2}}{m_2}\right) r_w (H - d)$$

knowing that

$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

and that

$$Q_t = Q_1 + Q_2$$

where H is the height of *wt* at the radius of influence (m), d is the depth of the pond area (m), K is the hydraulic conductivity (m/s), m_2 is the anisotropy, P is the distributed recharge (m/s), r_w is the radius of quarry (m), R_0 is the radius of influence (m), Q_1 is the inflow through the seepage face (m^3/s) and Q_2 is the inflow through the mine base (m^3/s). A schema of the discussed parameters is shown in Figure 3.

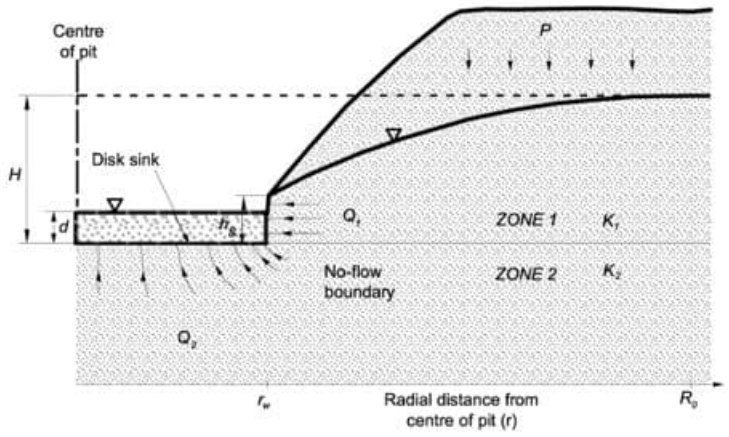

Figure 3: Schema of the Marinelli and Niccoli (2000) Equations Parameters

The equations are based on the following assumptions: there is no groundwater flow between zones 1 and 2; Zone 1 is in steady state, unconfined, and has a horizontal radial flow; Zone 1's recharge is uniformly distributed at the water table; Zone 1's basin walls are approximated as a right circular cylinder; both the initial static water table and groundwater flow are horizontal; Zone 1's groundwater flow to the basin is axially symmetric; Zone 2's

drawdown is constant and uniform; Zone 2's hydraulic head is initially uniform; Zone 2's disk sink has a constant hydraulic head equal to the elevation of the basin water surface; Zone 2's flow to the disk sink is three-dimensional and axially symmetric; Zone 2's materials are anisotropic (Marinelli and Niccoli, 2000).

3.2 Results

The input parameters defined to calculate the total inflow are shown in Table 4. Each basin includes a best-case and worst-case scenario to provide an understanding of the potential range of total inflow the basin could accommodate. The selected inflow falls within those margins and was carefully chosen after assessing the feasibility of every option. The radius of influence was calculated using the Niccoli et al. (1998) equations. Ultimately, the inflow estimates for the wide-site water balance for the S01, SP04, S06, and S07 basins are equal to 2000, 735, 222, and 64 m^3/d, respectively.

The groundwater drawdown induced by the pits dewatering presented in section 2.3 is neglected. Inflows presented in Table 4 could be lower depending on the stage of the mine life and the drawdown caused by dewatering.

Table 4: Inputs for the Marinelli and Niccoli (2000) Equation

Basin of interest:	S01		SP04		S06		S07	
Height of wt at radius of influence (H)	6.6	6.6	4	4	2.1	2.1	4.2	4.2
Depth of Ponded Area (d)	0.3	0.3	0.5	0.5	0.5	0.5	0.3	0.3
Layer 1								
Kh1 (m/s)	1×10^{-5}	1×10^{-5}	1×10^{-4}	1×10^{-4}	1×10^{-5}	1×10^{-5}	1×10^{-5}	1×10^{-5}
Layer 2								
Kh2 (m/s)	1×10^{-5}	1×10^{-6}	1×10^{-5}	1×10^{-6}	1×10^{-5}	1×10^{-6}	1×10^{-6}	1×10^{-7}
Kv2 (m/s)	1×10^{-5}	1×10^{-6}	1×10^{-5}	1×10^{-6}	1×10^{-5}	1×10^{-6}	1×10^{-6}	1×10^{-7}
Anisotropy	1	1	1	1	1	1	1	1
Distributed recharge (m/s)	3×10^{-9}	3×10^{-9}	9×10^{-9}	9×10^{-9}	3×10^{-9}	3×10^{-9}	3×10^{-9}	3×10^{-9}
Radius of quarry (m)	88	88	68	68	73	73	46	46
Radius of influence (m)	364	364	359	359	168	168	216	216
Inflow	Upper range	Lower range	Upper range	Lower range	Upper range	Lower range	Upper range	Lower range
Q1 m^3/d	101	101	303	303	19	19	36	36

Basin of interest:	S01		SP04		S06		S07	
Q2 m^3/d	1920	192	828	83	404	40	62	7
Total Inflow m^3/d	2021	293	1131	386	423	59	98	43
Chosen Inflow m^3/d	**2000**		**735**		**222**		**64**	

4.0 STUDY LIMITATIONS

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WSP Canada Inc.

DRAFT

Xavier Léveillée-dallaire, EIT
Engineer in Training
XLD/MG/js

DRAFT

Mathieu Gosselin, P. Eng., M.Sc.A., PMP
Geological Engineer

Attachments: [Click here and type list of attachments]

https://wsponline.sharepoint.com/sites/gld-169483/project files/6 deliverables/079-2257554004 hg memo/reva/079-2257554004-tm-reva hg summary.docx

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WSP Canada Inc.
1135, boul. Lebourgneuf
Québec (Québec)
G2K 0M5 Canada

APPENDIX M

Water Balance Results

DRAFT TECHNICAL MEMORANDUM

DATE 03 May 2024 083-2257554004 - RevA Troilus Support WB

TO Ian Pritchard,
Troilus Gold Corporation

CC Mathieu Gosselin

FROM Canny Tung, Jie Chen, Vlad Rojanschi **EMAIL: vlad.rojanschi@wsp.com**

A FEASIBILITY STUDY SITE-WIDE WATER BALANCE ANALYSIS FOR THE TROILUS PROJECT

1.0 INTRODUCTION

1.1 Background

Troilus Gold Corp. (Troilus) is planning to recommence mining operations at its Troilus Gold mine site north of Chibougamau, Quebec. Relative to the existing and inactive open-pit mine site layout, the proposed Troilus Project (the Project) would involve additional developments by expanding and creating new pits, expanding the footprint of the tailings storage facility (TSF), placing new overburden, waste, and ore stockpiles, and building new plant and road infrastructure. All these developments require a new site-wide water management plan (WMP). Troilus commissioned WSP Canada Inc. (WSP) to prepare a feasibility-level site-wide WMP for the Troilus Project.

This technical memorandum documents the water balance study as an important part of the feasibility study of the WMP for the Project. The memorandum includes a presentation of the data collection, analysis method, simulation results, and conclusions resulting from the sit-wide water balance study. The memorandum was prepared as a complement to the larger site-wide WMP report (WSP, 2024a, also the WMP Report) rather than as a stand-alone document; the reader is referred to this report for additional details and information.

This technical memorandum should be read in conjunction with the Important Limitations presented at the end of the document.

1.2 Objectives

The objectives of the site-wide water balance were to:

- Estimate fluxes and volumes of water collected at different points in the water management system (ponds and sump volumes and pumped outflows, effluent discharges) during the Project's lifetime and under a variety of climate conditions (historical, and in consideration of climate change projections).
- Support of the WMP design by verifying the proposed storage, pumping, and treatment capacities.
- Support the Project by providing the required information for the permitting process and for the future project operation.

1.3 Approach to the Water Balance Study

WSP used the following approach for the current water balance study in support of the Project's feasibility study and water management plan:

- Three time points (snapshots) in the Project's operating life were selected as representative for the site's conditions during the life of operation.
- For each of the three snapshots, the configuration and properties of the site and the water management plan as defined in the WMP report were extracted in consideration for the open pits, tailings storage facilities, waste rock dumps and ore stockpiles, overburden dumps, plant and other developed areas. This included identifying the ponds, sumps, pumps, and ditches, their geometry, drainage areas, hydrology and hydraulic properties, as well as development flow logic diagrams to represent the water management logic.
- For each of the three snapshots, a GoldSim water balance model was developed using a daily timestep. Under both historical climate and climate change conditions, the model calculated water flows and volumes for the main water management infrastructure. Verifying a large variety of climate conditions allowed for testing the system's robustness.
- Ore processing rates and the associated process water consumption were considered. This included quantifying the water volumes retained in the pores of the stored tailings versus the volumes of the water separating from the tailings after their deposition.
- Time-varying groundwater seepage rates, in particular the in-pit seepage, were also integrated in the model.
- Operating rules were defined to control the water levels in the TSF Pond, the site's main water storage facility, and also to decide priorities for the process water supply sources.
- The interpretation of the water balance model results focused on estimating typical fluxes, verifying the TSF Pond water levels, estimating typical effluents to the environment for the different effluent points, and verifying the availability at all times of process water.

2.0 TROILUS SITE DESCRIPTION AND PROPOSED WATER MANAGEMENT PLAN

2.1 Site and Mine Plan Overview

The Troilus site is located approximately 120 km north of Chibougamau, Québec, in Eastern Canada. On a regional level, the site is located in the Rupert River watershed, at the boundary with the Broadback River watershed. Both rivers flow west to Rupert Bay and James Bay. On a local level (Figure 1), the site drains via Bibou Creek and its existing diversion channel to Lake A. Lake A drains 12 km further downstream via a series of small lakes and water courses to Boisfort Lake. Lake A has a total watershed area of approximately 58 km^2.

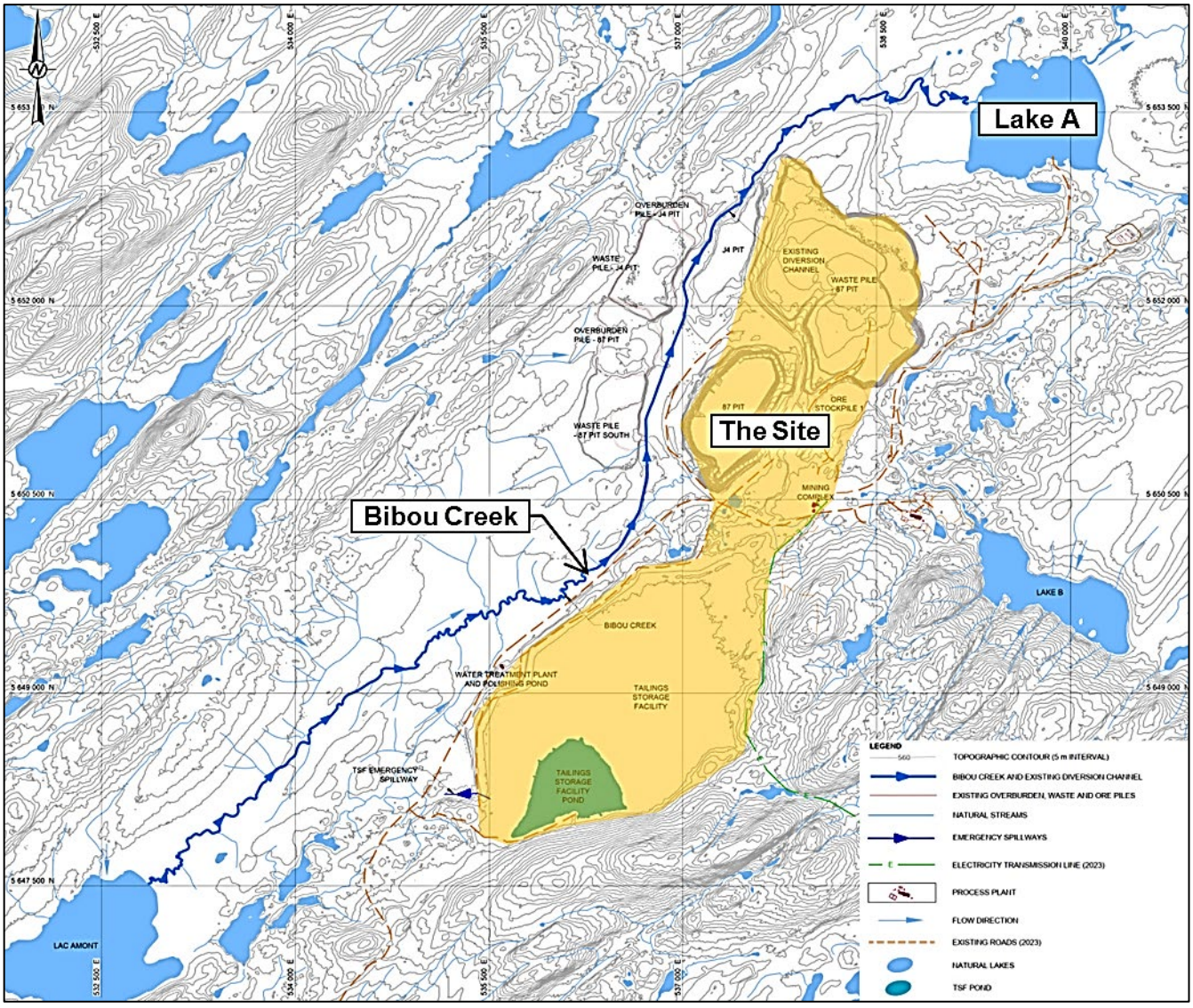


Figure 1: Troilus Project Study Area – Current Conditions

Previous mining operations at the Troilus Site started in 1996 and stopped in 2009. The developed infrastructures include:

- Pit 87 and Pit J;
- the Tailings Storage Facility (TSF);
- several waste rock dumps located near the open pits;
- a diversion channel connected Bibou Creek to Lake A.

2.2 Conceptual Water Management Plan

The WMP Report presents the proposed water management plan for the Troilus Project, including its objectives, design criteria, and proposed water management structures. The WMP was prepared based on the life of mine (LoM) development and material placement plan, which Troilus provided. The plan addresses the main water management system, facilities, and practices and includes design features and mitigation measures to minimize the potential effects of the Project on the environment.

For the purpose of the current water balance study, three specific snapshots in the Project's development were selected:

Figure 2, Figure 3, and Figure 4 present the proposed WMP for three specific snapshots in the Project's development:

- Figure 2 presents the proposed WMP for the end of Year 1 of the Project's planned operations:
  - It is the first year after the restart of the operations.
  - Active mining takes place in Pit 87 and Pit Southwest (Pit SW).
  - Upstream raises in the existing TSF create the required tailings storage capacity. In the first year of ore processing, Pit 87 expands, and mining begins in the Pit SW.
  - The natural water diversion system is in place, including the Main Diversion Channel (also called DC1). Active contact water sumps are S01, S02, S03, S05, S06, S09. Active sedimentation ponds are SP1, SP2, and SP4.
  - Tailing deposition in the TSF adds the tailings bleed water to the runoff collected in the TSF Pond. From the pond, most water will be pumped to the Ore Processing Plant (OPP) via a newly installed pumping station. The existing TSS flocculation treatment plant remains in operation for the excess pond water.
- Figure 3 presents the proposed WMP for Years 8 to 9 of the Project's planned operations:
  - Active Pits are Pit 87, Pit SW, and Pit J.
  - Sumps S07 and sedimentation pond SP3 have been added.
  - Water management infrastructure has reached close-to-complete development, although the expansion of the pits X22, J, and 87 continues. The water management infrastructure includes multiple diversion channels, four sedimentation ponds, eight contact water sumps, approximately 20 km of contact water ditches, the TSF Pond and an emergency spillway.
  - Year 9 is the last year when tailings deposition occurs entirely in the TSF. The transition to in-pit deposition takes place in Year 10.
- Figure 4 presents the proposed WMP for Year 21 of the Project's planned operations:
  - Mining takes place in Pit X22.
  - Relative to Year 9, the tailings deposition takes place in Pit 87.
  - Pit SW has been backfilled with tailings and a new waste rock stockpile has been placed in the pit area, which required changes to the water management infrastructure (changes to contact water ditches and relocation of the S01 collection sump).

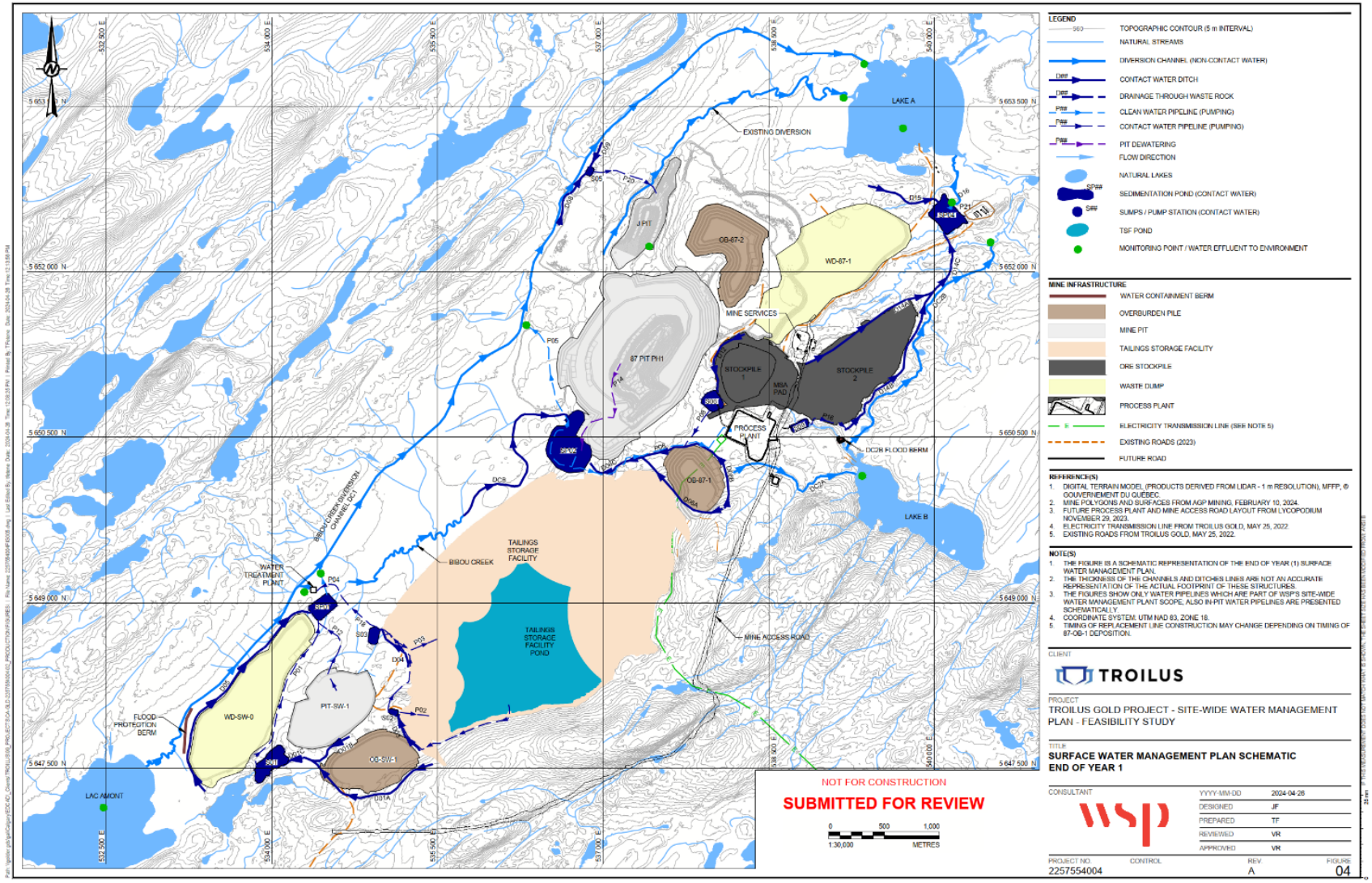


Figure 2: The Proposed Water Management Plan at the Troilus Site for End of Year 1

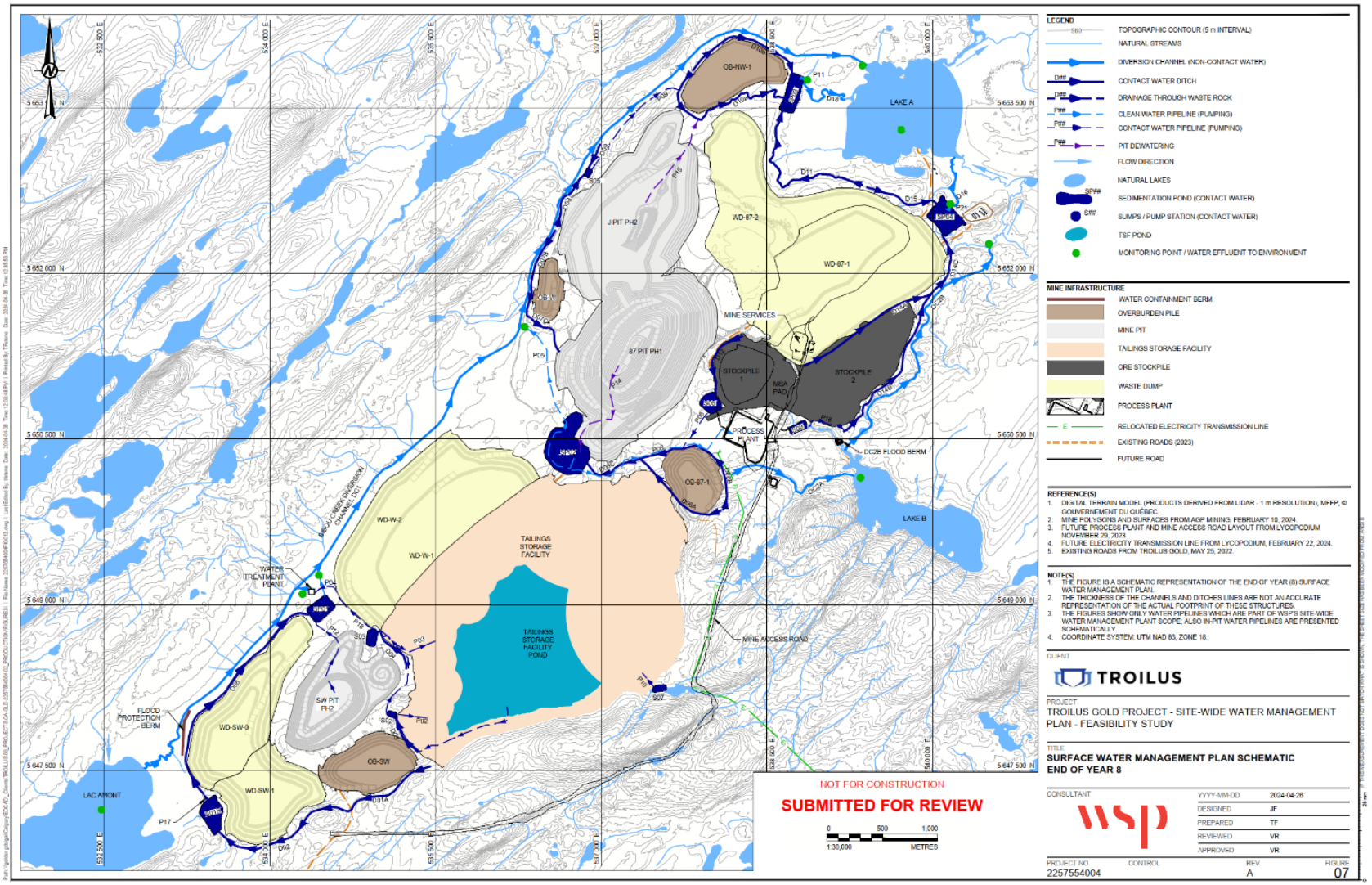
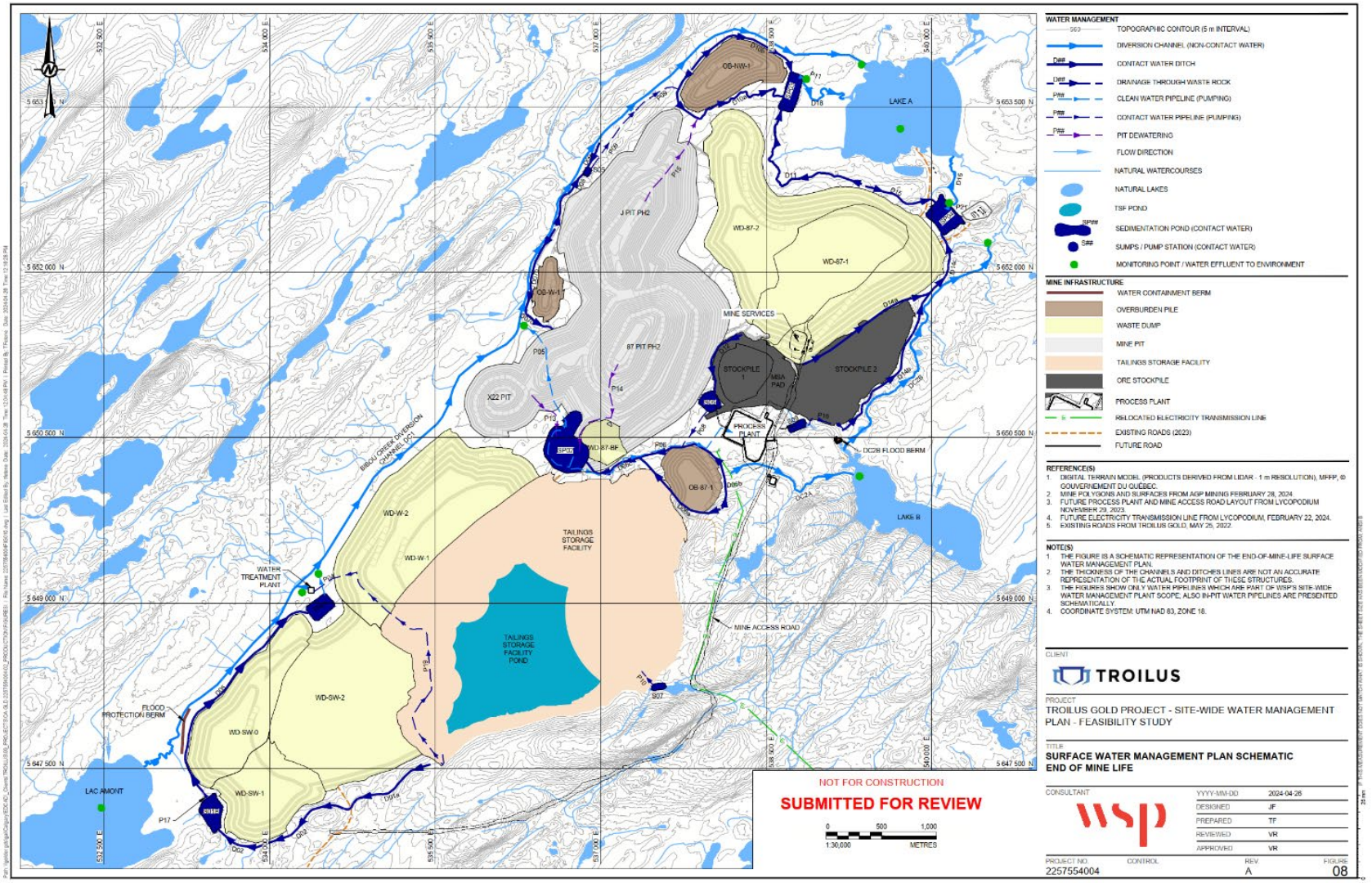


Figure 3: The Proposed Water Management Plan at the Troilus Site for Years 8 and 9


WATER MANAGEMENT
TOPOGRAPHIC CONTOUR (5 m INTERVAL)
DIVERSION CHANNEL (NON-CONTACT WATER)
CONTACT WATER DITCH
DRAINAGE THROUGH WASTE ROCK
CLEAN WATER PIPELINE (PUMPING)
CONTACT WATER PIPELINE (PUMPING)
PIT DEWATERING
FLOW DIRECTION
NATURAL WATERCOURSES
NATURAL LAKES
TSF POND
SEDIMENTATION POND (CONTACT WATER)
SUMPS / PUMP STATION (CONTACT WATER)
MONITORING POINT / WATER EFFLUENT TO ENVIRONMENT
MINE INFRASTRUCTURE
WATER CONTAINMENT BERM
OVERBURDEN PILE
WASTE DUMP
MINE PIT
TAILINGS STORAGE FACILITY
ORE STOCKPILE
PROCESS PLANT
RELOCATED ELECTRICITY TRANSMISSION LINE
EXISTING ROADS (2023)
FUTURE ROAD
REFERENCE(S)
1. DIGITAL TERRAIN MODEL (PRODUCTS DERIVED FROM LIDAR - 1 m RESOLUTION), MFFP, © GOUVERNEMENT DU QUÉBEC.
2. MINE POLYGONS AND SURFACES FROM AGP MINING FEBRUARY 28, 2024.
3. FUTURE PROCESS PLANT AND MINE ACCESS ROAD LAYOUT FROM LYCOPODIUM NOVEMBER 29, 2023.
4. FUTURE ELECTRICITY TRANSMISSION LINE FROM LYCOPODIUM, FEBRUARY 22, 2024.
5. EXISTING ROADS FROM TROILUS GOLD, MAY 25, 2022.
NOTE(S)
1. THE FIGURE IS A SCHEMATIC REPRESENTATION OF THE END-OF-MINE-LIFE SURFACE WATER MANAGEMENT PLAN.
2. THE THICKNESS OF THE CHANNELS AND DITCHES LINES ARE NOT AN ACCURATE REPRESENTATION OF THE ACTUAL FOOTPRINT OF THESE STRUCTURES.
3. THE FIGURES SHOW ONLY WATER PIPELINES WHICH ARE PART OF WSP'S SITE-WIDE WATER MANAGEMENT PLANT SCOPE. ALSO IN-PIT WATER PIPELINES ARE PRESENTED SCHEMATICALLY.
4. COORDINATE SYSTEM: UTM NAD 83, ZONE 18.
CLIENT
TROILUS
PROJECT
TROILUS GOLD PROJECT - SITE-WIDE WATER MANAGEMENT PLAN - FEASIBILITY STUDY
TITLE
SURFACE WATER MANAGEMENT PLAN SCHEMATIC END OF MINE LIFE
CONSULTANT
wsp
YYYY-MM-DD 2024-04-26
DESIGNED JF
PREPARED TF
REVIEWED VR
APPROVED VR
PROJECT NO. 2257554004
CONTROL
REV A
FIGURE 08
NOT FOR CONSTRUCTION
SUBMITTED FOR REVIEW
1:30,000
0 500 1,000
METRES
LAKE A
LAKE B
LAC AMONT
OB-NW-1
OB-W-1
OB-87-1
J PIT PH2
87 PIT PH2
X22 PIT
WD-87-2
WD-87-1
WD-87-RF
WD-W-2
WD-W-1
WD-SW-2
WD-SW-0
WD-SW-1
MINE SERVICES
STOCKPILE 1
MSA PAD
STOCKPILE 2
PROCESS PLANT
TAILINGS STORAGE FACILITY
TAILINGS STORAGE FACILITY POND
WATER TREATMENT PLANT
FLOOD PROTECTION BERM
DIVERSION CHANNEL
DIVERSION CHANNEL
DIVERSION CHANNEL

3.0 INPUT DATA

3.1 Climate Data

The WMP Report includes a climate baseline analysis based on publicly available historical climate records and climate change projections. On average, based on historical records, the following estimates were made:

- The mean annual temperature is -1.0 °C, varying between 16.6 °C in July and -20.6 °C in January (mean monthly daily temperatures). Temperatures stay below zero, on average, between mid-October to mid-April.
- The mean annual precipitation is 960 mm. July and September are the wettest months (130 mm and 120 mm, respectively, mean precipitation) and January and February the driest months (42 mm and 38 mm, respectively, mean precipitation).
- Mean annual values for lake evaporation and potential evapotranspiration are 515 mm and 661 mm, respectively.
- Climate change projections indicate generally warmer air temperatures and higher precipitations. The changes are largest over the winter months. The median annual projected temperature increase is 1.4 °C. The median annual precipitation increase is 6%, with the increase over the winter being much larger than those over the summer (11% vs. 4%).

The same WMP Report baseline analysis provided the required input for the Project's water balance study, including:

- Historical, daily timeseries, either measured or inferred from measured data, for precipitation, air temperature, open-water evaporation, and potential evapotranspiration rates for the 1982 to 2023 (31 years of complete time series) period.
- Projected daily timeseries for the same climate variables for the period 2021 to 2050 for three greenhouse gas emission scenarios (low emissions - SSP 1-2.6, moderate emissions - SSP 2-4.5, and high emissions – SSP 5-8.5). For each emission scenario, data from 26 different projection models were prepared as input to the water balance study, covering the range of variation of the available climate change projections. Appendix A lists the climate change projection models used in this study.

3.2 Hydrology Data

The WMP Report also includes a hydrology baseline analysis, including an analysis of publicly available regional streamflow records and locally collected data. Based on regional data, the mean annual runoff for a large natural area over the 1980 to 2010 period was estimated to be 567 mm. Mean monthly values varied between 16 mm in March, before the freshet, and 101 mm in May, the main freshet month.

A precipitation-runoff module for the terrestrial watersheds of different land types was implemented in the GoldSim water balance model to represent the physical processes associated with runoff generation based on standard hydrological water balance procedures. The daily water flux per unit area of the catchment (mm/d) was calculated as the balance of precipitation (rainfall and snowmelt), evapotranspiration (ET), water storage in the soil and runoff as follows. Figure 5 presents graphically the GoldSim terrestrial precipitation-runoff model.

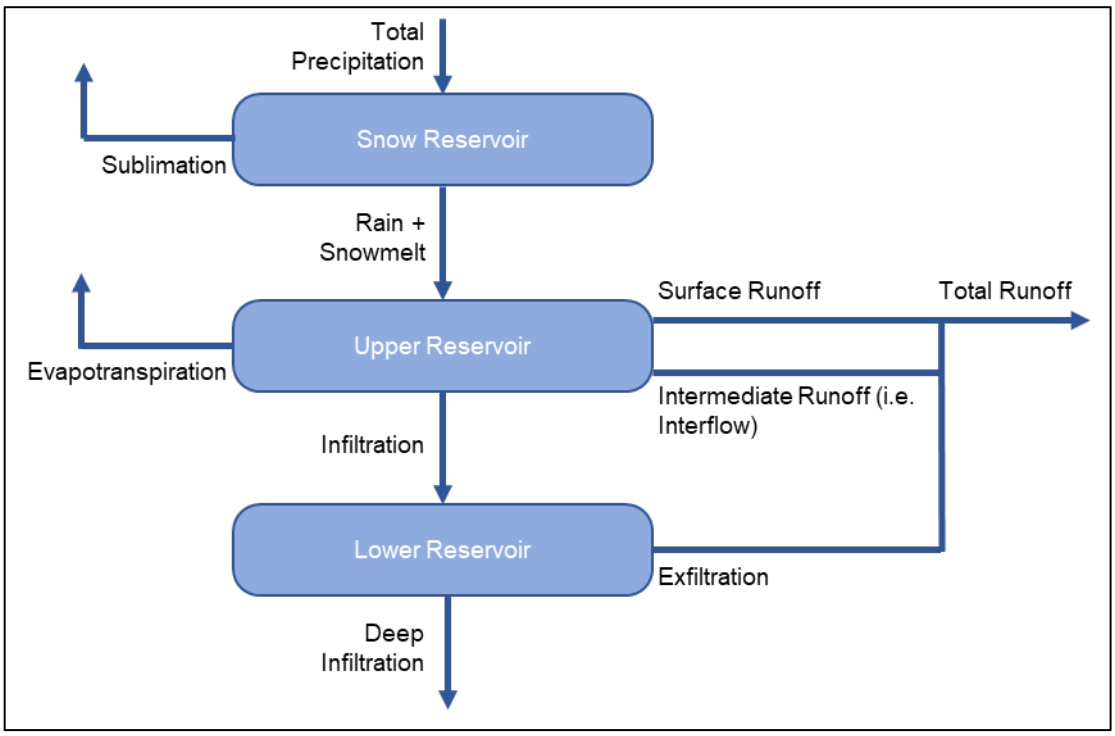


Figure 5: Terrestrial Runoff Model Diagram

The precipitation-runoff system is composed of the following storage elements:

- Snow storage:
  - Supplied by snowfall
  - Subject to sublimation
- Upper storage:
  - Supplied by snowmelt and rainfall
  - Subject to evapotranspiration, surface runoff (most rapid runoff component), interflow (intermediate runoff component), and infiltration to the lower storage
- Lower storage:
  - Supplied by infiltration from the upper storage
  - Subject to exfiltration (slowest runoff components, generally associated with porous media groundwater flow) and deep percolation (infiltration).

The total model runoff is the sum of surface runoff and intermediate runoff from the upper storage and exfiltration from the lower storage. Lower storage infiltration is defined as deep percolation and is a loss in the runoff model. The other losses considered in the rainfall-runoff model are sublimation and evapotranspiration.

The degree-day method was used to calculate the snowmelt rate as the product between a degree day factor and the difference between the mean daily air temperature and a base temperature.

Table 1 and Table 2 below describe the model parameters. WSP estimated the parameter values using the available hydrological data for reference. The resulting annual volumetric runoff coefficients (annual runoff as a percentage of the annual precipitation) are presented in Table 3 below.

Table 1: Snowmelt Model Parameters

Parameter	Unit	Description
Degree day factor	mm/d/°C	ratio between the daily snow melt (expressed in mm snow water equivalent) and the difference between the daily mean air temperature and the melt base temperature
Melt base temperature	°C	base temperature used in calculating the daily snow melt
Snow threshold	°C	threshold temperature for converting precipitation to snow or rainfall
Sublimation	mm/d	snow water equivalent loss for each day with non-zero snowpack depth

Table 2: Runoff Generation Model Parameters

Parameter	Unit	Description
% of potential evapotranspiration	%	ratio between available evapotranspiration and the potential evapotranspiration
Upper storage Capacity	mm	maximum upper storage water content
Upper storage coefficient	1/d	ratio between upper storage intermediate runoff and the upper storage daily water content
Maximum infiltration upper storage to lower storage	mm/ d	maximum infiltration from the upper storage to the lower storage
Lower storage capacity	mm	maximum lower storage water content
Lower storage coefficient	1/d	ratio between lower storage exfiltration and the lower storage daily water content
Maximum deep percolation from lower storage	mm/d	maximum percolation loss from the lower storage

Note: surface runoff is calculated as the overflow of the upper storage.

Table 3: Estimated Annual Runoff Coefficients for the Land Types Used in the Water Balance Model

Land Type	Annual Runoff Coefficient (% of Total Precipitation) [1]
Overburden dumps, built areas	68
Cleared area of the mine site	68
Waste rock dumps	60
Natural area, wooded	58
Natural Area, vegetated	58
Tailings Beach	77
Mine Pit Area	86
Pond area (including wetland)	100 – not including evaporation removal when ice layer is absent

Notes:

(a) The annual runoff coefficients are summary results of daily calculations that include evapotranspiration and infiltration losses and that account for antecedent moisture conditions near the surface. The daily effective runoff coefficients vary with the intensity of the rain and snowmelt event.

3.3 Drainage Areas and Land Types

For the purpose of the Project's water balance study, for each of the three study configurations (end of Year 1, Year 9, and Year 21 – see Section 2.2), the Site was divided into drainage areas reporting to sedimentation ponds (SP 1 to SP4), sumps (S01 to S09), open pits, and the TSF. For each drainage area, the areas of different land types were extracted and used as input to the runoff calculations (see Table 4, Table *5* and Table 6 below).

Table 4: Estimated Drainage Areas Reporting to Each Sump and Pond for the End of Year 1 Configuration (Unit: km²)

	S01	S02	S03	S05	S06	S07	S09	SP1	SP2	SP3	SP4	Pit SW	Pit X22	Pit 87	Pit J Zone	TSF
Overburden dumps, built areas	0.17	0.16	0.08	0.00	0.45	--	0.13	0.00	0.63	--	0.63	0.10	--	0.13	0.08	0.22
Cleared area of the mine site	0.06	0.04	0.14	0.09	0.48	--	0.00	0.00	0.21	--	0.17	0.16	--	1.09	0.32	0.00
Waste rock dumps	0.14	0.00	0.12	0.00	0.02	--	0.00	0.48	0.30	--	0.87	0.10	--	0.00	0.00	0.00
Natural area, wooded	0.83	0.01	0.00	0.09	0.00	--	0.00	0.18	0.86	--	0.18	0.14	--	0.17	0.00	1.87
Natural area, vegetated	0.17	0.02	0.00	0.00	0.00	--	0.31	0.08	1.07	--	0.76	0.01	--	0.50	0.00	0.00
Tailings beach	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	--	0.00	0.00	--	0.00	0.00	2.79
Mine pit area	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.11	--	0.00	0.40	--	1.62	0.23	0.00
Pond area (including wetland)	0.17	0.00	0.13	0.00	0.03	--	0.01	0.04	0.07	--	0.08	0.00	--	0.00	0.00	0.35
Total watershed	1.54	0.24	0.47	0.19	0.98	--	0.45	0.78	3.24	--	2.68	0.92	--	3.52	0.62	5.23

Table 5: Estimated Drainage Areas Reporting to Each Sump and Pond for the End of Year 9 Configuration (Unit: km²)

	S01b	S02	S03	S05	S06	S07	S09	SP1	SP2	SP3	SP4	Pit SW	Pit X22	Pit 87	Pit J Zone	TSF
Overburden dumps, built areas	0.08	0.13	0.15	0.00	0.42	0.00	0.13	0.00	0.53	0.36	0.52	0.22	--	0.08	0.04	0.22
Cleared area of the mine site	0.00	0.04	0.06	0.01	0.36	0.00	0.00	0.10	0.37	0.05	0.02	0.35	--	0.82	0.03	0.00
Waste rock dumps	0.35	0.00	0.21	0.00	0.00	0.00	0.00	0.49	1.71	0.71	1.38	0.43	--	0.30	0.26	0.00
Natural area, wooded	0.39	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.07	0.00	0.06	0.00	--	0.00	0.00	0.83
Natural area, vegetated	0.10	0.01	0.00	0.08	0.00	0.00	0.29	0.14	0.23	0.39	0.29	0.06	--	0.58	0.09	0.00
Tailings beach	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	2.49
Mine pit area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.65	--	1.54	1.42	0.00
Pond area (including wetland)	0.06	0.00	0.01	0.01	0.03	0.02	0.01	0.04	0.05	0.05	0.08	0.00	--	0.00	0.00	1.17
Total watershed	0.97	0.18	0.43	0.10	0.80	0.51	0.44	0.77	3.06	1.56	2.36	1.72	--	3.31	1.83	4.72

Table 6: Estimated Drainage Areas Reporting to Each Sump and Pond for the End of Year 21 (Unit: km²)

	S01b	S02	S03	S05	S06	S07	S09	SP1	SP2	SP3	SP4	Pit SW	Pit X22	Pit 87	Pit J Zone	TSF
Overburden dumps, built areas	0.00	--	--	0.00	0.42	0.00	0.13	0.00	0.59	0.36	0.52	--	0.00	0.08	0.03	0.22
Cleared area of the mine site	0.00	--	--	0.00	0.36	0.00	0.00	0.00	0.28	0.00	0.02	--	0.10	0.45	0.26	0.00
Waste rock dumps	0.45	--	--	0.00	0.00	0.00	0.00	0.57	3.90	0.71	1.38	--	0.00	0.30	0.26	0.00
Natural area, wooded	0.39	--	--	0.00	0.00	0.49	0.00	0.00	0.07	0.00	0.20	--	0.00	0.00	0.00	0.83
Natural area, vegetated	0.24	--	--	0.08	0.00	0.00	0.29	0.15	0.23	0.44	0.29	--	0.14	0.00	0.98	0.00
Tailings beach	0.00	--	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.45	0.36	2.49
Mine pit area	0.00	--	--	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	--	0.34	1.67	1.04	0.00
Pond area (including wetland)	0.06	--	--	0.01	0.03	0.02	0.01	0.04	0.05	0.05	0.08	--	0.00	0.00	0.00	1.17
Total watershed	1.13	--	--	0.09	0.81	0.51	0.44	0.76	5.21	1.56	2.50	--	0.58	2.95	2.93	4.72

3.4 Groundwater Seepage Data

The WMP report and WSP (2024c) present the hydrogeological baseline data, the conceptual and numerical groundwater flow model development and results, which were prepared for the Troilus Project. Table 7 and Table 8 summarizes the groundwater inflows to the sumps and sedimentation ponds (Table 7) and to the pits (Table 8). These groundwater flows were incorporated in the water balance model. It is noted that the precipitation-runoff hydrological model (see Section 3.2) already includes a groundwater runoff component. The flows in the following tables are understood as flows due to primarily groundwater dewatering effects.

Table 7: Groundwater Seepage to Ponds and Sumps

Pond/Sump	Seepage Flow (m^3/d)
S01/S01b	2,000
S02	-
S03	-
S05	-
S06	222
S07	64
S09	-
SP1	-
SP2	-
SP3	-
SP4	735

Note: Groundwater seepage rate to ponds and sumps are assumed to be constants throughout lifespan of mine.

Table 8: Groundwater Seepage to Pits

Year	Pit 87 (m3/d)	Pit J (m3/d)	Pit SW (m3/d)	Pit X22 (m3/d)	Total Seepage (m3/d)
-1	900	-	-	-	900
1	1,850	-	3,520	-	5,370
2	1,850	-	3,520	-	5,370
3	1,850	-	3,520	-	5,370
4	1,850	-	3,520	-	5,370
5	1,850	1,430	4,010	-	7,290
6	1,850	1,430	4,010	-	7,290
7	1,850	1,430	4,010	-	7,290
8	1,850	1,430	4,010	-	7,290
9	1,850	1,430	4,010	-	7,290
10	1,850	1,430	4,010	-	7,290
11	1,850	1,430	4,010	-	7,290
12	2,450	1,430	4,010	-	7,890
13	2,450	1,430	4,010	-	7,890

Table 8: Groundwater Seepage to Pits

Year	Pit 87 (m3/d)	Pit J (m3/d)	Pit SW (m3/d)	Pit X22 (m3/d)	Total Seepage (m3/d)
14	2,450	1,430	4,010	-	7,890
15	2,450	1,430	4,010	-	7,890
16	2,450	2,370	-	-	4,820
17	2,450	2,370	-	-	4,820
18	2,450	2,370	-	1,380	6,200
19	2,450	2,370	-	2,350	7,170
20	2,450	2,370	-	2,350	7,170
21	2,450	2,370	-	2,350	7,170
22	2,450	2,370	-	2,350	7,170

3.5 Operational Data

3.5.1 Ore Production

The predicted annual ore production rate was used in the water balance forecast as shown in Table 9 (see WMP Report and AGP, 2024). At a maximum average daily rate of 50,000 tonnes, the annual ore processing planned capacity is 18,250,000 tonnes.

Table 9: Annual Ore Processing Capacity for the Troilus Project

Year	Annual Processing Rate (tonne/year)
-1	714,000
1	12,900,000
2 to 21	18,300,000
22	947,000

3.5.2 Tailings Deposition

The estimated tailings deposition rates and stored location is presented in Table 10 and used in the water balance model (see WMP Report and AGP, 2024).

Table 10: Annual Tailing Deposition and Stored Location

Year	Dry Tailings Production (tonne)	Dry Tailings Production (m^3)	Deposition Location
-1	714,000	473,000	TSF
1	12,900,000	8,510,000	TSF
2	18,200,000	12,100,000	TSF
3	18,300,000	12,100,000	TSF

Table 10: Annual Tailing Deposition and Stored Location

Year	Dry Tailings Production (tonne)	Dry Tailings Production (m^3)	Deposition Location
4	18,300,000	12,100,000	TSF
5	18,300,000	12,100,000	TSF
6	18,300,000	12,100,000	TSF
7	18,300,000	12,100,000	TSF
8	18,300,000	12,100,000	TSF
9	18,300,000	12,100,000	TSF
10	18,300,000	12,100,000	TSF/ Pit SW
11	18,300,000	12,100,000	Pit SW
12	18,300,000	12,100,000	Pit SW
13	18,300,000	12,100,000	Pit SW
14	18,300,000	12,100,000	Pit SW
15	18,300,000	12,100,000	Pit SW / Pit J
16	18,300,000	12,100,000	Pit J
17	18,300,000	12,100,000	Pit J
18	18,300,000	12,100,000	Pit J/ Pit 87
19	18,300,000	12,100,000	Pit 87
20	18,300,000	12,100,000	Pit 87
21	18,300,000	12,100,000	Pit 87
22	947,000	627,000	Pit 87

Based on Lycopodium (2024) and WSP (2024b), the water balance model used the following data:

- Tailings are being deposited as thickened slurry at 54.4% solids by weight. At a 50,000 dry tonnes per day processing rate, this corresponds to 1,746 m^3/hour (41,900 m^3/day or 15.3 M m^3/year) water contained in the tailings flux at the deposition.
- Due to solids settlement and slurry consolidation, water is released from the tailings until these reach a solids content of 76% solids by weight. 658 m^3/hour (15,600 m^3/day or 5.8 M m^3/year) remain entrapped in the tailings' pores, while 1,088 m^3/hour (26,100 m^3/day or 9.5 M m^3/year) are being released and flow towards the TSF Pond.

3.5.3 Process Flows and Water Demands

Lycopodium (2024), also included in Appendix B, presents the operation's key water flows, including:

- Ore Processing Plant (OPP) inflows (water in ore, water in reagents, fresh water supply, and recycled process water);
- Ore processing outflows (water in ore, water in the tailings stream);
- Recycled water used for dust suppression;
- Fresh water use for domestic purposes at the camp and plant.

Fresh water consumption is from Lake A. Water recycling is:

- Primarily from the TSF Pond and SP2 sedimentation pond.
- From the pits where there is active tailings deposition, when applicable.
- Elsewhere from the site, when required.

Figure **6** and Table 11 present additional data on process flows and water demands; the data are extracted from Lycopodium (2024), see also Appendix B.

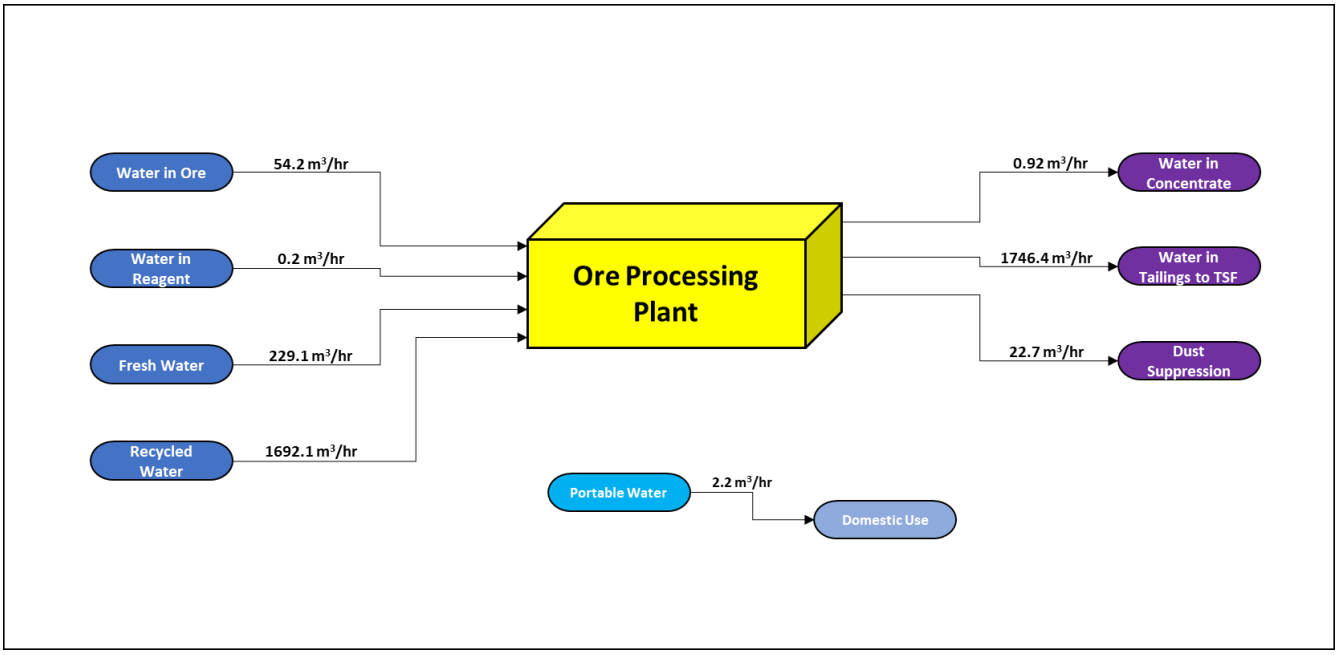


Figure 6: Process Water Flows and Water Demand at Full Capacity of OPP (Based on Lycopodium, 2024)

Table 11: Process Flows and Water Demands (Based on Lycopodium, 2024)

Variable	Flow Rate (m^3/hr)	Flow Rate (m^3/year)
Process Water Inflows		
Water in Ore	54.2	475,000
Water in Reagents	0.2	1,750
Fresh Water	229.1	2,010,000
Recycled Water	1692.1	14,800,000
Process Water Outflows		
Water in Concentrate	0.92	8,060
Water in Tailings	1746.4	15,300,000
Dust suppression Consumption	22.7	199,000
Domestic Water Use (Camp and Plant)		
Potable Water Use	2.2	19,300

3.5.4 Water Storage and Pumping Systems

The storage and pumping capacity in the ponds, sumps, mine pits, and TSF Ponds was based on available and planned design information (see WMP report). Table 12 presents the values included in the water balance model.

Table 12: Pumping Rates and Storage Capacity of Ponds

Location	Pump Capacity (m^3/s)	Storage Capacity (m^3)
S01	0.25	126,000
S01b	0.25	89,000
S02	0.30	6,000
S03	0.30	23,000
S05	0.20	7,000
S06	0.20	106,000
S07	0.20	11,000
S09	0.30	27,000
SP1	0.40	79,000
SP2	1.10	429,000
SP3	1.00	111,000
SP4	1.00	170,000
Water Treatment Plant	0.33	--
TSF Pond	Set at OPP maximum demand	Variable. See Section 3.6
Pit 87	0.40	Not applicable
Pit X22	0.30	Not applicable
Pit SW	0.50	Not applicable
Pit J	0.50	Not applicable

3.6 TSF Pond Water Management

The current section includes key information regarding the TSF Pond water management. The WMP Report presents additional details.

The TSF Pond collects the natural runoff on the TSF itself, runoff from a natural watershed upstream of the TSF, and water released from tailings during their consolidation process after deposition. Seepage water collected at the toe of the TSF dykes in sumps S02, S03, and S07 may be returned to the TSF as well. The TSF Pond water is recycled as process water at the OPP. When required, it can be discharged to the environment after treatment at the dedicated Water Treatment Plant (WTP), which has a 1,200 m^3/hour capacity.

The water level in the TSF Pond is controlled such that:

- A minimum 3 m water depth is maintained at all times near the pumping water intake. This water depth avoids significant resuspension of the tailings solids during pumping even under unfavorable ice-cover conditions.
- The water level is low enough that it allows storing the regulatory environmental design flood, as defined in the WMP report.

Table 14 summarizes the key parameters of TSF pond for Year 1, Year 9, and Year 21. Figure 7 and Figure 8 illustrate stage-storage curves for these three snapshots

Table 13: Critical Elevations in the TSF Pond

Parameters	Year 1	Year 9	Year 21
Dam Crest Elevation (m)	407.0	435.0	435.0
Emergency Spillway Elevation (m)	405.5	433.5	433.5
Maximum Normal Operating Water Level (m)	404.6	432.6	432.6
Trigger Water Level for Pumping to WTP (m)	402.1	431.3	431.3
Minimum Operating Water Level to Maintain 3 m Water Depth (m)	397.8	428.0	428.0
Pond Bottom Elevation (m)	394.8	425.0	425.0

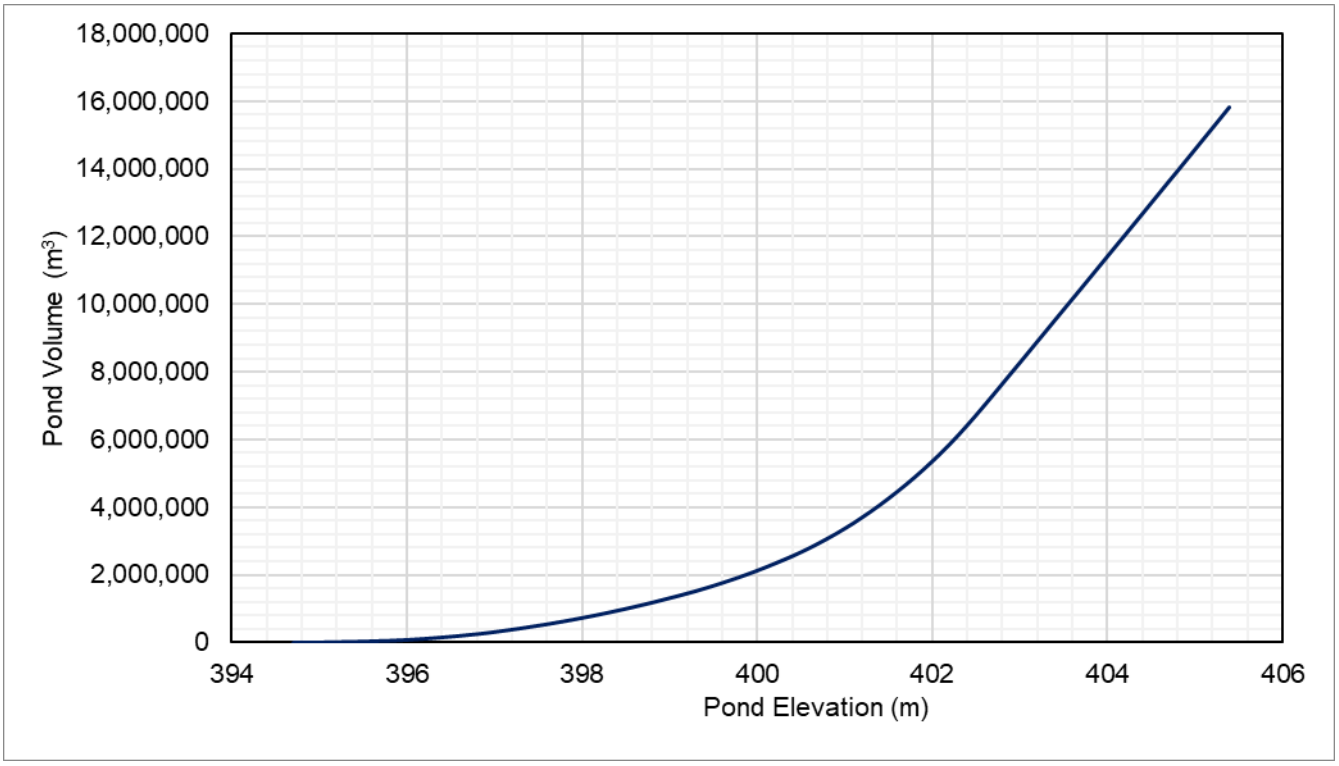


Figure 7: TSF Pond Stage Storage Curve for End of Year 1

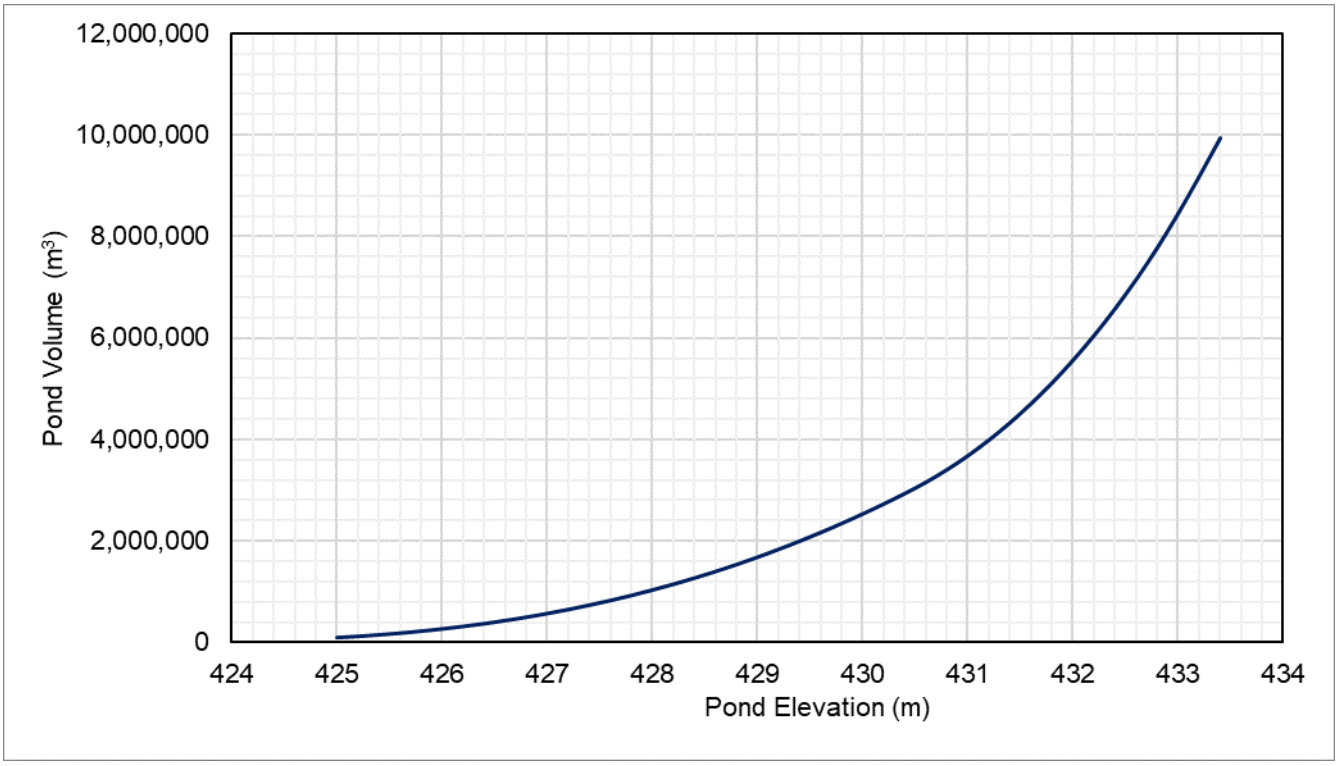


Figure 8: TSF Pond Stage Storage Curve for End of Year 9 and Year 21

3.7 Ice Management

When the tailings are discharged via spigots on the TSF beach, they spread slowly on the beach and flow towards the TSF Pond. The tailings settle and consolidate, such as water runoffs the surface to the pond. When the temperatures drop significantly below zero degrees Celsius (0˚C), a part of the water runoff freezes before reaching the pond, forming an ice layer and ice lenses on the beach; the ice melts mostly during the spring to fall warm season, although ice lenses can stay frozen for many years as they are covered by tailings.

The ice forming and thawing process can be significant for the overall water balance as it decreases the water availability for recycling in winter and increases the water to manage during the freshet. WSP included the processes in the water balance model. The water freezing ratio and the ice melting rate were estimated based on our past project experience and our professional judgment. Figure 9 plots the relationship between the fraction of the tailings release water flux that freezes relative to the overall release flux and the daily air temperature. For example, for a day with an average air temperature of -15˚C, WSP assumed that approximately 21% of the water released from tailings may freeze before reaching the pond. As part of a water availability sensitivity scenario, WSP also studied the case that up to 32% of the water released from tailings may freeze at the same temperature.

Also, WSP calculated the ice melt rate as a function of the square root of the air temperature and a constant multiplier equal to 0.95 mm/day/°C.

The water balance model did not consider ice formation on the ponds. However:

- The sumps and sedimentation ponds are to be managed as dry (empty) ponds outside flood periods. It follows that ice management during the winter period should not be a critical issue.
- For the TSF Pond, maintaining at all times a 3 m minimum water depth near the pump intake accounts for the winter presence of an ice layer.

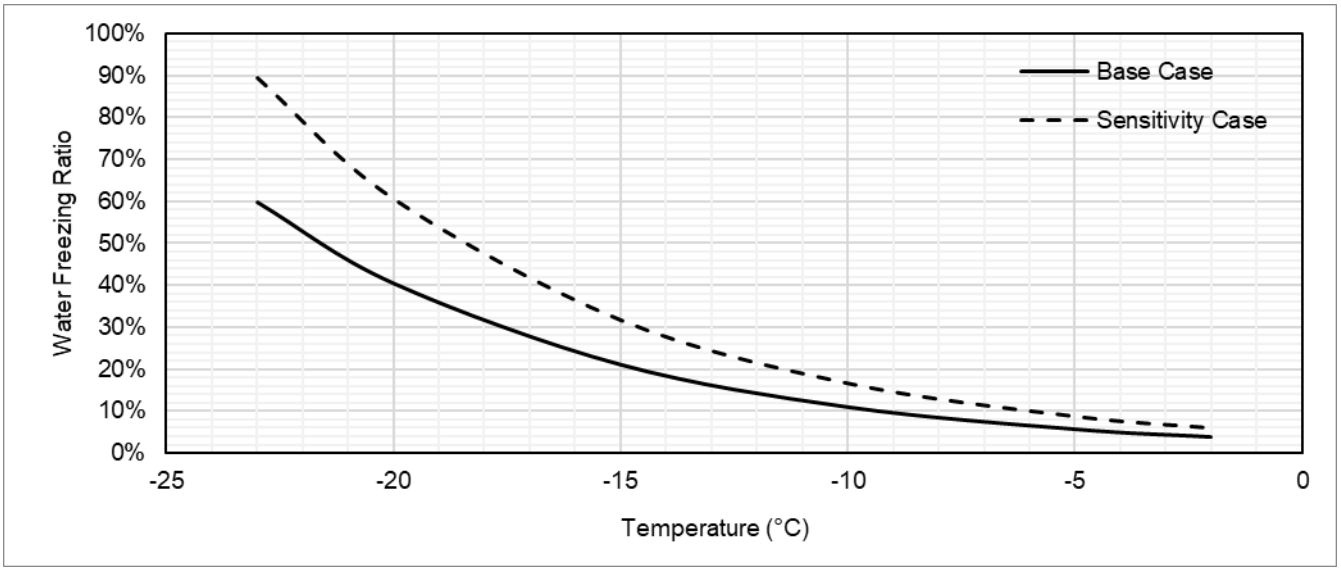


Figure 9. Water Freezing Ratio vs Temperature.

4.0 MODEL DESCRIPTION

4.1 GoldSim

GoldSim (GoldSim 2023, Version 14) was used to develop the water balance model for Troilus Project. GoldSim is a dynamic and probabilistic simulation program. It is a general-purpose simulator that provides features and flexibility to simulate the performance of many types of engineered systems. GoldSim® is highly graphical and allows relationships and equations to be represented visually. GoldSim is also modular and enables large complex models to be developed in smaller pieces. It is frequently used in the mining industry to evaluate water management alternatives, design key infrastructure components, assess the uncertainty underlying water management scenarios, perform sensitivity analyses, and conduct mass balance water quantity and quality simulations.

4.2 Water Flow Logic Diagram

Figure 10 to Figure 12 present an overview of the major water balance fluxes and their linkage for the three studied configurations:

- End of Year 1 site development combined with a full production rate. This configuration is called **Year 1/2** for the remainder of this document;
- End of Year 9 site development with tailings deposition at full production rate in the TSF Pond; and
- End of Year 21 site development with tailings deposition at full production rate in Pit 87.

The inflow and outflow fluxes, and the storage components included in the model.

- The process water flows listed in Section 3.5.3:
- For each sump and pond, the runoff from its direct watershed, direct precipitation and evaporation losses, interaction with groundwater, and pumped fluxes out of the pond.

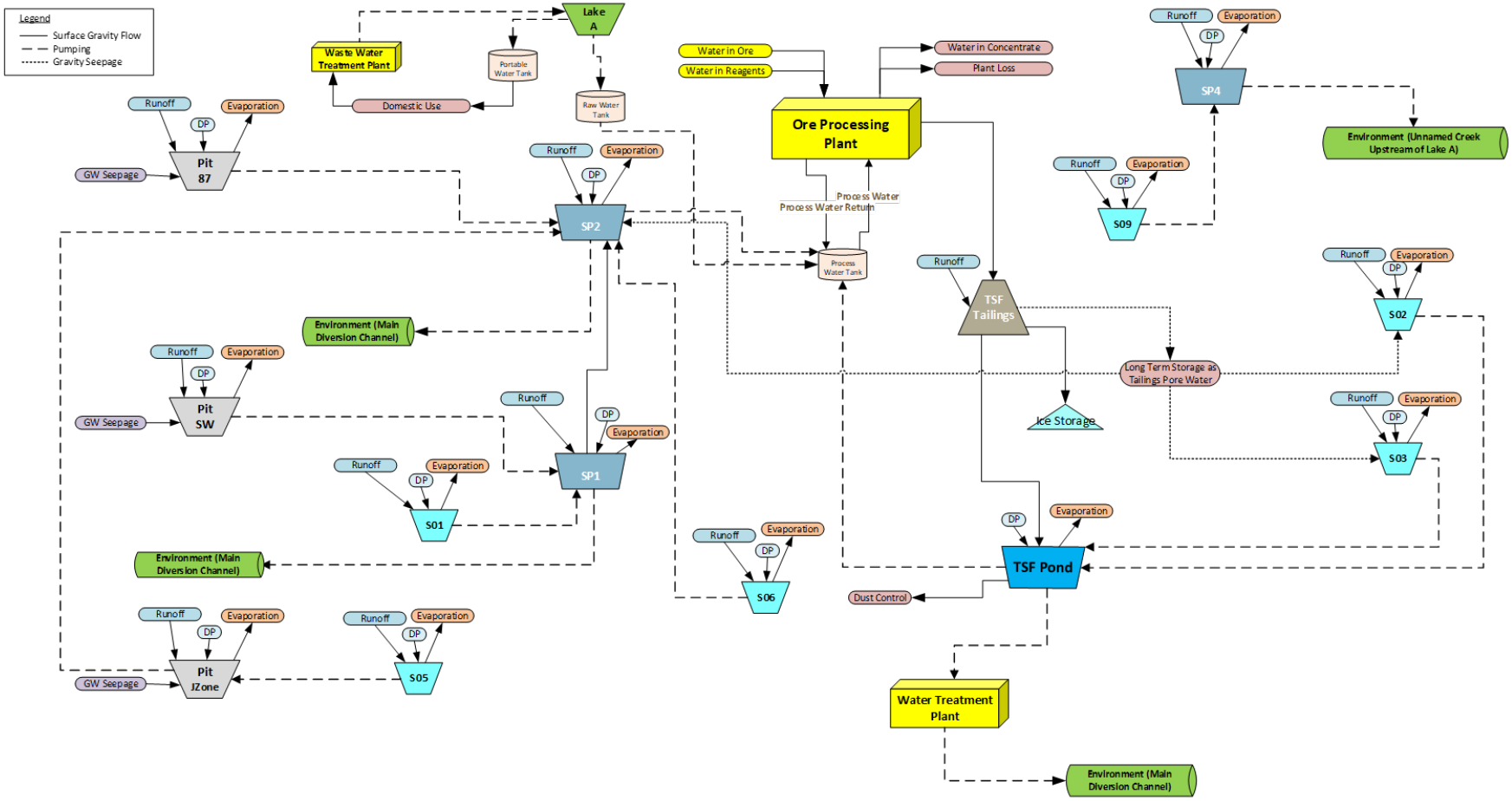


Figure 10. Flow Logic Diagram for Year 1/2

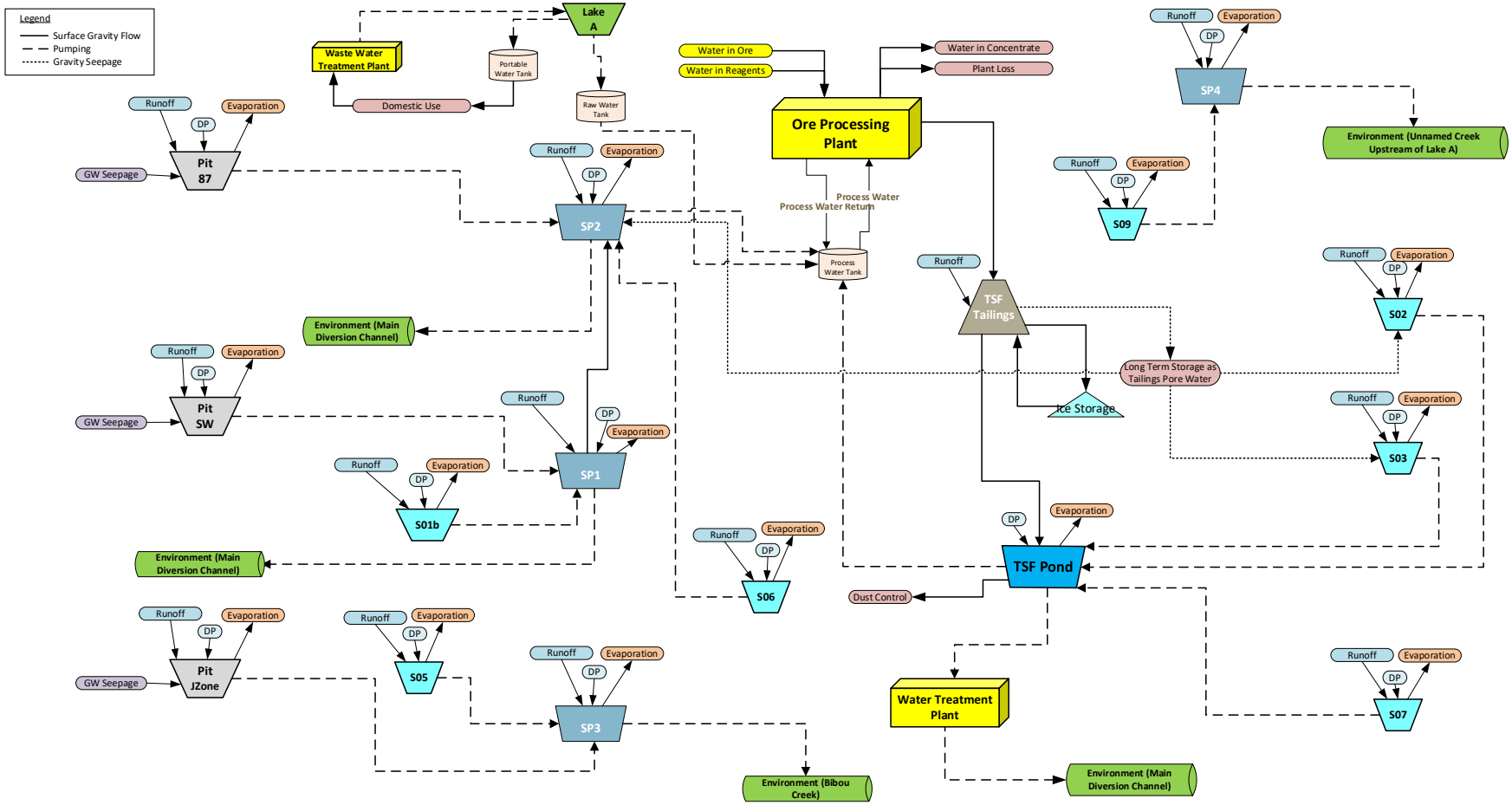


Figure 11. Flow Logic Diagram for Year 9

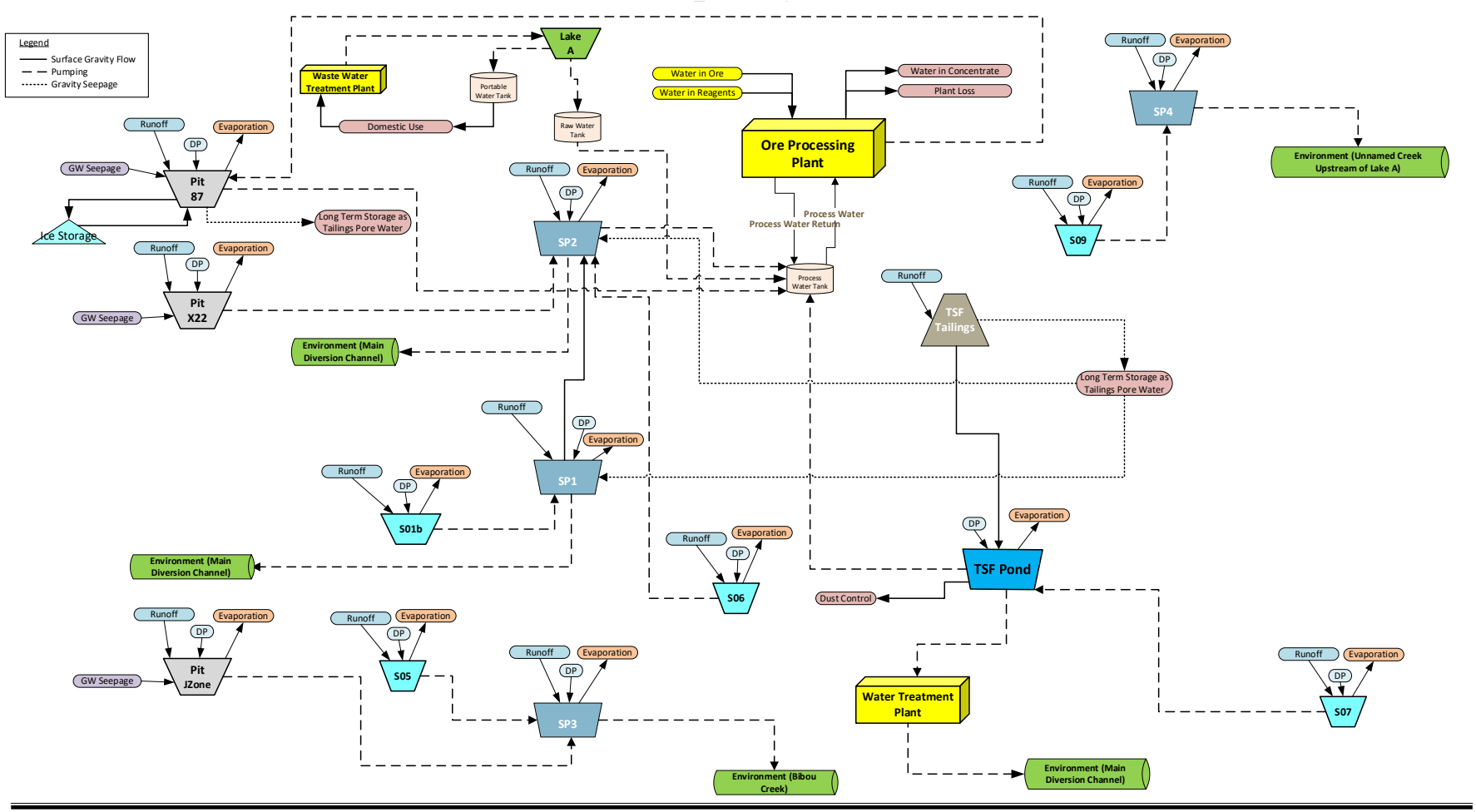


Figure 12. Flow Logic Diagram for Year 21

4.3 Model Approach

The water balance model was developed in a hierarchical structure using the GoldSim® software. The model was structured in the software user interface with different containers used to organize related components (e.g., model inputs, climate module, hydrology module, storage structures, and results). Sub-containers were included in a major component if they were required. The water quantity was calculated by balancing the inflows and outflows in each storage component, and the required makeup water was determined after accounting for all of the other inflows, outflows and storage.

4.4 Climate and Sensitivity Analysis Scenarios

Each of the three studied configurations (Year 1/2, Year 9, and Year 21) was simulated under a wide range of climate conditions:

- 31 years of historical climate conditions.
- 31 years × 26 climate change projection models × 3 greenhouse gas emissions scenario (SSP1-2.6, SSP2-4.5 and SSP5-8.5).

In addition, a sensitivity analysis case was simulated using the historical climate timeseries and the following assumptions:

- a 50% increase in the freezing ratio for the water released from tailings under winter conditions, as shown in Figure 9;
- a decrease of the solids content at deposition from 54.2% to 50% solids by weight.

The intent of the sensitivity analysis case was to study the robustness of the Project's process water availability.

5.0 SIMULATION RESULTS

The current section summarizes key results of the undertaken water balance analysis. Appendix C includes additional tables and diagrams.

The results discussion focuses on:

- Water level and water volume control in the TSF Pond, the main contact water storage facility for the Troilus Project.
- Process water supply of the OPP, including the supply sources and deficit risks.
- Volumes of water treated by the WTP.
- Volumes of effluent to the environment.

The results were extracted for simulated scenarios:

- Historical climate conditions.
- Climate change projections are grouped based on the three greenhouse gas emission scenarios.
- A sensitivity analysis using historical climate conditions and focusing on the tailings water and ice management.

The results are presented in the following paragraphs. They are structured according to the three selected development snapshots (Year 1/2, Year 9, and Year 21).

5.1 Year 1/2 - First Year of Mine Operation at Full Production Rate.

Year 1/2 simulates the site's configuration at the end of Year 1 of operation, and with a full ore processing plant production rate, Mining occurs in Pits 87 and SW. Tailings are deposited in the external TSF.

TSF Pond Water Levels

For all historical climate and climate change scenarios, the TSF Pond water levels vary between the minimum operating water level (397.8 m or 0.64 M m^3) and the maximum normal operating water level (404.6 m or 13.3 M m^3). The TSF Pond maintains at all times the minimum 3 m water depth, which allows the operation of the pumping system even under ice cover conditions and the ability to store the regulatory environmental design flood without uncontrolled discharge to the environment.

The minimum operating water level is reached at the end of the winter season, in February and March, when the pumping to the OPP slowly depletes the pond. The water level rebounds in April and May during the spring freshet. The average annual water level varies between 399.7 m and 401.7 m (1.8 M m^3 and 4.7 M m^3) depending on the climate conditions.

Water Supply to the Ore Processing Plant

Once accounting for the water in ore and reagents, the OPP and domestic water consumption is 14.9 M m^3/year, out of which 2.0 M m^3/year is the freshwater withdrawn from Lake A. Out of the remainder 12.9 M m^3/year:

- The TSF Pond supplies between 11.5 M m^3/year and 12.8 M m^3/year, varying with the climate conditions.
- The SP2 supplies between 0 and 0.7 M m^3/year.
- For 0.8 % out of the simulated years over the four different climate conditions, additional supply was required during the pre-spring months. The maximum additional required volume over any simulation was 0.7 M m^3/year. However:
  - There is no risk of actual process water deficit, because the site has a clear surplus of contact water.
  - The missing volume could come, from example, from the Pit SW, which generates on average 1.9 M m^3/year in runoff and groundwater seepage. Should the TSF Pond and SP2 water levels stay low during the fall or early winter period, Troilus would divert Pit SW pumping towards the S02 or S03 sumps and, from there, to the TSF Pond. Because the proximity of these locations, no or only minor changes to the pumping system would be required.

The sensitivity analysis tested the robustness of the process water supply system by increasing the tailings water content at deposition and the rate of tailings ice formation in winter. Under this scenario, the largest additional water volume that needs to be supplied by a source other than the TSF Pond and SP2 is 1.3 M m^3/year. This remains small relative to the available contact water volumes and could be supplied from the Pit SW, as discussed above.

In summary, the water balance study indicates that the proposed water management plan allows the safe supply of process water to the OPP under all climate conditions.

Water Treatment Plant Operation

TSF Pond water is treated at the WTP when the pond water level exceeds 402.1 m (5.6 M m^3). Under all simulated climate conditions, pumping to the treatment plant was required for only 14.5% of the years. The typical months that required treatment were September to November. When required, the treated volume varied up to 1.1 M m^3/year with an average of 0.7 M m^3/year or, on average, 22.5 days of operation per year (average volume and average days of operation over the 14.5% of the climate years, when treatment is required).

Water Effluent to the Environment

There are four planned effluent points in Year 1/2: WTP, SP1 and SP2 (all to the Main Diversion Chanel flowing to Lake A), and SP4 (to a tributary of Lake A). Table 14 below presents estimated statistics for the annual effluent volumes, per effluent point and per climate scenario:

- The total annual effluent varies between 6.9 M m^3 and 22.0 M m^3. The average annual effluent volume is 11.9 M m^3 for the historical climate, and 12.9, 12.8, and 12.8 M m^3 for the three climate change scenarios, respectively.
- Among the four effluent points, on average, 0.59% is from WTP, 31% is from SP1, 52% is from SP2 and 17% is from SP4.

Table 14: Effluent Volumes for Year 1/2

Effluent Point	Annual Effluent Volumes (M m^3/year) - Average / (Minimum to Maximum) [a]			
	Historical Climate	Climate Change Projection Scenarios		
		SPS1-2.6	SPS2-4.5	SPS5.8.5
WTP	0.0 (0.0 to 0.5)	0.1 (0.0 to 2.6)	0.1 (0.0 to 1.6)	0.1 (0.0 to 2.2)
SP1	3.8 (3.3 to 4.4)	3.9 (3.1 to 5.7)	3.9 (3.0 to 5.3)	3.9 (2.9 to 4.9)
SP2	6.1 (4.6 to 7.9)	6.7 (4.4 to 11.6)	6.6 (4.0 to 10.6)	6.6 (2.8 to 9.7)
SP4	2.0 (1.6 to 2.6)	2.2 (1.4 to 4.0)	2.2 (1.3 to 3.4)	2.2 (1.1 to 3.2)
Total Effluent	11.9 (9.7 to 15.4)	12.9 (8.9 to 22.0)	12.8 (8.7 to 18.6)	12.8 (6.9 to 19.1)

Notes:
(a) For each cell, the table includes average, minimum, and maximum over all simulated climate years.

5.2 Year 9 of Mine Operation

During Year 9 of operation, mining occurs in Pits 87 and J. Tailings are deposited in the external TSF.

TSF Pond Water Levels

For all climate and simulation scenarios, the TSF Pond water levels vary between the minimum operating water level (428.0 m or 1.0 M m^3) and the maximum normal operating water level (432.6 m or 7.2 M m^3). The TSF Pond maintains at all times a minimum 3 m water depth, which allows the pumping system to operate even under ice cover conditions and the ability to store the regulatory environmental design flood without uncontrolled discharge to the environment.

The minimum operating water level is reached at the end of the winter season, in February and March, when the pumping to the OPP slowly depletes the pond. The water level rebounds in April and May during the spring freshet. The average annual water level varies between 428.9 m and 431.1 m (1.6 M m^3 and 3.8 M m^3) depending on the climate conditions.

Water Supply to the Ore Processing Plant

Once accounting for the water in ore and reagents, the total OPP and domestic water consumption is 14.9 M m^3/year, out of which 2.0 M m^3/year is the fresh water withdrawn from Lake A. Out of the reminder 12.9 M m^3/year:

- The TSF Pond supplies 11.6 M m^3/year and 12.9 M m^3/year, varying with the climate conditions.
- The SP2 supplies the reminder, or between 0 m^3/year and 0.6 M m^3/year.

For 0.9% out of the simulated years over the four different climate conditions, additional supply was required during the pre-spring month. The maximum additional required volume over any simulation was 0.6 M m^3/year. Similarly to the comments for Year 1/2, there is no risk of deficit since the site overall has a large contact water surplus and water can be recycled from other sources. The comments in Section 5.1 apply.

The sensitivity analysis tested the robustness of the process water supply system by increasing the tailings water content at deposition and the rate of tailings ice formation in winter. Under this scenario, the largest additional water volume that needs to be supplied by a source other than the TSF Pond and SP2 is 1.2 M m^3/year. This remains small relative to the available contact water volumes and could be supplied from the Pit SW, as discussed above.

In summary, the water balance study indicates that the proposed water management plan allows the safe supply of process water to the OPP under all climate conditions.

Water Treatment Plant Operation

TSF Pond water is treated at the WTP when the pond water level exceeds 431.3 m (4.2 M m^3). Under all simulated climate conditions, pumping to the treatment plant was required for 58.6% of the years. The typical months that required treatment were June to November. When required, the treated volume varied up to 2.7 M m^3/year with an average of 0.7 M m^3/year or, on average, 38.9 days of operation per year.

Water Effluent to the Environment

There are five planned effluent points in Year 9: WTP, SP1 and SP2 (all to the Diversion Chanel flowing to Lake A), SP3 (to Bibou Creek, upstream of Lake A), and SP4 (to a tributary of Lake A). Table 15 below presents estimated statistics for the annual effluent volumes, per effluent point and per climate scenario:

- The total annual effluent varies between 7.9 M m^3 and 26.9 M m^3. The average annual effluent volume is 13.8 M m^3 for the historical climate, and 15.0, 14.8, and 14.8 M m^3 for the three climate change scenarios, respectively.
- Among the five effluent points, on average, 2.5 % is from WTP, 29 % is from SP1, 37 % is from SP2, 19 % is from SP3 and 13 % is from SP4.

Table 15: Effluent Volumes for Year 9

Effluent Point	Average Annual Effluent Volumes (m^3/year) - Average / (Minimum to Maximum) [(a)]			
	Historical Climate	Climate Change Projection Scenarios		
		SPS1-2.6	SPS2-4.5	SPS5.8.5
WTP	0.3 M (0.0 M to 1.4 M)	0.4 M (0.0 M to 2.7 M)	0.4 M (0.0 M to 2.7 M)	0.4 M (0.0 M to 2.1 M)
SP1	4.1 M (3.6 M to 4.8 M)	4.3 M (3.4 M to 6.2 M)	4.3 M (3.2 M to 5.8 M)	4.3 M (3.1 M to 5.2 M)
SP2	5.1 M (3.7 M to 6.7 M)	5.6 M (3.5 M to 9.8 M)	5.5 M (3.1 M to 8.8 M)	5.5 M (2.2 M to 8.2 M)
SP3	2.6 M (2.0 M to 3.3 M)	2.8 M (1.8 M to 4.8 M)	2.7 M (1.8 M to 4.3 M)	2.7 M (1.5 M to 4.0 M)
SP4	1.8 M (1.4 M to 2.4 M)	2.0 M (1.2 M to 3.5 M)	1.9 M (1.2 M to 3.1 M)	1.9 M (1.0 M to 2.9 M)
Total Effluent	13.8 M (10.8 M to 18.5 M)	15.0 M (10.0 M to 26.9 M)	14.8 M (9.5 M to 22.9 M)	14.8 M (7.9 M to 22.8 M)

Notes:
(a) For each cell, the table includes average, minimum, and maximum over all simulated climate years.

5.3 Year 21 of Mine Operation

During Year 21 of operation, mining occurs in Pit X22. Tailings are deposited in Pit 87.

TSF Pond Water Levels

For all climate and simulation scenarios, the TSF Pond water levels vary between the minimum operating water level (428.0 m or 1.0 M m^3) and the maximum normal operating water level (432.6 m or 7.2 M m^3). The TSF Pond maintains at all times the minimum 3 m water depth, which allows the operation of the pumping system even under ice cover conditions and the ability to store the regulatory environmental design flood without uncontrolled discharge to the environment.

The minimum operating water level is reached at the end of the winter season, in February and March, when the pumping to the OPP slowly depletes the pond. The water level rebounds in April and May during the spring freshet. The average annual water level varies between 429.2 m and 431.1 (1.8 M m^3 and 3.8 M m^3) depending on the climate conditions.

Water Supply to the Ore Processing Plant

The total OPP and domestic water consumption is 14.9 M m^3/year, out of which 2.0 M m^3/year is the freshwater withdrawn from Lake A. Out of the remainder 12.9 M m^3/year:

- The Pit 87 supplies between 9.6 M m^3/year and 1.2 M m^3/year, varying with the climate conditions.
- The TSF Pond supplies the remainder or between 0.9 M m^3/year and 3.2 M m^3/year.
- The SP2 supplies the remainder or between 0 and 0.6 M m^3/year.

For 0.04% out of the simulated years over the four different climate conditions, additional supply was required during the pre-spring month. The maximum additional required volume over any simulation was only 0.03 M m³/year. There is no risk of actual deficit because the site has a clear surplus of contact water. The small missing volume, when applicable, could be provided from the Pit J, for example, with only minor required changes to the pumping systems.

The sensitivity analysis tested the robustness of the process water supply system by increasing the tailings water content at deposition and the rate of tailings ice formation in winter. Under this scenario, the largest additional water volume that needs to be supplied by a source other than Pit 87, TSF Pond, and SP2 is 1.2 M m³/year. This is still smaller than the volumes of water available at Pit J and the sedimentation pond SP4, which is close to the OPP.

In summary, the water balance study indicates that the proposed water management plan allows the safe supply of process water to the OPP under all climate conditions.

Water Treatment Plant Operation

TSF Pond water is treated at the WTP when the pond water level exceeds 431.3 m (3.8 M m³). Under all simulated climate conditions, pumping to the treatment plant was required for 91% of the years. The typical months that required treatment were April to December. When required, the treated volume varied up to 4.2 M m³/year with an average of 1.2 M m³/year or, on average, 45.9 days of operation per year.

Water Effluent to the Environment

There are five planned effluent points in Year 21: WTP, SP1 and SP2 (all to the Diversion Chanel flowing to Lake A), SP3 (to Bibou Creek, upstream of Lake A), and SP4 (to a tributary of Lake A). Table 16 below presents estimated statistics for the annual effluent volumes, per effluent point and per climate scenario:

- The total annual effluent varies between 7.4 M m³ and 25.4 M m³. The average annual effluent volume is 12.0 M m³ for the historical climate and 13.6, 13.5, and 13.5 M m³ for the three climate change scenarios, respectively.
- Among the five effluent points, on average, 7.0% is from WTP, 15% is from SP1, 39% is from SP2, 24% is from SP3, and 15% is from SP4.

Table 16: Effluent Volumes for Year 21

Effluent Point	Average Annual Effluent Volumes (m³/year) - Average / (Minimum to Maximum) [1]			
	Historical Climate	Climate Change Projection Scenario		
		SPS1-2.6	SPS2-4.5	SPS5.8.5
WTP	0.4 (0.0 to 1.9)	1.1 (0.0 to 4.3)	1.1 (0.0 to 4.0)	1.1 (0.0 to 3.1)
SP1	1.9 (1.6 to 2.3)	2.0 (1.5 to 3.0)	2.0 (1.5 to 2.8)	2.0 (1.4 to 2.6)
SP2	4.8 (3.7 to 6.3)	5.2 (3.5 to 8.9)	5.2 (3.4 to 8.1)	5.2 (3.0 to 7.5)
SP3	3.0 (2.5 to 3.8)	3.2 (2.2 to 5.5)	3.2 (2.2 to 4.9)	3.2 (1.9 to 4.6)
SP4	1.9 (1.5 to 2.5)	2.0 (1.3 to 3.7)	2.0 (1.3 to 3.2)	2.0 (1.1 to 3.0)
Total Effluent	12.0 (9.6 to 16.4)	13.6 (8.5 to 25.4)	13.5 (8.5 to 23.3)	13.5 (7.4 to 20.8)

Notes:

(a) For each cell, the table includes average, minimum, and maximum over all simulated climate years.

6.0 CONCLUSIONS AND RECOMMENDATIONS

As part of the Troilus Project's feasibility study WSP completed a site-wide water management plan including a water balance study; the study is documented in this technical memorandum.

The water balance study considered the mine development plan and the associated water management plan, the proposed design for the various water management structures, and operational rules, which are consistent with the structures' design intent. Also, the process water demands and tailings characteristics.

Logic flow diagrams and a water balance model were developed for three snapshots, including early years site development, full site development with tailings deposition in the TSF, and late site development with in-pit tailings deposition. The numerical model, developed in the GoldSim software and using a time step of 1 day, was used to simulate five scenarios for each snapshot, including:

- One scenario includes 31 years of historical climate conditions.
- Three scenarios including each a greenhouse gas emission scenario and 26 years of climate change projection models. The three emission scenarios are: low emissions - SSP 1-2.6, climate change condition for moderate emissions - SSP 2-4.5, climate change condition for high emissions – SSP 5-8.5.
- A sensitivity analysis scenario combining historical climate conditions and conservative parameters for tailings water release and water freeze on the tailings beach; the intent is to test the robustness of the process water supply system.

6.1 Conclusions

The water balance model provides a tool to support water quantity management planning, design, and operation at the Troilus Project, including management of TSF Pond.

The results of the water balance study support the following conclusions:

- The TSF design and the proposed operational rules are efficient in controlling the TSF Pond water level within safe intervals under all climate scenarios. A Water Treatment Plant is required to discharge surplus water from the TSF Pond under wet conditions.
- The process water demand can be fulfilled under all configurations and for all climate scenarios. The TSF Pond, the SP2, and, when applicable, the in-pit tailings deposition facility provide the required process water. Under less than 1% of the climate scenarios, additional water may be required from other site ponds. Because of the large site surplus, this can be provided with only minor changes to the proposed pumping systems.
- There are year-round effects on the environment from the sites' sedimentation ponds under all configurations and climate conditions.

6.2 Recommendations

WSP makes the following recommendations:

- The water balance model should be updated during the next engineering phase to reflect changes to the mine development, site design, or water management plan. Also, if updated climate change projections change significantly.
- The refinement of the model to include the dynamic site evolution rather than using a snapshot approach should be considered.
- The calibration of the model's runoff, seepage, and tailings parameters would improve the confidence in the results. The calibration and validation are recommended before and during the site's operation.

7.0 SIGNATURE PAGE

WSP Canada Inc.

Canny Tung,
Water Resources Consultant

Jie Chen
Water Resources Consultant

Vlad Rojanschi, P.Eng.
Senior Water Resources Engineer

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APPENDIX A

Climate Change Projection Models

Below is the list of climate change projection models incorporated in the climate change scenarios. WSP downloaded the data from Environment and Climate Change Canada's "Climate Data for a Resilient Canada" on climatedata.ca in August 2023. The Appendix C of the site-wide water management plan report provides additional details.

- ACCESS-CM2
- ACCESS-ESM1-5
- BCC-CSM2-MR
- CMCC-ESM2
- CNRM-CM6-1
- CNRM-ESM2-1
- CanESM5
- EC-Earth3
- EC-Earth3-Veg
- FGOALS-g3
- GFDL-ESM4
- HadGEM3-GC31-LL
- INM-CM4-8
- INM-CM5-0
- IPSL-CM6A-LR
- KACE-1-0-G
- KIOST-ESM
- MIROC-ES2L
- MIROC6
- MPI-ESM1-2-HR
- MPI-ESM1-2-LR
- MRI-ESM2-0
- NorESM2-LM
- NorESM2-MM
- TaiESM1
- UKESM1-0-LL

APPENDIX B

Mass Balance (from Lycopodium 2024)

Lycopodium

Troilus Gold Corporation

Troilus Feasibility Study

Mass Balance

5175-FMBE-001

July 2023

TROILUS

REV NO.	DATE	DESCRIPTION OF REVISION	BY	DESIGN APPROVED	PROJECT APPROVED
A	12.07.23	ISSUED FOR REVIEW			

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Lycopodium

Project	**TROILUS FEASIBILITY STUDY**
Client	**TROILUS GOLD CORPORATION**
Date	**23-07-11**
Revision	**A**

Mass Balance

Raw Water
Filtered Water
Process Water
Reagents
Potable Water

Primary Crushing

Stream Number		1	2	3	4	5
Stream Name		ROM Ore	Primary Crusher Feed	Apron Feeder Feed	Primary Crusher Product	Feed to Secondary Crushing
Solids	t/h	1,944	1,944	1,944	1,944	1,944
% Solids	%w/w	95.0%	95.0%	95.0%	95.0%	95.0%
Solids SG		2.77	2.77	2.77	2.77	2.77
Solution	t/h	102	102	102	102	102
Solution SG		1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	2,047	2,047	2,047	2,047	2,047
Volumetric Flow	m^3/h		804	804	804	804
Slurry SG			2.54	2.54	2.54	2.54

Secondary Crushing and Screening

Stream Number		5	6	7 / 8	9 / 10	11 / 12	13	14	15 / 16	17 / 18	19	20
Stream Name		Feed to Secondary Crushing	Feed to Dry Screens	Feed to a single Dry Screen	Dry Screen Oversize	Dry Screen Undersize	Combined Dry Screens Oversize	Stockpile Feed	Feed to a single Reclaim Feeder [2]	Feed to a single Sec. Crusher	Sec Crushers Product	Tertiary Crushing Circuit Feed [2]
Solids	t/h	1,944	4,328	2,164	1,192	972	2,384	1,944	829	1,192	2,384	1,657
% Solids	%w/w	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Solids SG		2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77
Solution	t/h	102	228	114	63	51	125	102	44	63	125	87
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	2,047	4,556	2,278	1,255	1,023	2,509	2,047	872	1,255	2,509	1,744
Volumetric Flow	m^3/h	804	1,790	895	493	402	986	804	343	493	986	685
Slurry SG		2.54	2.54	2.54	2.54	2.54	2.54	2.54	2.54	2.54	2.54	2.54

1) Foam dust suppression systems envisaged

2) Note that post-stockpile utilization is higher hence instantaneous flow is lower from the stockpile than to the stockpile

Tertiary Crushing and Screening

Stream Number		20	21	22/23/24/25		26/27/28/29	30/31/32/33	34/35	36/37		38/39	201	250
Stream Name		Tertiary Crushing Circuit Feed	Total Feed to HPGR Feed Bin	Feed to Each Screen Feeder	Feed to Each Screen after Repulping	Screen Oversize (per screen)	Screen Undersize (per screen)	Two Screens O/S Combined Recycle	HPGR Product Belt Feeder Discharge (per belt)	Total Feed to Milling Circuit	Feed to Cyclone Feed Pumpbox (per launder)	Repulping Water to Screen Feed	Combined Wet Screens Sprays
Solids	t/h	1,657	3,977	994	994	580	414	1,160	1,989	1,657	829		
% Solids	%w/w	95.0%	93.8%	93.8%	63.9%	93.0%	42.7%	93.0%	93.8%	42.7%	42.7%		
Solids SG		2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77		
Solution	t/h	87	262	65	563	44	557	87	131	2,227	1,114	1,989	151
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	1,744	4,239	1,060	1,557	624	971	1,247	2,120	3,884	1,942	1,989	151
Volumetric Flow	m^3/h	685	1,698	424	922	253	706	506	849	2,825	1,413	1,989	151
Slurry SG		2.54	2.50	2.50	1.69	2.46	1.37	2.46	2.50	1.37	1.37	1.00	1.00

3) MB accounts for ore and water masses only. Reagent mass is insignificant.

Milling (For Both Ball Milling Lines Combined)

Stream Number																		
Stream Name		Lime Addition to Mill Feed [4]	Combined Ball Mill Circuits Fresh Feed	Cyclone Overflow	Cyclone Underflow	Cyclone Feed	Cyclone Underflow to Gravity Circuit	Cyclone U/Flow to Ball Mill	Total Mill Feed excl. dilution	Mill Discharge	Mill Dilution Water	Mill Trommel Sprays	Mill Trommel Oversize	Mill Trommel Undersize	Grav Tails & ICU Residue to Mill D/C Hopper	Process Streams to Mill Discharge Hopper	Cyclone Feed Pump Gland Seal Water	Mill Hopper Dilution
Solids	t/h	2.4	1,657	1,657	7,706	9,363	2,314	5,392	6,086	6,086			0.0	6,086	1,620.1	9,363		
% Solids	%w/w	100.0%	42.7%	29.5%	68.5%	55.5%	68.5%	68.5%	70.3%	70.0%			90.0%	69.4%	47.6%	58.3%		
Solids SG		3.30	2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77			2.77	2.77	2.77	2.77		
Solution	t/h	0	2,227	3,960	3,547	7,507	1,065.2	2,482	2,576	2,608	32	80	0.0	2,688	1,782	6,698	14.0	796
Solution SG		1.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	2.45	3,884	5,618	11,253	16,871	3,380	7,873	8,662	8,694	32	80	0.0	8,774	3,402	16,061	14	796
Volumetric Flow	m^3/h	0.7	2,825	4,559	6,329	10,888	1,901	4,428	4,774	4,805	32	**80**		4,885	2,367	10,078	**14.0**	796
Slurry SG		3.30	1.37	1.23	1.78	1.55	1.78	1.78	1.81	1.81	1.00	1.00		1.80	1.44	1.59	1.00	1.00
Instantaneous Max. (if applicable)	m^3/h										700						28	

4) Lime will dissolve in water, not accounted in solids t/h.

465% Recirc Load (incl gravity stream)

Lycopodium

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Milling (Per Ball Milling Line)

Stream Number			38/39	40/41	42/43	44/45	46/47	48/49			202/203	204/205	50/51	52/53				206/207
Stream Name		Lime Addition to Mill Feed [4]	Ball Mill Fresh Feed	Cyclone Overflow	Cyclone Underflow	Cyclone Feed	Cyclone Underflow to Gravity Circuit	Cyclone U/Flow to Ball Mill	Mill Feed excl. dilution	Mill Discharge	Mill Dilution Water	Mill Trommel Sprays	Mill Trommel Oversize	Mill Trommel Undersize	Grav Tails & ICU Residue to Mill D/C Hopper	Process Streams to Mill Discharge Hopper	Cyclone Feed Pump Gland Seal Water	Mill Hopper Dilution
Solids	t/h	1.2	829	829	3,853	4,682	1,157	2,696	3,043	3,043			0.0	3,043	810.1	4,682		
% Solids	%w/w	100.0%	42.7%	29.5%	68.5%	55.5%	68.5%	68.5%	70.3%	70.0%			90.0%	69.4%	47.6%	58.3%		
Solids SG		3.30	2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77			2.77	2.77	2.77	2.77		
Solution	t/h	0	1114	1,980	1,773	3,754	532.6	1,241	1,288	1,304	16	40	0.0	1,344	891	3,349	7.0	398
Solution SG		1.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	1.22	1942	2,809	5,626	8,435	1,690	3,937	4,331	4,347	16	40	0.0	4,387	1,701	8,030	7	398
Volumetric Flow	m^3/h	0.4	1413	2,279	3,164	5,444	950	2,214	2,387	2,403	16	40		2,443	1,184	5,039	7.0	398
Slurry SG		3.30	1.37	1.23	1.78	1.55	1.78	1.78	1.81	1.81	1.00	1.00		1.80	1.44	1.59	1.00	1.00
Instantaneous Max. (if applicable)	m^3/h										350						11	

4) Lime will dissolve in water, not accounted in solids t/h. 465% Recirc Load (incl gravity stream)

Gravity and Intensive Cyanidation (Combined for Both Lines)

Stream Number													62	214	101	102	103	63
Stream Name		Gravity Circuit Total Feed	GC Scalping Screen Sprays	GC Scalping Screen Feed Dilution	GC Scalping Screen Feed	GC Scalping Screen Oversize	GC Scalping Screen Undersize	Fluidizing Water GC	Gravity Conc to Intensive Cyanidation	Regrind Gravity Conc to Primary ICU	Gold Room Sumpage to ICR	Gravity Tails	ICU Residue to Mill D/C Hopper	Intensive Cyanidation Dilution (Ave)	Caustic to Intensive Cyanidation (Ave)	Cyanide to Intensive Cyanidation (Ave)	Flocculant to Intensive Cyanidation (Ave)	Pregnant ICU Solution to EW (Ave)
Solids	t/h	2,314			2,314	694	1,620		0.333	0.100		1,620	0.433					
% Solids	%w/w	68.5%			57.0%	88.0%	49.5%		75%	50.0%		47.6%	25%					
Solids SG		2.77			2.77	2.77	2.77		3.20	3.40		2.77	3.20					
Solution	t/h	1,065.2	87.8	593	1,746	95	1,651	130	0.11	0.100	0.10	1,781	1.30	1.28	0.03	0.04	0.01	0.36
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.20	1.10	1.00	1.00
Total Stream	t/h	3,380	88	593	4,060	789	3,271	130	0.44	0.200	0.10	3,401	1.73	1.28	0.03	0.04	0.01	0.36
Volumetric Flow	m^3/h	1,901	88	593	2,581	345	2,236.0	130	0.22	0.129	0.10	2,366	1.44	1.28	0.02	0.03	0.01	0.36
Slurry SG		1.78	1.00	1.00	1.57	2.28	1.46	1.00	2.06	1.55	1.00	1.44	1.21	1.00	1.20	1.10	1.00	1.00
Instantaneous Max. (if applicable)	m^3/h													30	1.5	1.6	0.2	

Gravity and Intensive Cyanidation (Per Line)

Stream Number		46/47	208/209	210/211		54/55	56/57	212/213	58/59			60/61						
Stream Name		Gravity Circuit Feed	GC Scalping Screen Spray	GC Scalping Screen Feed Dilution	GC Scalping Screen Feed	GC Scalping Screen Oversize	GC Scalping Screen Undersize	Fluidizing Water GC	Gravity Conc to Intensive Cyanidation	Regrind Gravity Conc to Primary ICU	Gold Room Sumpage to ICR	Gravity Tails	ICU Residue to Mill D/C Hopper	Intensive Cyanidation Dilution (Ave)	Caustic to Intensive Cyanidation (Ave)	Cyanide to Intensive Cyanidation (Ave)	Flocculant to Intensive Cyanidation (Ave)	Pregnant ICU Solution to EW (Ave)
Solids	t/h	1,157			1,157	347	810		0.167	0.100		810	0.433					
% Solids	%w/w	68.5%			57.0%	88.0%	49.5%		75%	50.0%		47.6%	25%					
Solids SG		2.77			2.77	2.77	2.77		3.20	3.40		2.77	3.20					
Solution	t/h	532.6	43.9	296	873	47	826	65	0.06	0.100	0.10	891	1.30	1.28	0.03	0.04	0.01	0.36
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.20	1.10	1.00	1.00
Total Stream	t/h	1,690	44	296	2,030	394	1,636	65	0.22	0.200	0.10	1,700	1.73	1.28	0.03	0.04	0.01	0.36
Volumetric Flow	m^3/h	950	44	296	1,291	173	1,118.0	65	0.11	0.129	0.10	1,183	1.44	1.28	0.02	0.03	0.01	0.36
Slurry SG		1.78	1.00	1.00	1.57	2.28	1.46	1.00	2.06	1.55	1.00	1.44	1.21	1.00	1.20	1.10	1.00	1.00
Instantaneous Max. (if applicable)	m^3/h													30	1.5	1.6	0.2	

Lycopodium

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Trash Screening

Stream Number			40/41			92/93
Stream Name		Total from Cyclone Overflow	Feed to Trash Screen (Per Screen)	Trash Screen Spray Water (per Screen)	Trash Screen Oversize (Per Screen)	Trash Screen Undersize (Per Screen)
Solids	t/h	1,657	829		0	829
% Solids	%w/w	29.5%	29.5%		**85.0%**	29.3%
Solids SG		2.77	2.77		2.77	2.77
Solution	t/h	3,960	1,980	**20**	0	2,000
Solution SG		1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	5,618	2,809	20	0	2,829
Volumetric Flow	m^3/h	4,559	2,279	20	0	2,299
Slurry SG		1.23	1.23	1.00	0.00	1.23
Instantaneous Max. (if applicable)	m^3/h					

Rougher/Scavenger Flotation

Stream Number			108	109	111	215	64	216	65	66
Stream Name		Conditioning Tank Feed	Frother to Rougher and Scavenger Flotation	KAX (Collector 1) to Rougher and Scavenger Flotation	SPRI 206 (Collector 2) to Rougher and Scavenger Flotation	Rougher Flotation Dilution Water	Rougher Feed	Rougher/Scavenger Flotation Wash Water	Rougher and Scavenger Concentrate to Regrinding	Tailings from Rougher/Scav Flotation
Solids	t/h	1,657					1,657		166	1,491
% Solids	%w/w	29.3%					28.3%		**23.0%**	28.3%
Solids SG		2.77					2.77		**3.20**	2.77
Solution	t/h	4,001	0.04	0.80	0.05	**200**	4,202	**140**	555	3,787
Solution SG		1.00	0.94	1.07	1.06	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	5,658	0.04	0.80	0.05	200	5,859	140	721	5,278
Volumetric Flow	m^3/h	4,599	**0.04**	**0.74**	**0.04**	200	4,800	140	607	4,325
Slurry SG		1.23	0.94	1.07	1.06	1.00	1.22	1.00	1.19	1.22
Instantaneous Max. (if applicable)	m^3/h									

Concentrate Regrind

Stream Number		65		217	67	68	69	70	218			219	71	72	230
Stream Name		Rougher and Scavenger Concentrate to Regrinding	Regrind Cyclone Feed Pump GSW	Regrind Cyclone Feed Hopper Dilution	Regrind Gravity Tails Return to Regrind Cyclone Feed	Feed to Regrind Cyclone	Regrind Cyclone Underflow to Regrind Mill	Regrind Cyclone Overflow to Cleaner Conditioning	Regrind Mill Feed Dilution Water	Regrind Mill Feed after Dilution	Regrind Mill Discharge Pump GSW	Regrind GC Fluidization Water	Feed to Regrind Gravity Concentrators	Regrind Gravity Conc to Primary ICU	Total Process Water to Regrind Circuit
Solids	t/h	166			248	414	**248.6**	**166**		249			249	**0.10**	
% Solids	%w/w	**23.0%**			42.1%	31.3%	**60.0%**	**18.2%**		**55.0%**			54.6%	**50.0%**	
Solids SG		3.20			3.20	3.20	3.20	3.20		3.20			3.20	**3.40**	
Solution	t/h	555	3.0	11	341	911	165.7	745	38	203.4	3.0	135	206	0.100	184.1
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	721	3	11	590	1,325	414	911	38	452	3	135	455	0.200	184.1
Volumetric Flow	m^3/h	607	**3.0**	11	419	1,040	243	797	38	281	**3.0**	**135**	284	0.129	184.1
Slurry SG		1.19	1.00	1.00	1.41	1.27	1.70	1.14	1.00	1.61	1.00	1.00	1.60	1.55	1.00
Instantaneous Max. (if applicable)	m^3/h														

Lycopodium

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Cleaner Flotation

Stream Number		70	107	110	112	113	114	115	116	220		221	73			74
Stream Name		Regrind Circuit Products to Cleaner Flotation Circuit	Frother to Cleaner Flotation	KAX (Collector 1) to Cleaner Flotation	SPRI 206 (Collector 2) to Cleaner Flotation	Milk-of-Lime Addition to Cleaner Flotation	Na_2SO_3 Addition to Cleaner Flotation	$ZnSO_4$ Addition to Cleaner Flotation	Na_2CS_3 Addition to Cleaner Flotation	Cleaner Flotation Dilution Water	Cleaner 1 Feed[5]	Wash Water to Cleaner 1	Cleaner 1 Concentrate to Cleaner 2 Feed	Cleaner 1 Tails	Cleaner 1 Tails Pump GSW	Cleaner 1 Tails to Flotation Tails Pumpbox
Solids	t/h	166									166		56.7	109.0		109.0
% Solids	%w/w	18.2%									18.1%		18.2%	15.3%		15.3%
Solids SG		3.20									3.20		3.20	2.77		2.77
Solution	t/h	745	0.00	0.02	0.05	1.01	0.50	0.00	0.00	5	751	107	255	604	1.0	605
Solution SG		1.00	0.94	1.07	1.06	1.10	1.10	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	911	0.00	0.02	0.05	1.01	0.50	0.00	0.00	5	917	107	311	713	1	714
Volumetric Flow	m^3/h	797	0.00	0.02	0.05	0.92	0.45	0.00	0.00	5	803	107	272	643	1.0	644
Slurry SG		1.14	0.94	1.07	1.06	1.10	1.10	0.00	0.00	1.00	1.14	1.00	1.14	1.11	1.00	1.11
Instantaneous Max. (if applicable)	m^3/h							0.22	0.22						1.5	

5) For mass balance simplicity, all cleaner flotation reagents are assumed to be dosed into cleaner 1 flotation.

Cleaner Flotation (Continued)

Stream Number			75			76	222	77				78	
Stream Name		Wash Water to Cleaner 2	Cleaner 2 Concentrate to Cleaner 3 Feed	Cleaner 2 Tails	Cleaner 2 Tails Pump GSW	Cleaner 2 Tails to Flotation Tails Pumpbox	Wash Water to Cleaner 3	Cleaner 3 Concentrate to Conc Thickener	Cleaner 3 Tails	Cleaner 3 Tails Recycled to Cleaner 2	Cleaner 3 Tails Pump GSW	Cleaner 3 Tails to Flotation Tails Pumpbox	Total Cleaner Tails To Tails Thickener (incl. GSW)
Solids	t/h		19.4	37.3		37.3		6.6	12.8	0.0		12.8	159
% Solids	%w/w		18.2%	15.4%		15.4%		18.2%	15.4%	0.0%		15.3%	15.3%
Solids SG			3.20	2.77		2.77		3.20	2.77	2.77		2.77	2.77
Solution	t/h	37	87	204	1.0	205	13	29.8	70	0	1.0	71	881
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	37	106	242	1	243	13	36.4	83	0	1	84	1,040
Volumetric Flow	m^3/h	37	93	218	1.0	219	13	31.9	74	0	1.0	75	939
Slurry SG		1.00	1.14	1.11	1.00	1.11	1.00	1.14	1.11	0.00	1.00	1.11	1.11
Instantaneous Max. (if applicable)	m^3/h		131	291		292		33		111			

Concentrate Handling

Stream Number		77	106	88		84	85	86	87			223	89
Stream Name		Final Cleaner Concentrate (Fresh Feed to Conc. Thickener)	Flocculant Addition Conc. Thickener	Filtrate Recycle to Thickener	Total Feed to Concentrate Thickener Feed Box	Conc. Thickener Underflow to Filter Feed Tank	Conc. Thickener Overflow to Overflow Tank	Thickener Overflow Recycle to Flocculant Mixer	Conc. Thickener Overflow to Tails Pumpbox	Concentrate Thickener U/F Pump GSW	Concentrate Filter Feed Pump GSW	Process Water to Filter Wash	Concentrate Filter Cake to Load-Out
Solids	t/h	6.6			6.6	6.6							6.6
% Solids	%w/w	18.2%			13.2%	50%							90%
Solids SG		3.20			3.20	3.20							3.20
Solution	t/h	29.8	0.265	11.0	43.4	6.6	37	2.4	34	0.05	0.05	5.0	0.74
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	36.4	0.265	11.0	50.1	13.3	37	2.4	34	0.05	0.05	5.0	7.4
Volumetric Flow	m^3/h	31.9	0.265	11.0	45.5	8.7	37	2.4	34	0.05	0.05	5.00	2.8
Slurry SG		1.14	1.00	1.00	1.10	1.52	1.00	1.00	1.00	1.00	1.00	1.00	2.62
Instantaneous Max. (if applicable)	m^3/h												

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Electrowinning and Refining

Stream Number		63	104	257	90
Stream Name		Combined ICU Preg Solution to EW	Caustic to Pregnant Eluate Tank (Ave)	Raw Water to Gold Room	Combined ICU EW Barren Bleed To Tails Thickener
Solids	t/h				
% Solids	%w/w				
Solids SG					
Solution	t/h	0.36	0.00	0.10	0.36
Solution SG		1.00	1.20	1.00	1.00
Total Stream	t/h	0.36	0.00	0.10	0.36
Volumetric Flow	m^3/h	0.36	**0.00**	**0.10**	0.36
Slurry SG		1.00	0.00	1.00	1.00
Instantaneous Max. (if applicable)	m^3/h	TBD			TBD

Tailings

Stream Number			79		105	224	-		80	81		87	82		83
Stream Name		Flotation Tails Pump GSW	Total Flotation Tails (incl. GSW)	Combined ICU EW Barren Bleed To Tails Thickener	Flocculant Addition to Tailings Thickener	Tailings Thickener Flocc Dilution Water	Plant Washdown Water (Ave)	Total Tailings Thickener Feed Box Feed	Tailings Thickener Overflow	Tailings Thickener Underflow	Tailings Thickener U/F Pump GSW	Conc. Thickener Overflow to Overflow Tank	Tailings Pumpbox Discharge	Tailings Pump GSW	Tailings to TSF (Ave)
Solids	t/h		1,651					1,651		1,651			1,651		1,651
% Solids	%w/w		26.1%					25.3%		**55.0%**			54.3%		54.2%
Solids SG			2.77					2.77		2.77			2.77		2.77
Solution	t/h	5.0	4,673	0.36	19.8	178.3	0.3	4,872	3,521	1,350	5.0	34	1,390	5.0	1,395
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	5.0	6,324	0.36	19.8	178.3	0.3	6,522	3,521	3,001	5.0	34	3,040	5.0	3,045
Volumetric Flow	m^3/h	**5.0**	5,269	0.36	**19.8**	**178.3**	**0.3**	5,468	3521	1,946	**5.0**	34	1,986	**5.0**	1,991
Slurry SG		1.00	1.20	1.00	1.00	1.0	1.00	1.19	1.00	1.54	1.00	1.00	1.53	1.00	1.53
Instantaneous Max. (if applicable)	m^3/h														

Tailings (Continued)

Stream Number						
Stream Name		Accumulation in TSF	Water Released by Settling Slimes	Precipitation and Runoff to TSF	Evaporation from TSF	Reclaim Water to Process Water Tank (Ave)
Solids	t/h	1,651				
% Solids	%w/w	**75.0%**				
Solids SG		2.77				
Solution	t/h	550	845	1,421	98	1098
Solution SG		1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	2,201	845	1,421	98	1098
Volumetric Flow	m^3/h	1,146	845	**1,421**	**98**	1098
Slurry SG		1.92	1.00	1.00	1.00	1.00
Instantaneous Max. (if applicable)	m^3/h					

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Reagents

Stream Number		101	102	103	104	105	106	251	252	253
Stream Name		Caustic to Intensive Cyanidation (Ave)	Cyanide to Intensive Cyanidation (Ave)	Flocculant to Intensive Cyanidation (Ave)	Caustic to Pregnant Eluate Tank (Ave)	Flocculant Addition to Tailings Thickener	Flocculant Addition Conc. Thickener	Raw Water to Caustic Mixing (Ave)	Raw Water to Cyanide Mixing (Ave)	Raw Water to Flocc Mixing (Ave)
Solids	t/h									
% Solids	%w/w									
Solids SG										
Solution	t/h	0.03	0.04	0.01	0.00	19.8	0.27	0.02	0.03	20.08
Solution SG		1.20	1.10	1.00	1.20	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	0.03	0.04	0.01	0.00	19.8	0.27	0.02	0.03	20.08
Volumetric Flow	m^3/h	0.02	0.03	0.01	0.00	19.8	0.27	0.02	0.03	20.08
Slurry SG		1.20	1.10	1.00	0.00	1.00	1.00	1.00	1.00	1.00
Instantaneous Max. (if applicable)	m^3/h							1.50		

Reagents (continued)

Stream Number				254		113	225	114	226	115	227	116	233
Stream Name		Frother to Flotation Circuits	KAX (Collector 1) to Flotation Circuits	Raw Water to KAX Mixing	SPRI 206 (Collector 2) to Flotation Circuits	Milk-of-Lime Addition to Cleaner Flotation	Process Water to Lime Mixing	Na_2SO_3 Addition to Cleaner Flotation	Process Water to Na_2SO_3 Mixing	$ZnSO_4$ Addition to Cleaner Flotation	Process Water to $ZnSO_4$ Mixing	Na_2CS_3 Addition to Cleaner Flotation	Process Water to Na_2CS_3 Mixing
Solids	t/h												
% Solids	%w/w												
Solids SG													
Solution	t/h	0.04	0.81	0.76	0.10	1.01	0.92	0.50	0.45	0.00	0.00	0.00	0.00
Solution SG		0.94	1.07	1.00	1.06	1.10	1.00	1.10	1.00	1.00	1.10	1.00	1.00
Total Stream	t/h	0.04	0.81	0.76	0.10	1.01	0.92	0.50	0.45	0.00	0.00	0.00	0.00
Volumetric Flow	m^3/h	0.05	0.76	0.76	0.09	0.92	0.92	0.45	0.45	0.00	0.00	0.00	0.00
Slurry SG		0.94	1.07	1.00	1.06	1.10	1.00	1.10	1.00	0.00	0.00	0.00	0.00
Instantaneous Max. (if applicable)	m^3/h						44		36	0.22	13	0.22	13

Lycopodium

Project TROILUS FEASIBILITY STUDY
Client TROILUS GOLD CORPORATION
Date 23-07-11
Revision A

Mass Balance

Raw Water
Filtered Water
Process Water
Reagents
Potable Water

Process Water

Stream Number		201	-		-	228	214	234	229	230	231	232	225	226	227	233	-	223
Stream Name		Repulping of HPGR Cakes	Milling Area Screen Sprays & Screen Dilution	Fluidization Water to Gravity Conc.	Mill Feed & Pumpbox Dilution Header	Total to Milling Circuit	Intensive Cyanidation (Ave)	Total to Trash Screen Spray Water	Rougher Flotation Dilution & Wash Water	Total Process Water to Regrind Circuit	Dilution Water and Wash Water to Cleaner 1	Dilution & Wash Water to Cleaner 2 & 3	Process Water to Lime Mixing	Process Water to Na_2SO_3 Mixing	Process Water to $ZnSO_4$ Mixing	Process Water to Na_2CS_3 Mixing	Plant Washdown Water (Ave)	Process Water to Filter Wash
Solids	t/h																	
% Solids	%w/w																	
Solids SG																		
Solution	t/h	1,989	761	130.0	828	1,718	1.3	40	340	184	112	49	0.92	0.45	0.00	0.00	0.3	5.00
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	1,989	761	130.0	828	1,718	1.3	40	340	184	112	49	0.92	0.45	0.00	0.00	0.3	5.00
Volumetric Flow	m^3/h	1,989	761	130.0	828	1,718	1.3	40	340	184	112	49	0.92	0.45	0.00	0.00	**0.3**	5.00
Slurry SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Instantaneous Max. (if applicable)	m^3/h						30						44	36	13	13		

Process Water (Continued)

Stream Number		224	235	91	80	255
Stream Name		Tailings Thickener Flocc Dilution Water	Total Process Water Demand (Ave)	Reclaim from TSF	Tailings Thickener Overflow	Raw Water Make-up to Process Water Tank
Solids	t/h					
% Solids	%w/w					
Solids SG						
Solution	t/h	178.3	4,619.0	1,098	3,521	0.0
Solution SG		1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	178.3	4,619.0	1,098	3,521	0.0
Volumetric Flow	m^3/h	178.3	4,619.0	1,098	3,521	0.0
Slurry SG		1.00	1.00	1.00	1.00	0.00
Instantaneous Max. (if applicable)	m^3/h		4,754			135

Raw Water

Stream Number													256		251	252	253	255
Stream Name		Cyclone Feed Pump GSW	Regrind Cyclone Feed Pump GSW	Regrind Mill Discharge Pump GSW	Cleaner 1 Tails Pump GSW	Cleaner 2 Tails Pump GSW	Cleaner 3 Tails Pump GSW	Flotation Tails Pump GSW	Tailings Thickener U/F Pump GSW	Concentrate Thickener U/F Pump GSW	Concentrate Filter Feed Pump GSW	Tailings Pumps GSW	Total Gland Seal Water (GSW)	Raw Water Total to Header 2 (Ave)	Raw Water to Caustic Mixing (Ave)	Raw to Cyanide Mixing (Ave)	Raw Water to Flocculant Mixing	Make-Up to Process Water Tank
Solids	t/h																	
% Solids	%w/w																	
Solids SG																		
Solution	t/h	14.0	3.0	3.0	1.0	1.0	1.0	5.0	5.0	0.05	0.05	5.0	38	58.2	0.02	0.03	20.1	0.0
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	14.0	3.0	3.0	1.0	1.0	1.0	5.0	5.0	0.05	0.05	5.0	38	58.2	0.02	0.03	20.1	0.0
Volumetric Flow	m^3/h	14.0	3.0	3.0	1.0	1.0	1.0	5.0	5.0	0.05	0.05	5.0	38	58.2	0.02	0.03	20.1	0.0
Slurry SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Instantaneous Max. (if applicable)	m^3/h	28										7.5	57.2	96.8	1.5	0.4	32.2	135

Lycopodium

Project	**TROILUS FEASIBILITY STUDY**
Client	**TROILUS GOLD CORPORATION**
Date	**23-07-11**
Revision	**A**

Mass Balance

Raw Water
Filtered Water
Process Water
Reagents
Potable Water

Raw Water (continued)

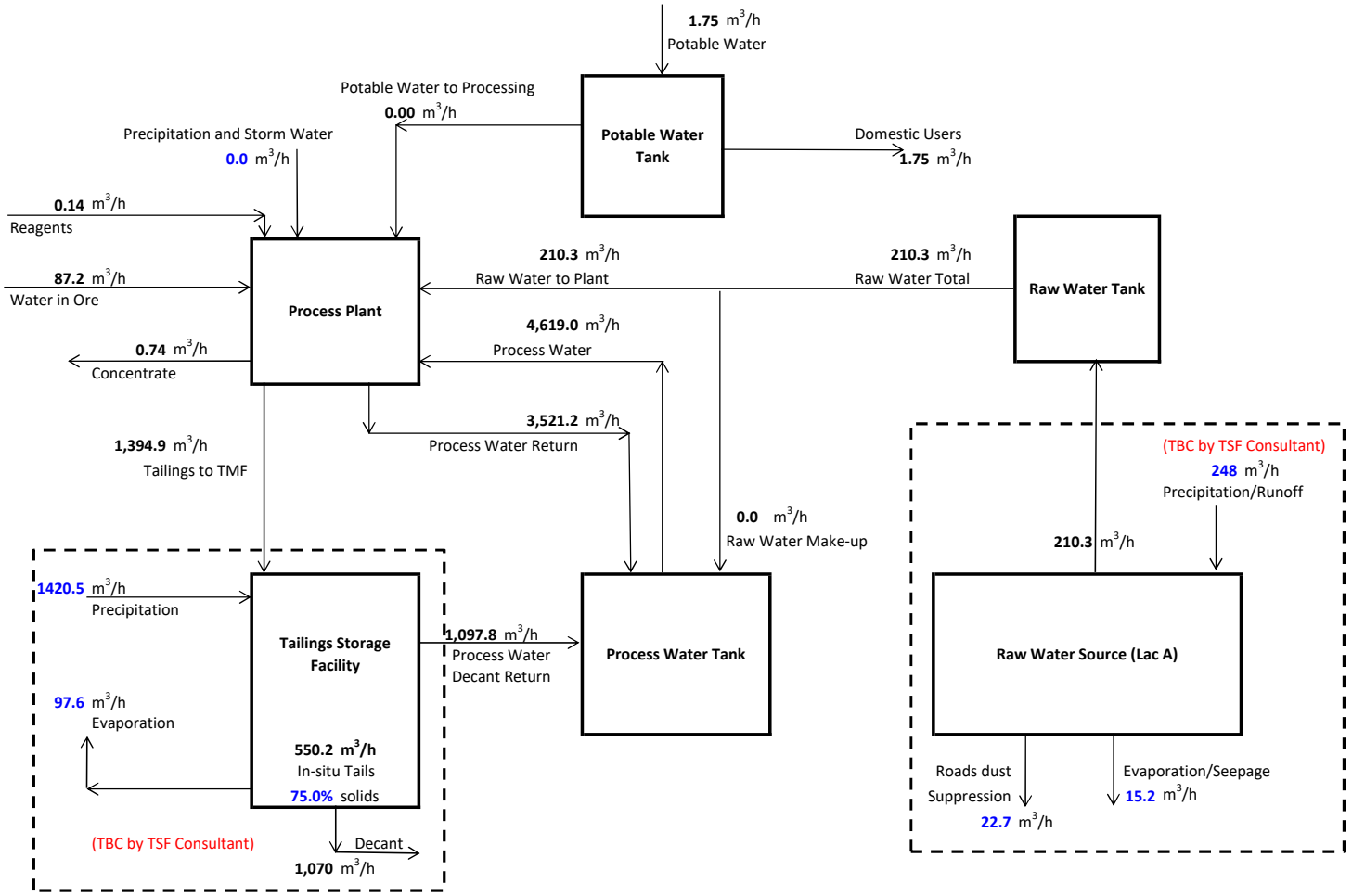
Stream Number		250	254	257	258			259		260		
Stream Name		Raw Water to Wet Screens Sprays	Raw Water to KAX Mixing	Raw Water to Gold Room	Total Raw Water Demand (Ave)	Raw Water Total to Header 2(Ave)	Raw Water Total to Header 1(Ave)	Raw Water Pumped from Lake	Pit dewatering	Roads Dust Suppression Allowance	Evaporation from RW Pond	Precipitation onto RW Pond
Solids	t/h											
% Solids	%w/w											
Solids SG												
Solution	t/h	151.2	0.76	0.10	210.3	58.2	152.1	210.3	0.0	23	15	248
Solution SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Stream	t/h	151.2	0.76	0.10	210.3	58.2	152.1	210.3	0.0	23	15	248
Volumetric Flow	m^3/h	151.2	0.76	0.10	210.3	58.2	152.1	210.3	0.0	**23**	**15**	**248**
Slurry SG		1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Instantaneous Max. (if applicable)	m^3/h		9.1		393.6	96.8	296.8	1308.1				

Potable Water

Stream Number		275		276
Stream Name		Potable Water to Process Plant Safety Showers	Potable Water to Domestic Users	Total Potable Water Demand
Solids	t/h			
% Solids	%w/w			
Solids SG				
Solution	t/h	0.00	1.75	1.75
Solution SG		1.00	1.00	1.00
Total Stream	t/h	0.00	1.75	1.75
Volumetric Flow	m^3/h	**0.00**	**1.75**	1.75
Slurry SG		0.00	1.00	1.00
Instantaneous Max. (if applicable)	m^3/h	9.1	84.0	93.1

Client : TROILUS GOLD CORPORATION
Project : TROILUS FEASIBILITY STUDY
Date : July 2023

SIMPLIFIED OVERALL WATER BALANCE SUMMARY



TMF Reclaim available =	2,167.7 m³/h
PW shortfall =	1,097.8 m³/h
Reclaim to PWP =	1,097.8 m³/h
Excess reclaim =	1,069.9 m³/h

APPENDIX C

Water Balance Modelling Results

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1.5 Year 1/2 – Simulation of Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management 23

2.0 YEAR 9 (LAST YEAR OF TAILINGS DEPOSITION IN THE TAILINGS STORAGE FACILITY) 28

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2.5 Year 9 – Simulation of Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management 53

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3.1 Year 21 – Simulation of Historical Climate Conditions 59

3.2 Year 21 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP1 - 2.6 66

3.3 Year 21 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP2 - 4.5 72

3.4 Year 21 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP5 - 8.5 78

3.5 Year 21 – Simulation of Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management 84

1.0 YEAR 1/2 (FIRST YEAR OF OPERATION AT FULL PRODUCTION CAPACITY)

1.1 Year 1/2 – Simulation of Historical Climate Conditions

Figure C1.1 - 1: Estimated TSF Pond Water Levels for Year 1/2 and Historical Climate Conditions

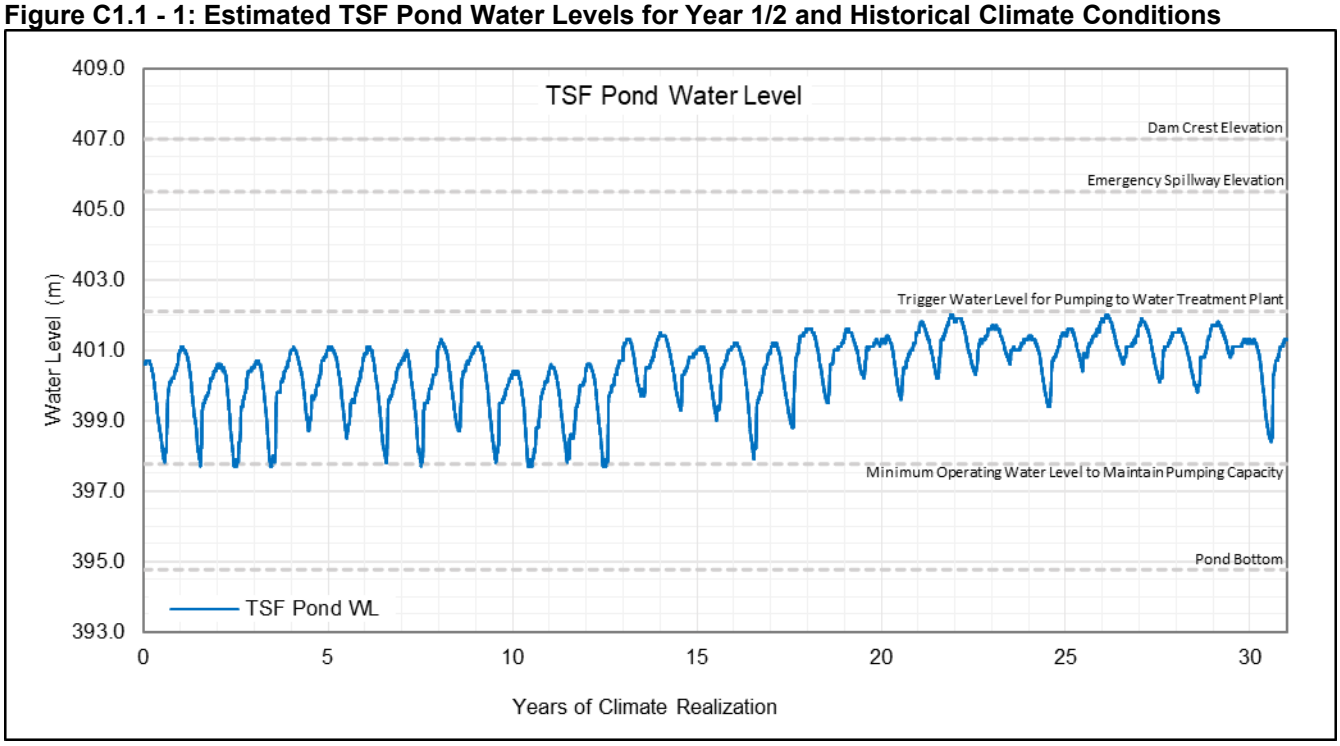


Figure C1.1 - 2: Estimated TSF Pond Water Volumes for Year 1/2 and Historical Climate Conditions

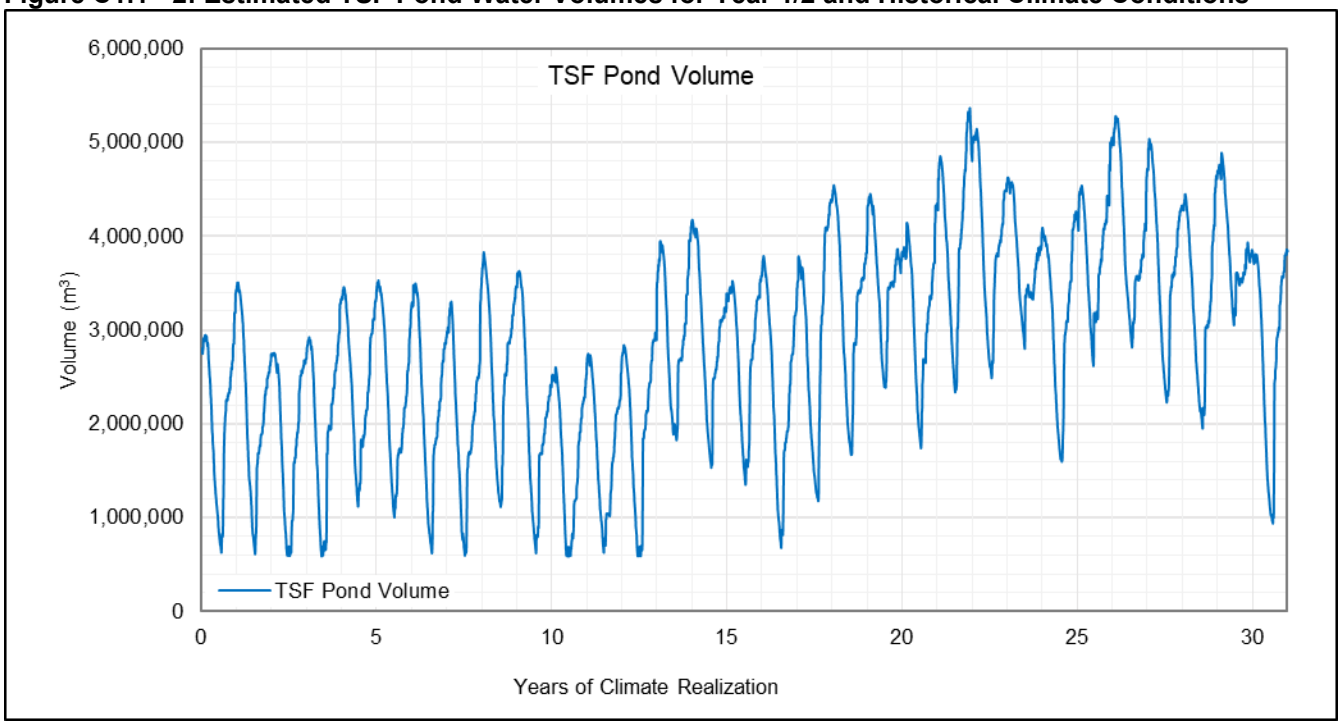


Figure C1.1 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 1/2 and Historical Climate Conditions

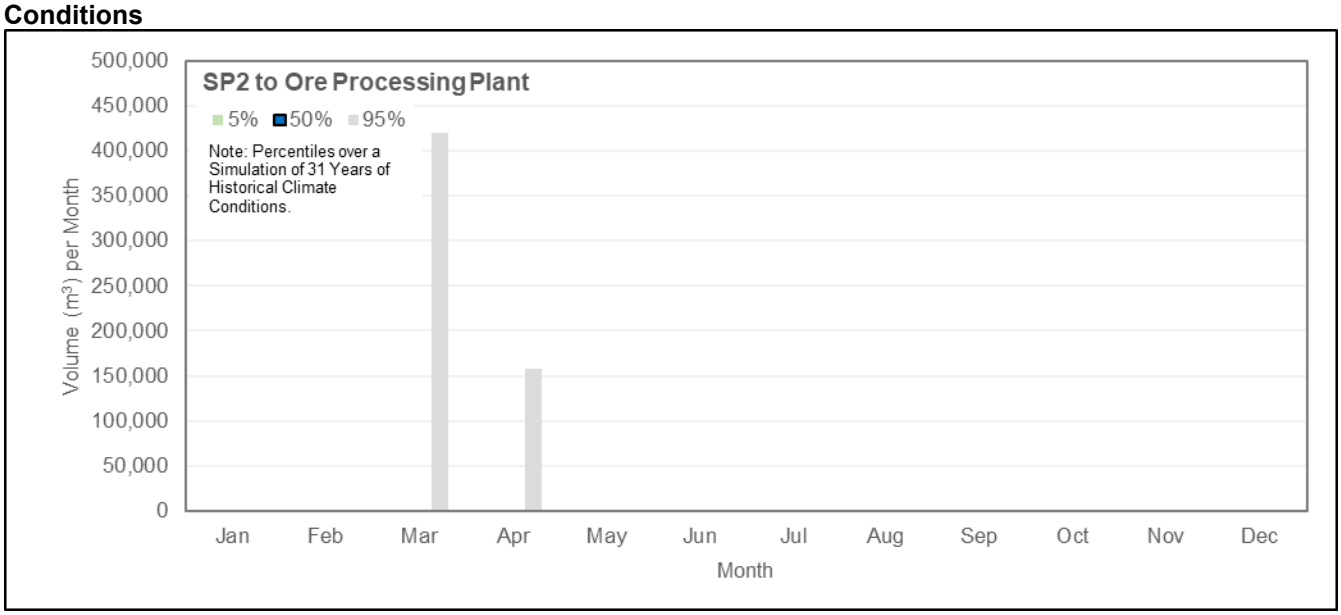


Figure C1.1 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 1/2 and Historical Climate Conditions

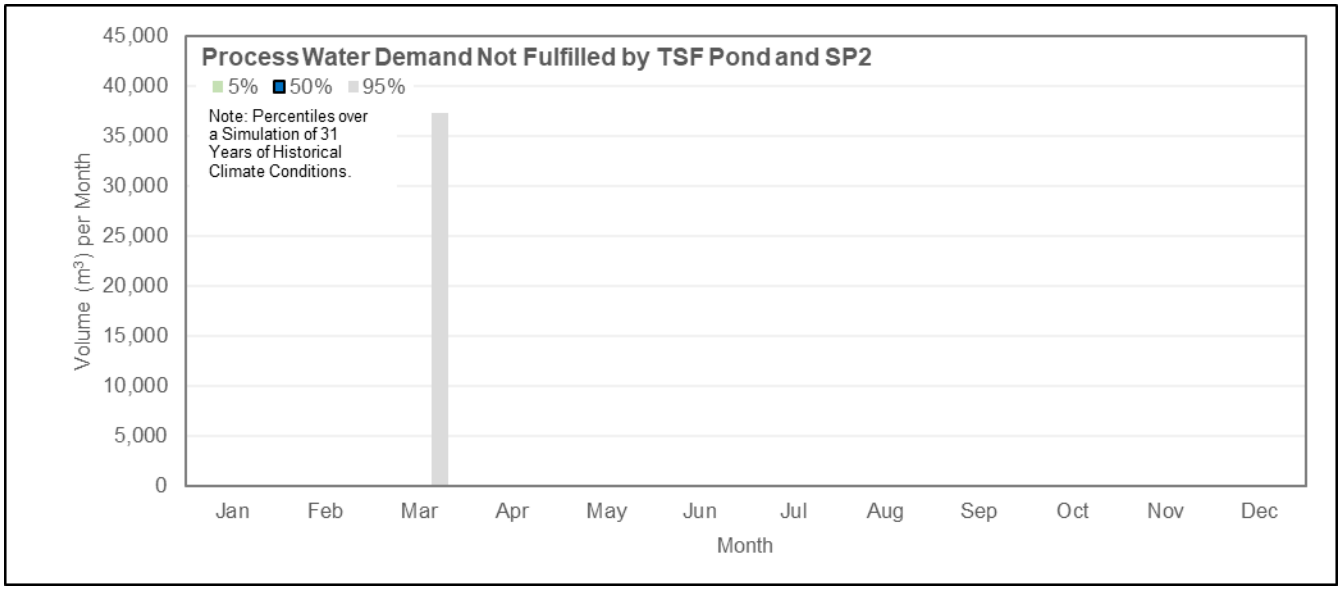


Figure C1.1 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 1/2 and Historical Climate Conditions

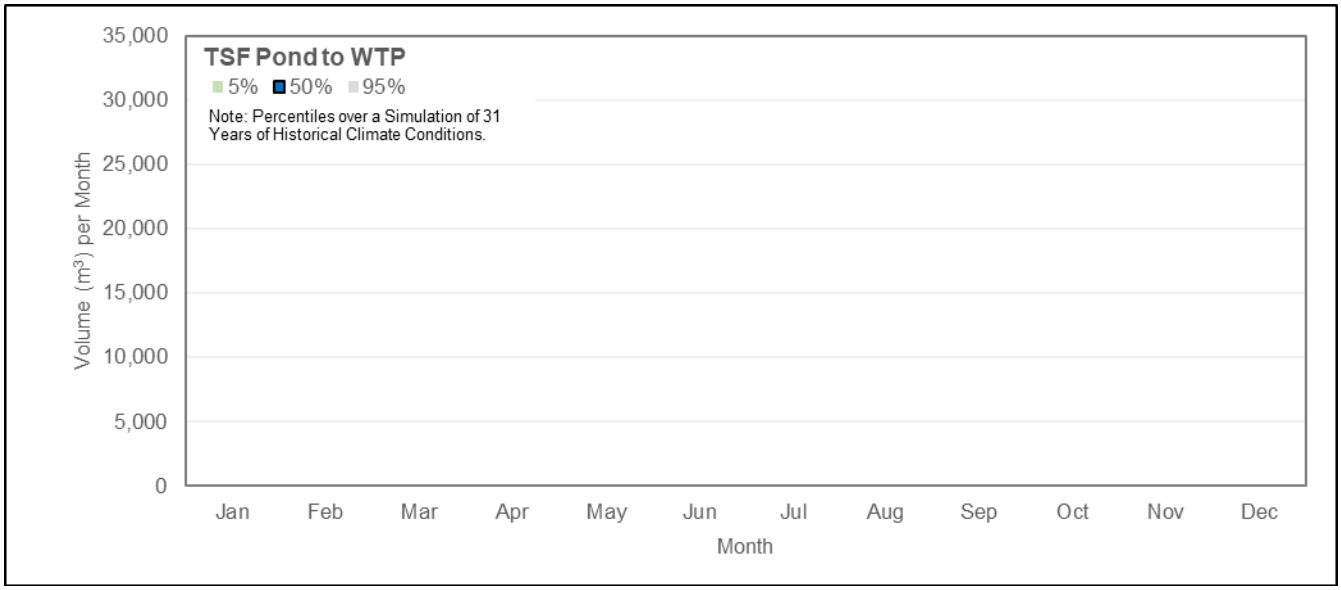


Figure C1.1 - 6: Estimated SP1 Effluent Fluxes for Year 1/2 and Historical Climate Conditions

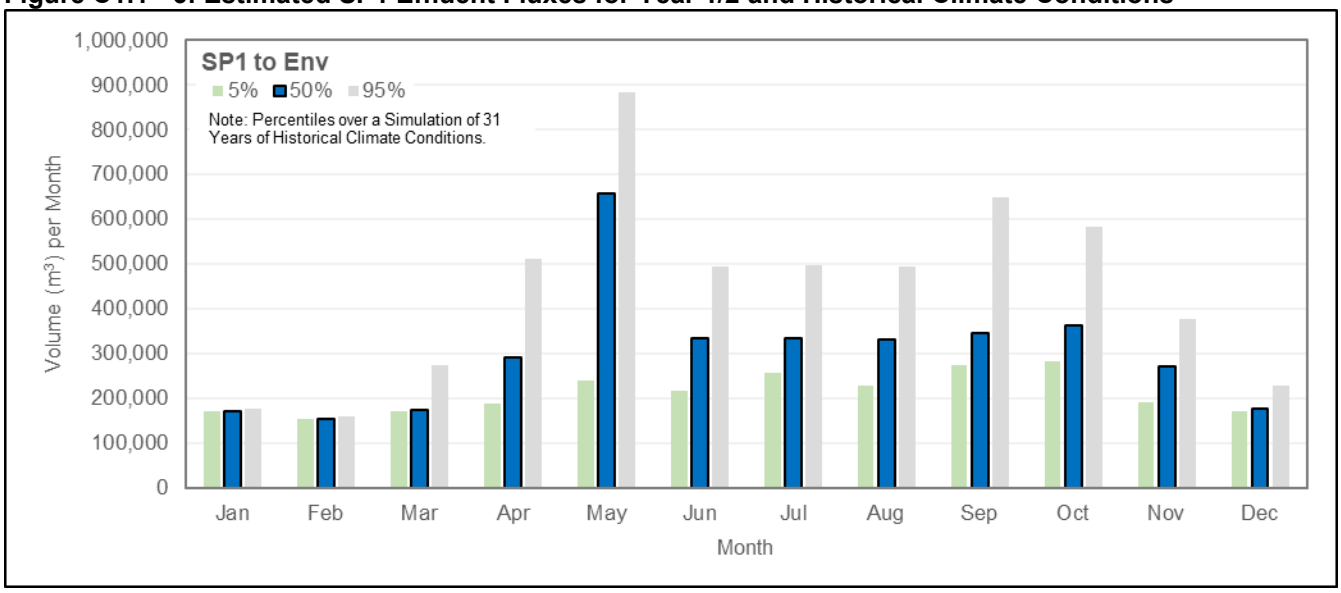


Figure C1.1 - 7: Estimated SP2 Effluent Fluxes for Year 1/2 and Historical Climate Conditions

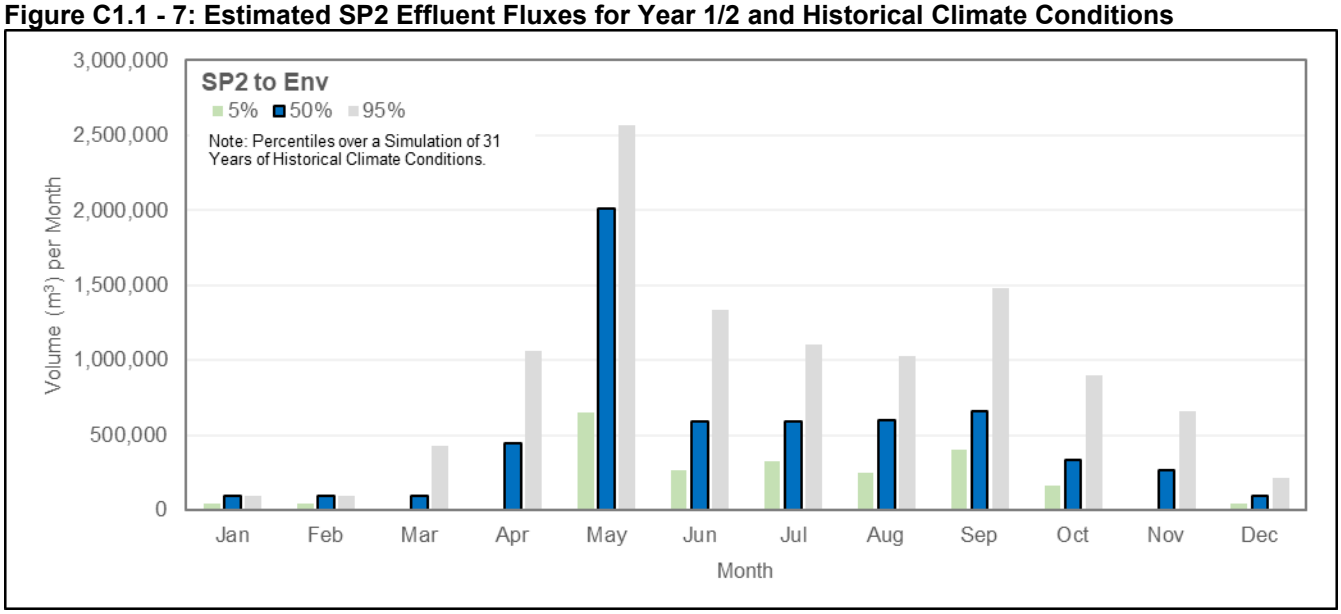


Figure C1.1 - 8: Estimated SP4 Effluent Fluxes for Year 1/2 and Historical Climate Conditions

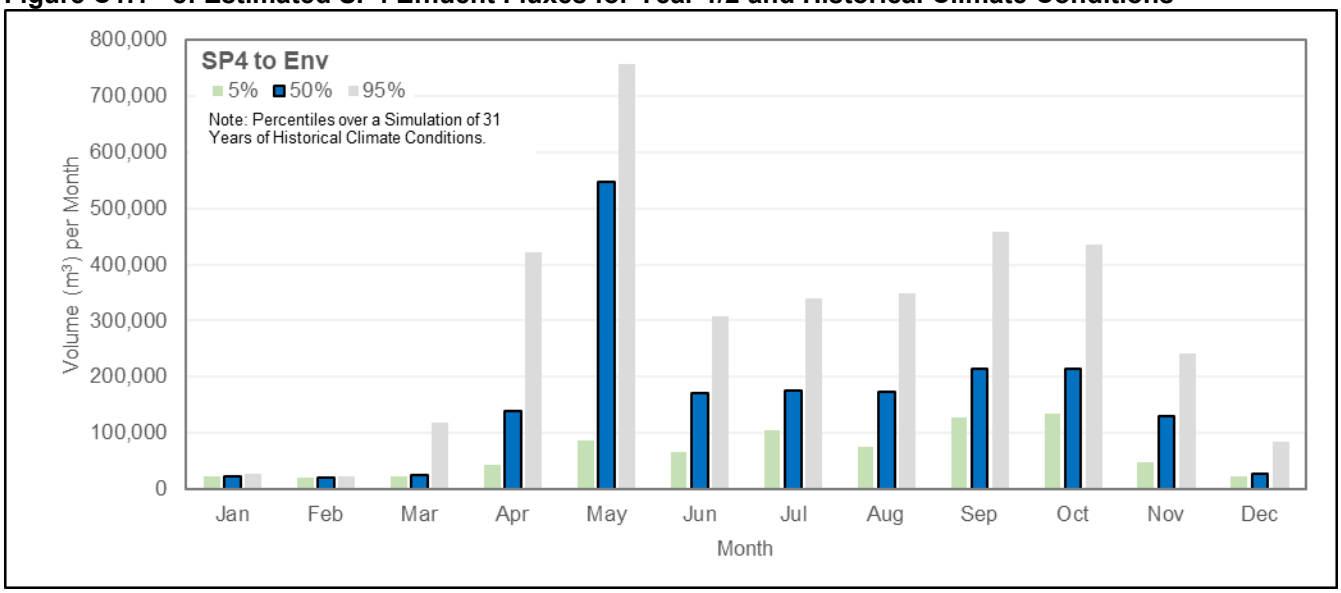


Figure C1.1 - 9: Estimated Total Effluent Fluxes for Year 1/2 and Historical Climate Conditions

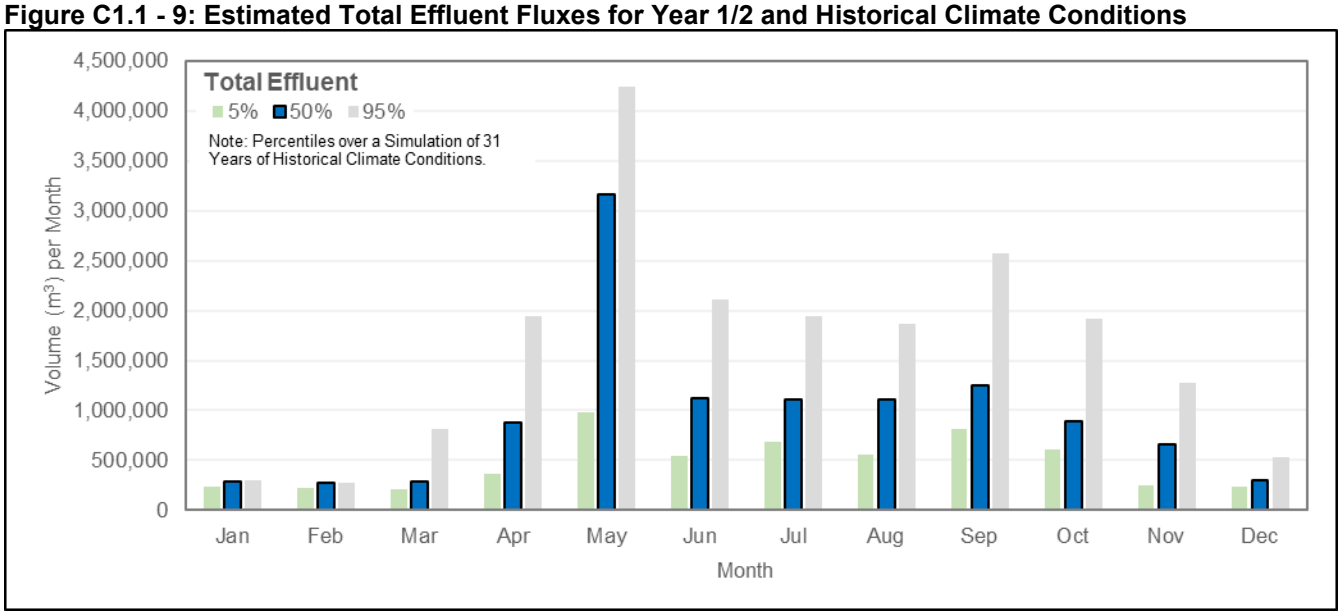
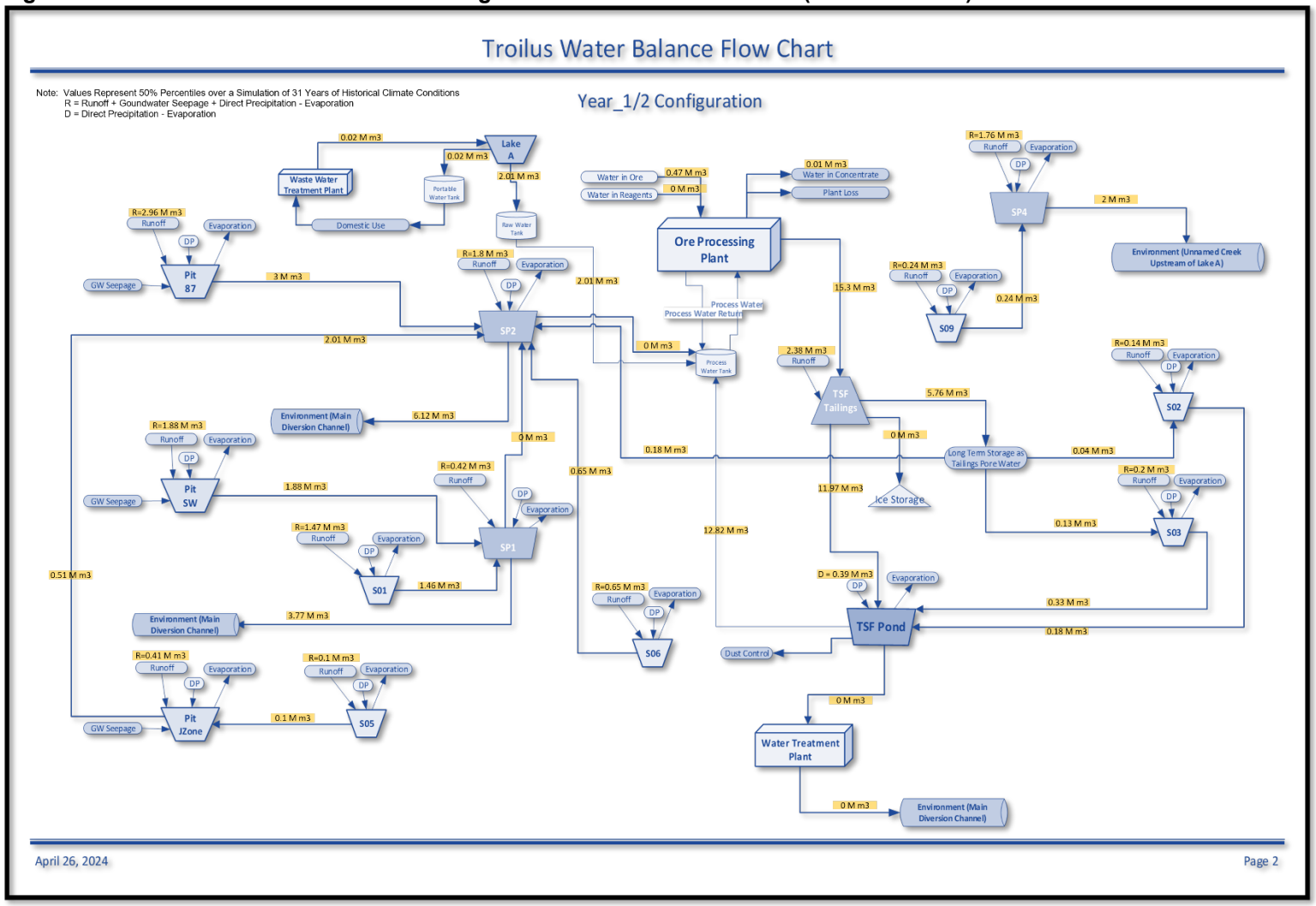


Figure C1.1 - 10: Estimated Annual Flow Diagram for Year 1/2 and Median (50th Percentile) Historical Climate Condition



1.2 Year 1/2 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP1 - 2.6

Figure C1.2 - 1: Estimated TSF Pond Water Levels for Year 1/2 and Climate Change Projection Scenario SSP1 - 2.6

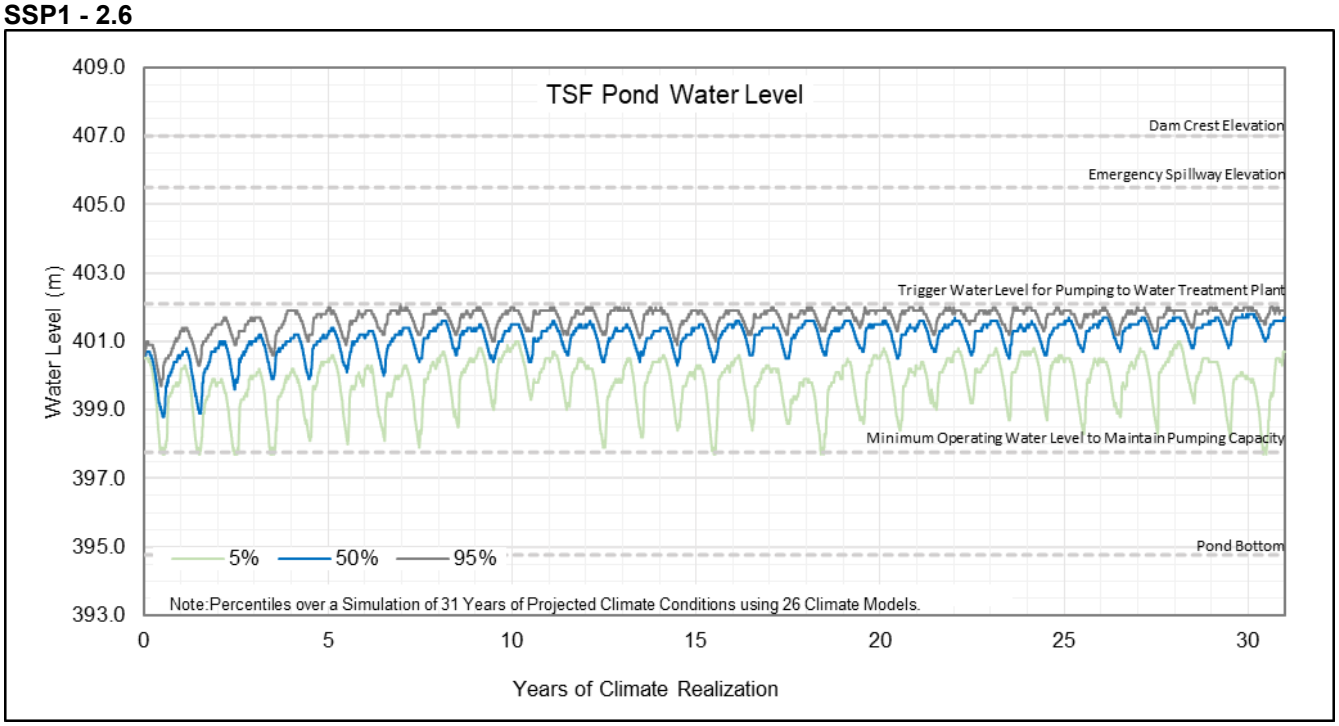


Figure C1.2 - 2: Estimated TSF Pond Water Volumes for Year 1/2 and Climate Change Projection Scenario SSP1 - 2.6

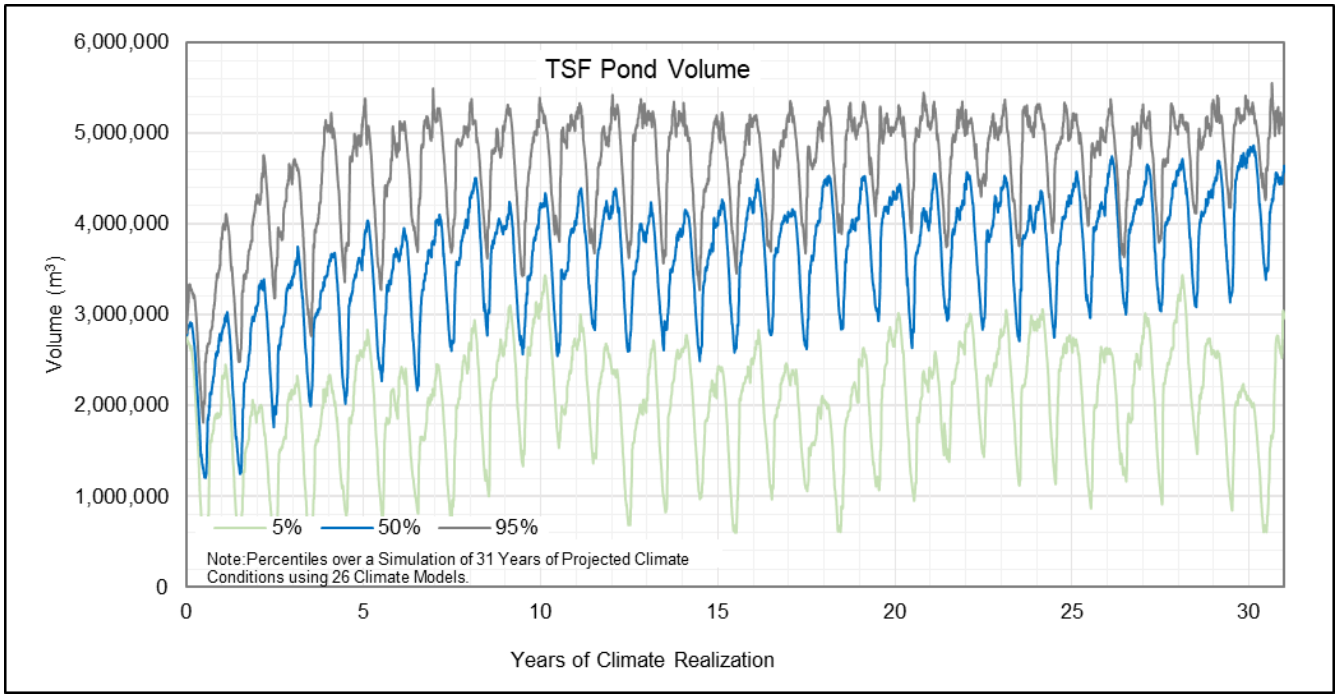


Figure C1.2 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 1/2 and Climate Change Projection Scenario SSP1 - 2.6

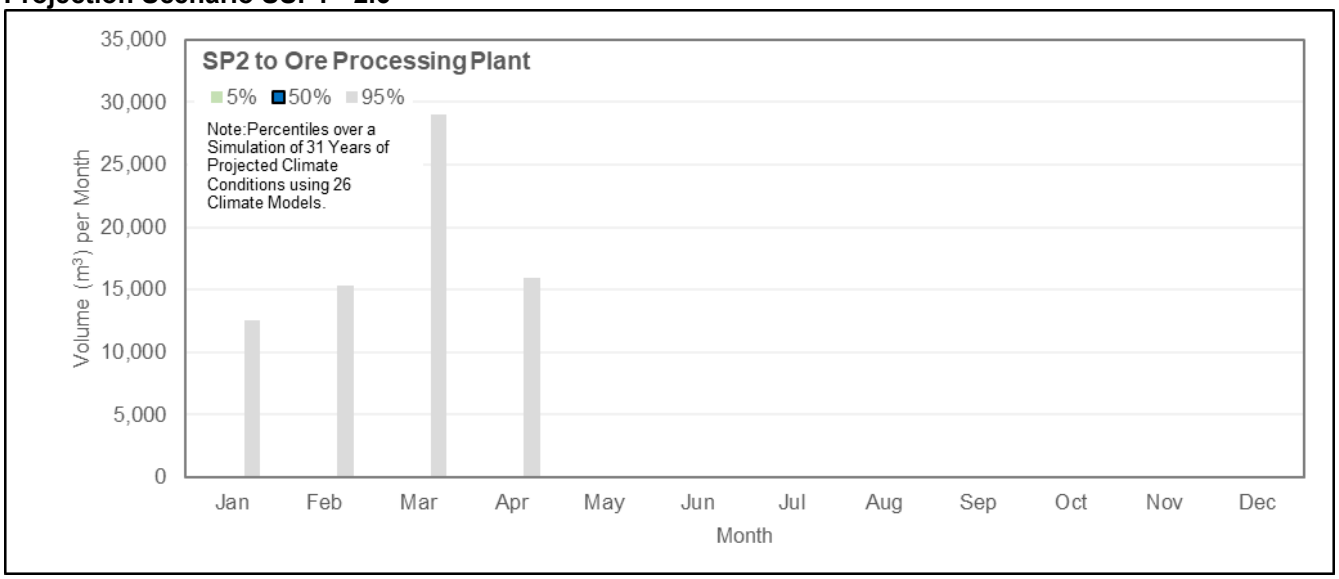


Figure C1.2 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 1/2 and Climate Change Projection Scenario SSP1 - 2.6

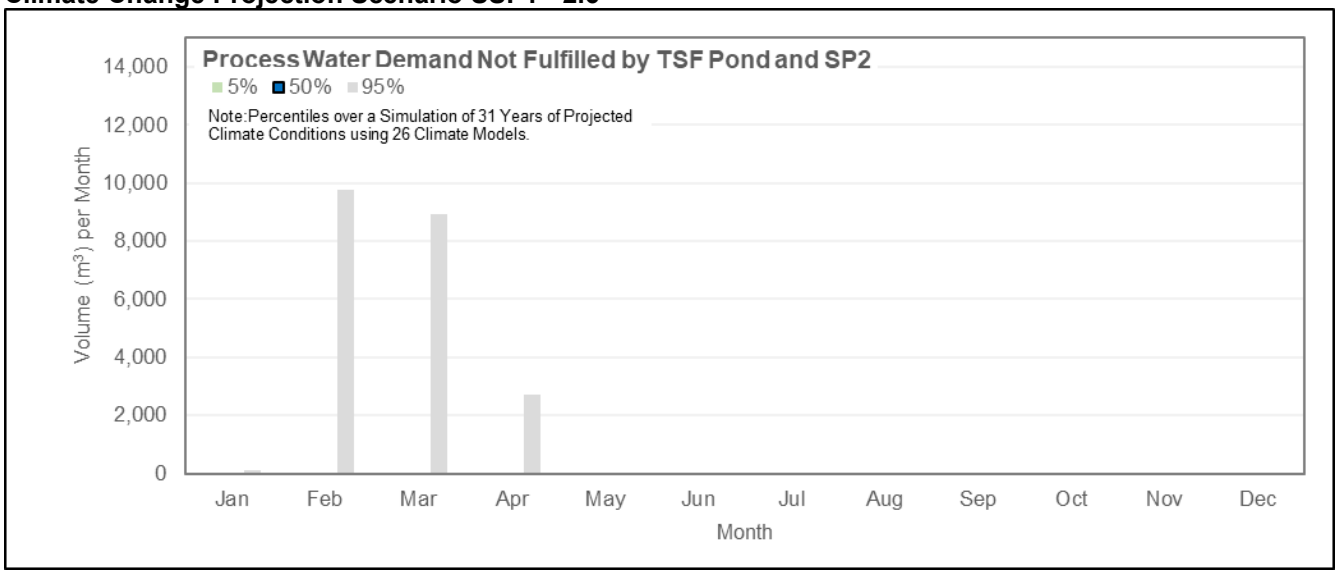


Figure C1.2 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP1 - 2.6

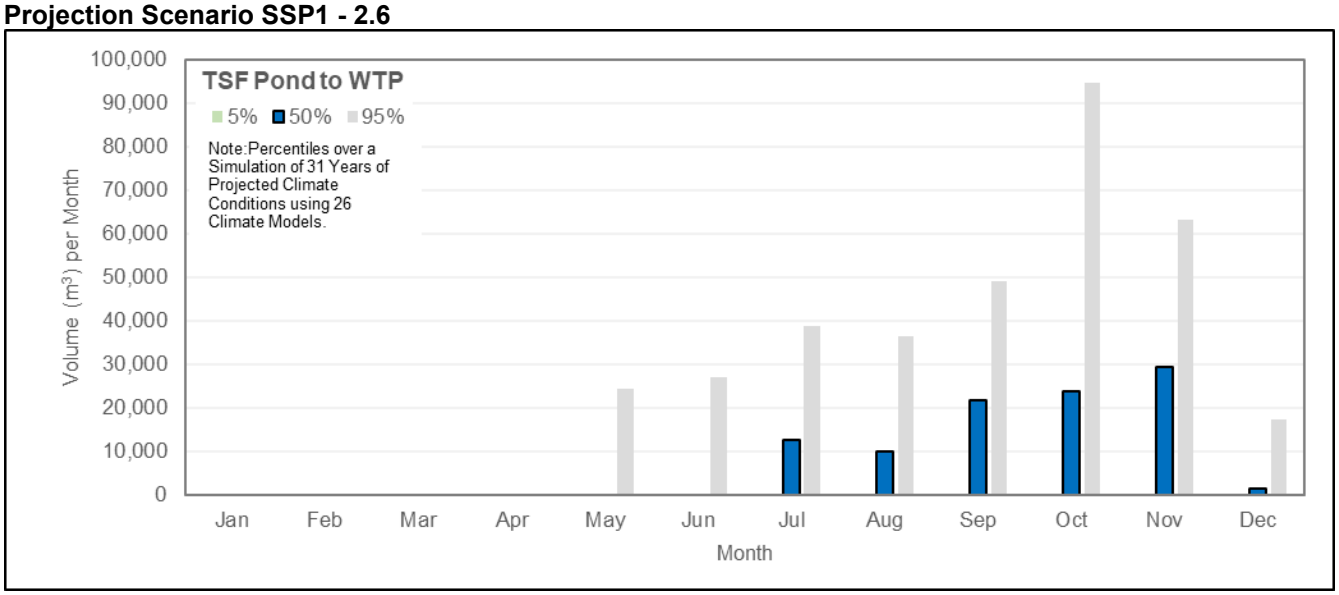


Figure C1.2 - 6: Estimated SP1 Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP1 - 2.6

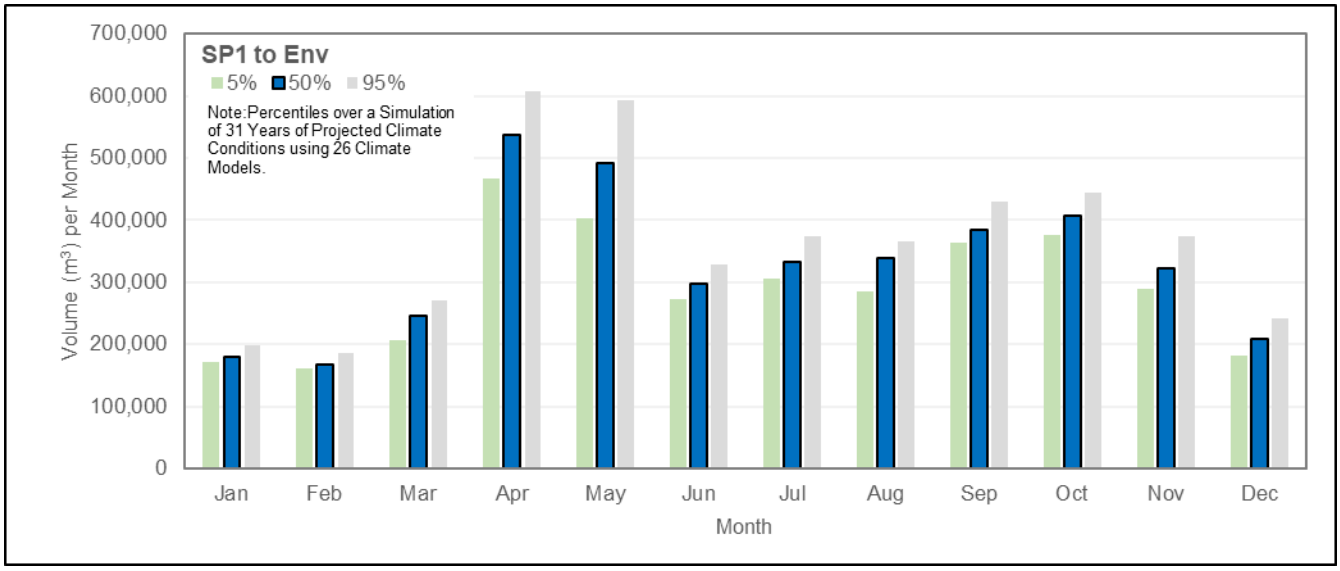


Figure C1.2 - 7: Estimated SP2 Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP1 - 2.6

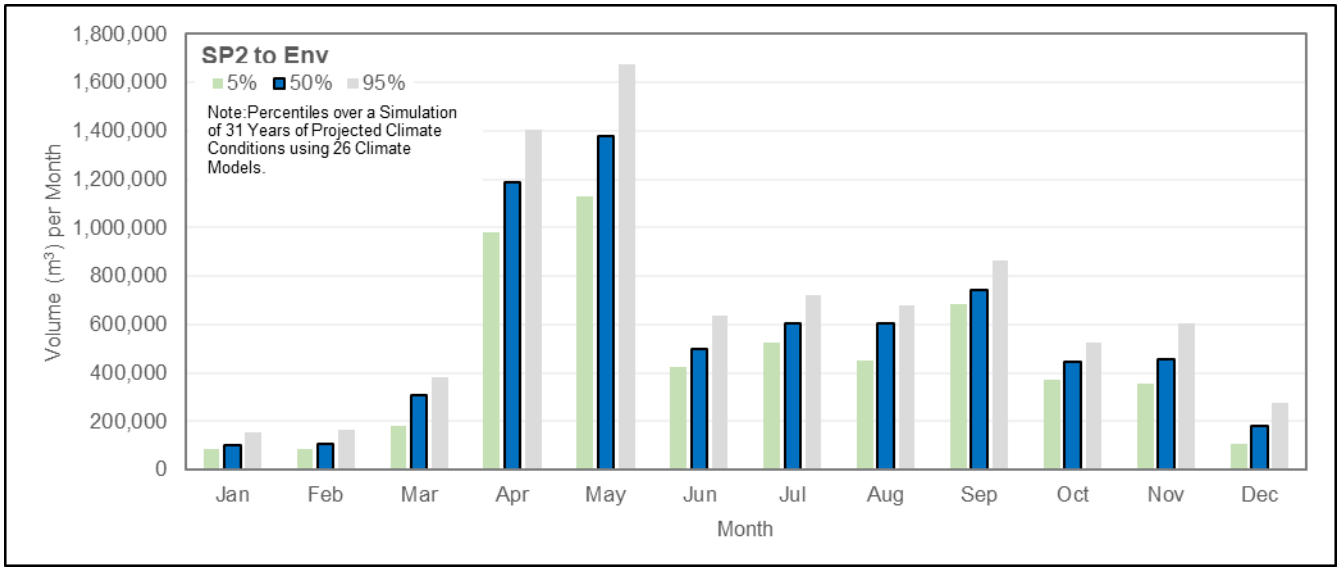


Figure C1.2 - 8: Estimated SP4 Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP1 - 2.6

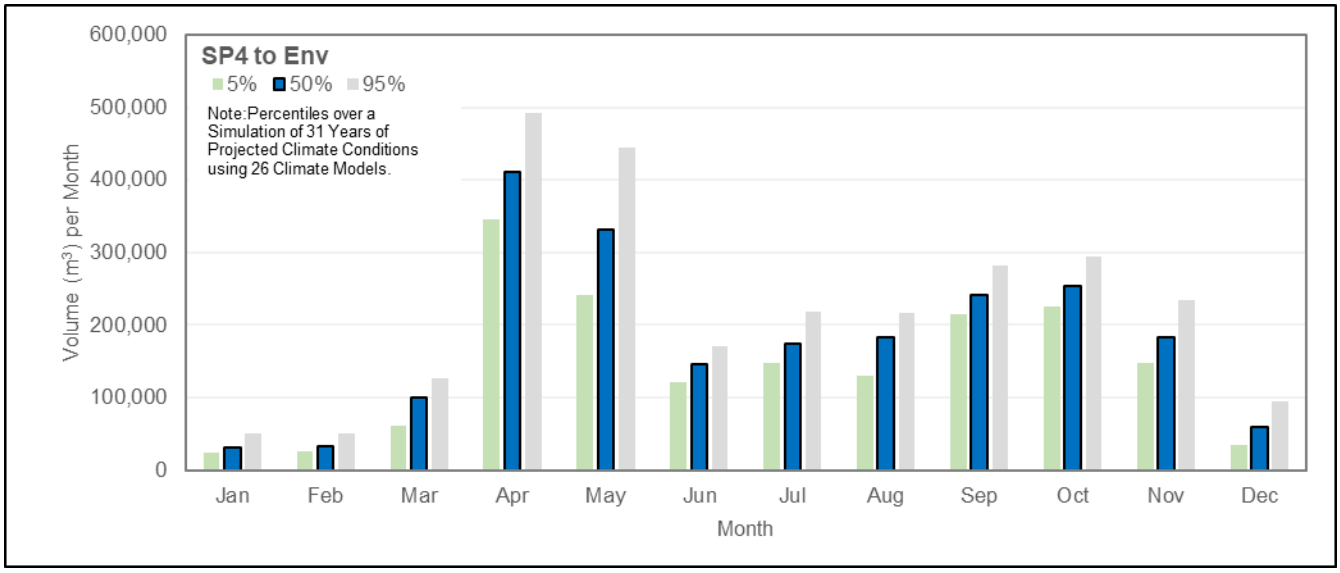
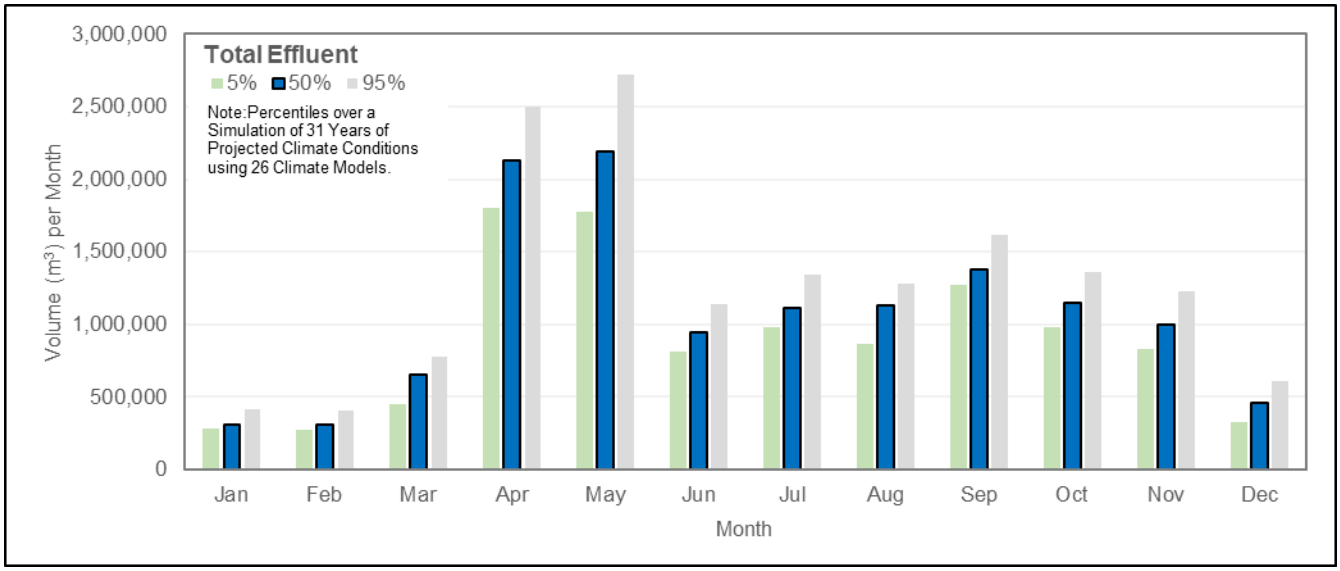


Figure C1.2 - 9: Estimated Total Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP1 - 2.6



1.3 Year 1/2 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP2 - 4.5

Figure C1.3 - 1: Estimated TSF Pond Water Levels for Year 1/2 and Climate Change Projection Scenario SSP2 - 4.5

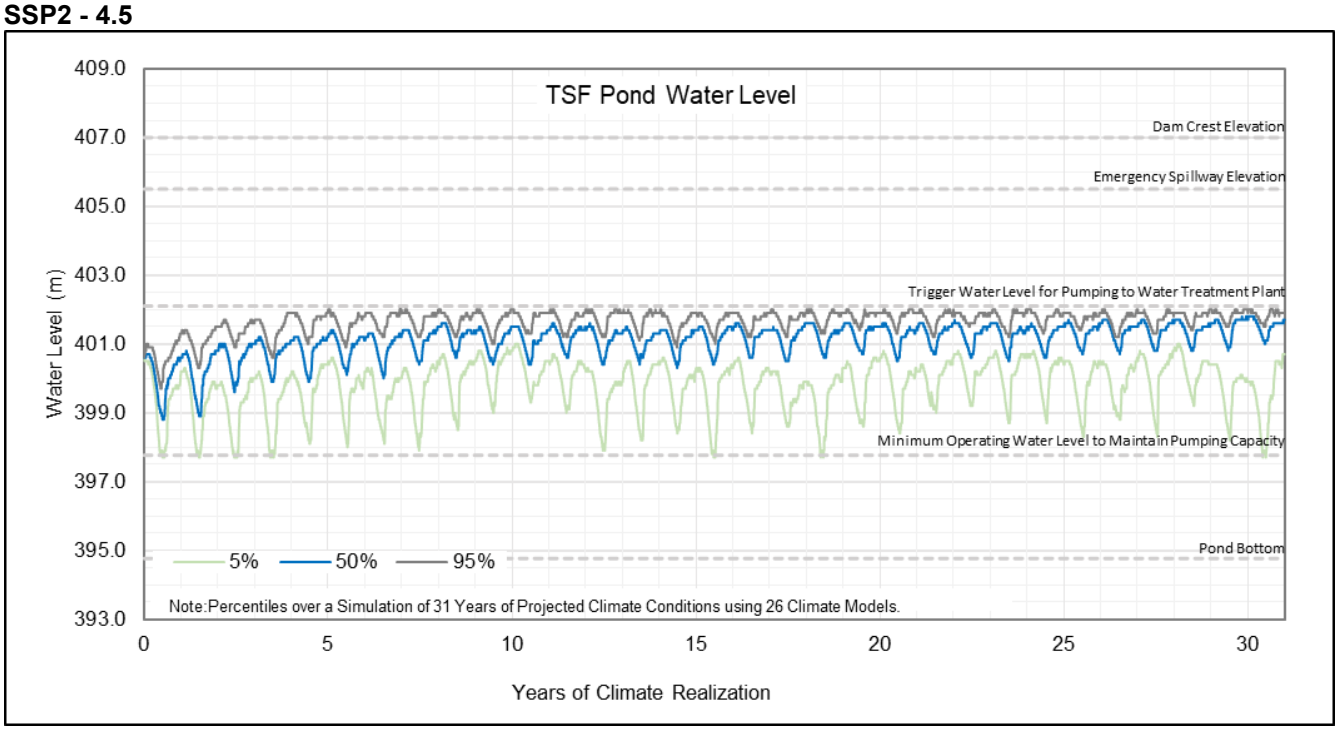


Figure C1.3 - 2: Estimated TSF Pond Water Volumes for Year 1/2 and Climate Change Projection Scenario SSP2 - 4.5

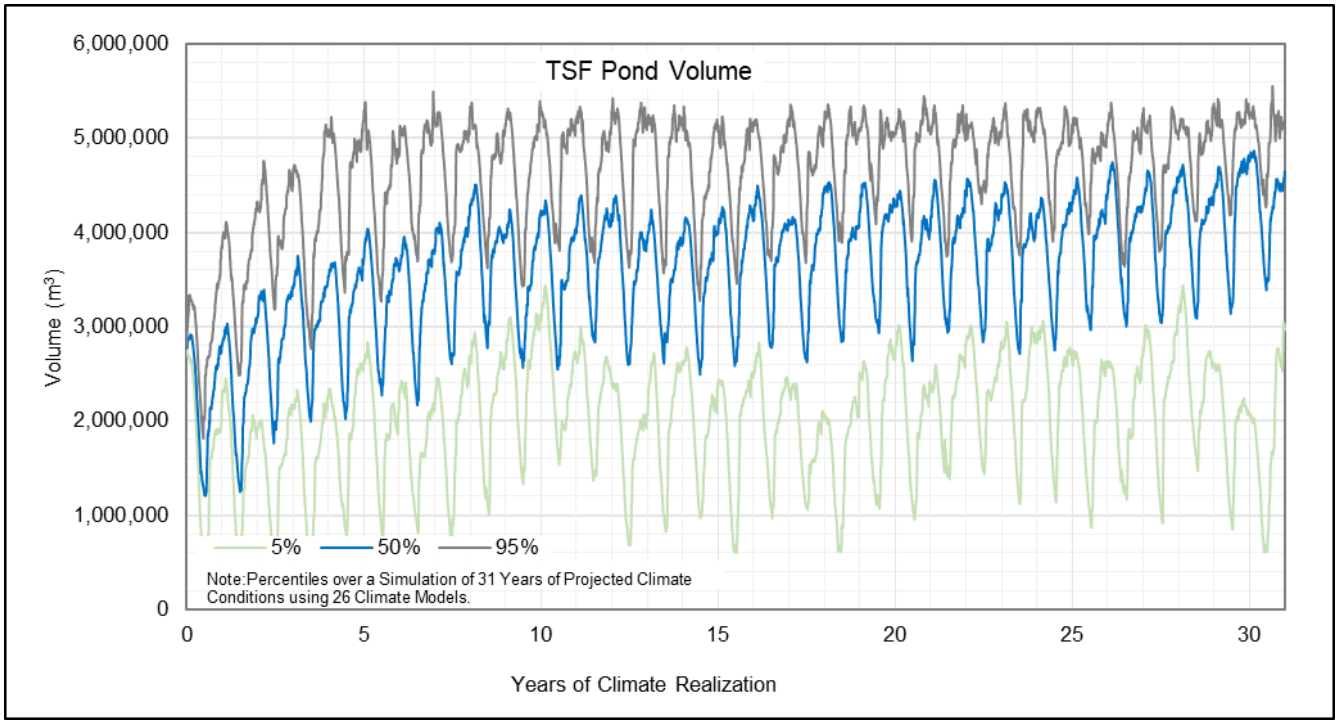


Figure C1.3 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 1/2 and Climate Change Projection Scenario SSP2 - 4.5

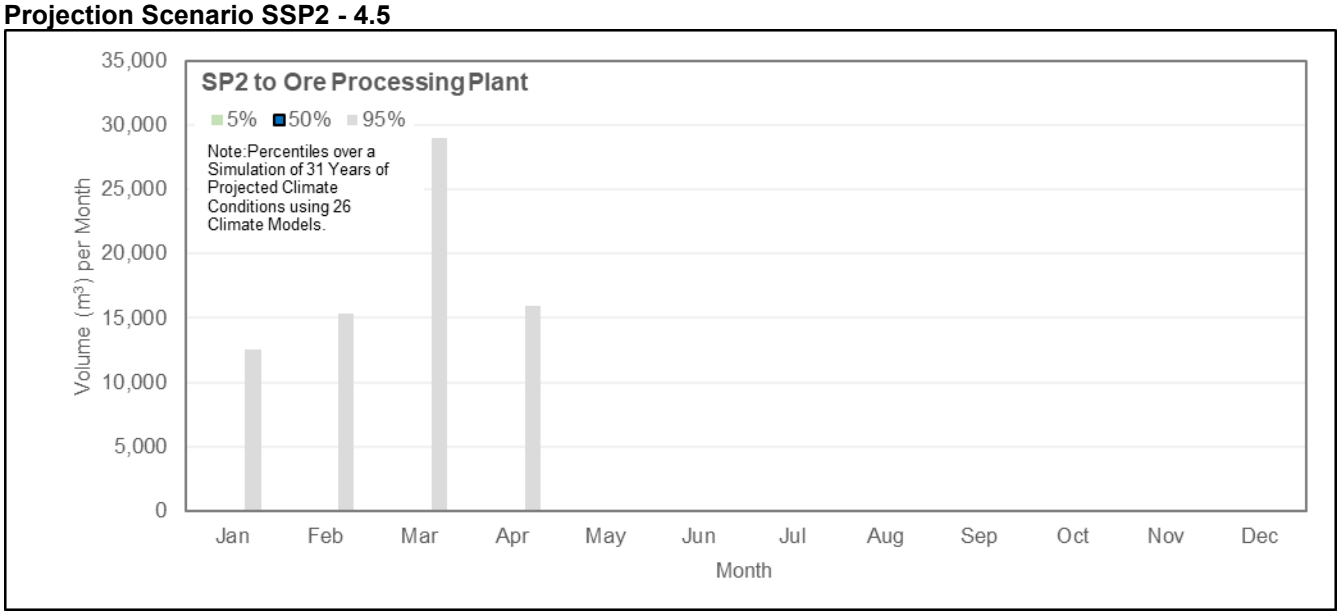


Figure C1.3 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 1/2 and Climate Change Projection Scenario SSP2 - 4.5

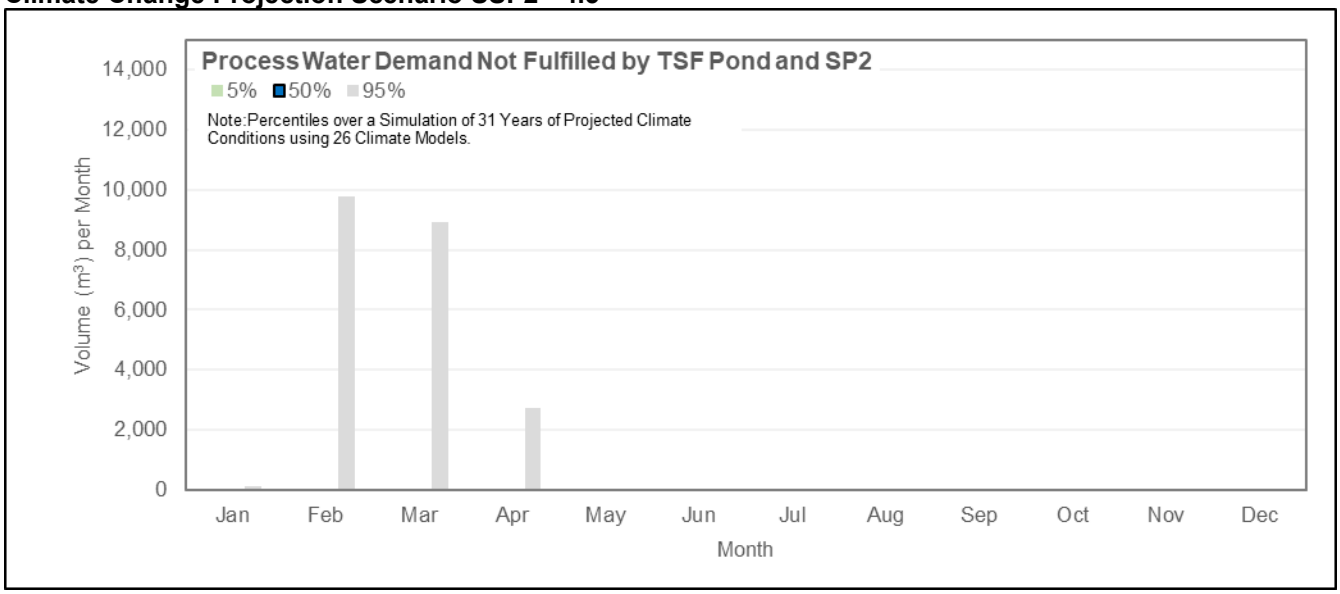


Figure C1.3 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP2 - 4.5

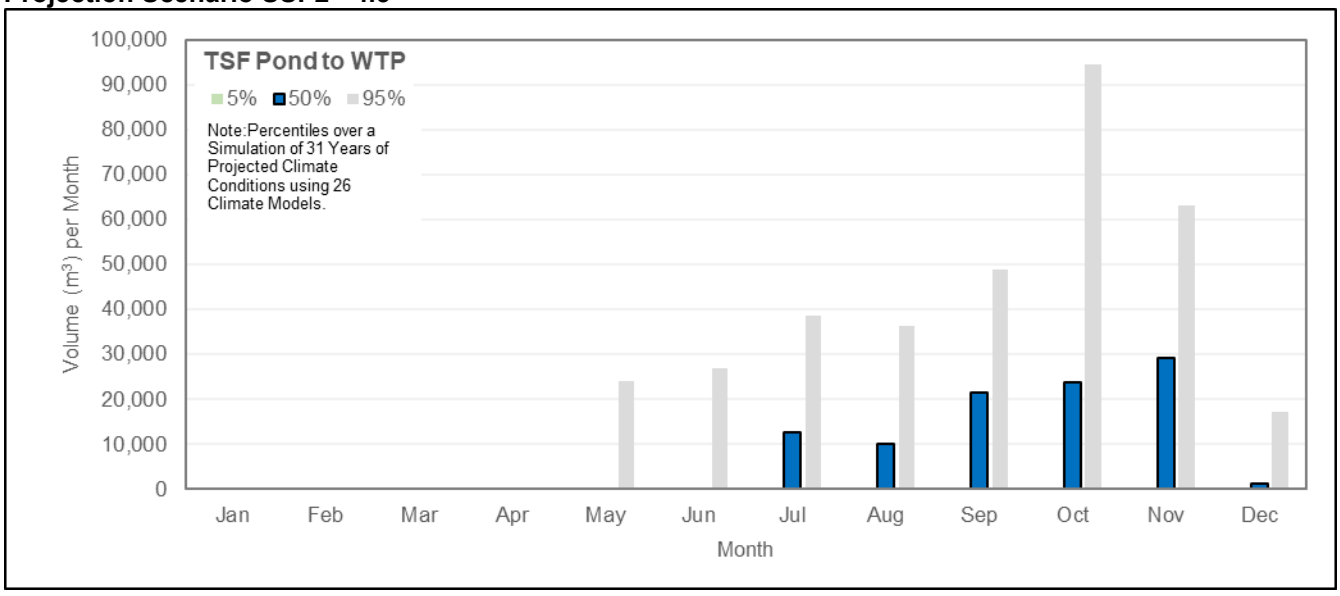


Figure C1.3 - 6: Estimated SP1 Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP2 - 4.5

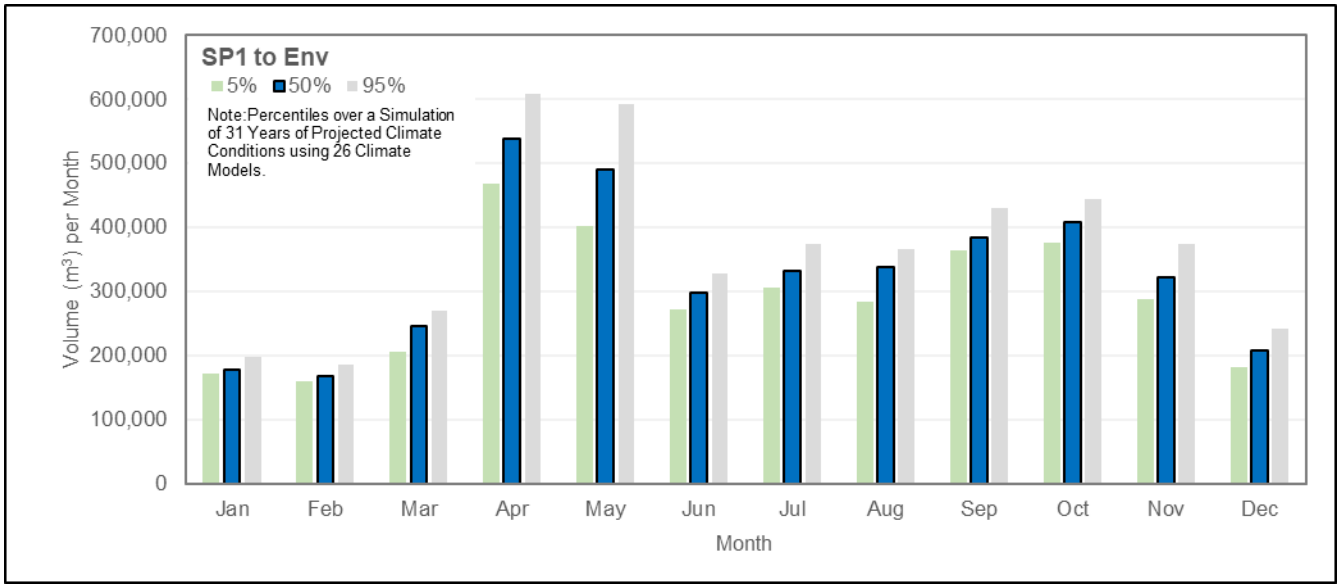


Figure C1.3 - 7: Estimated SP2 Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP2 - 4.5

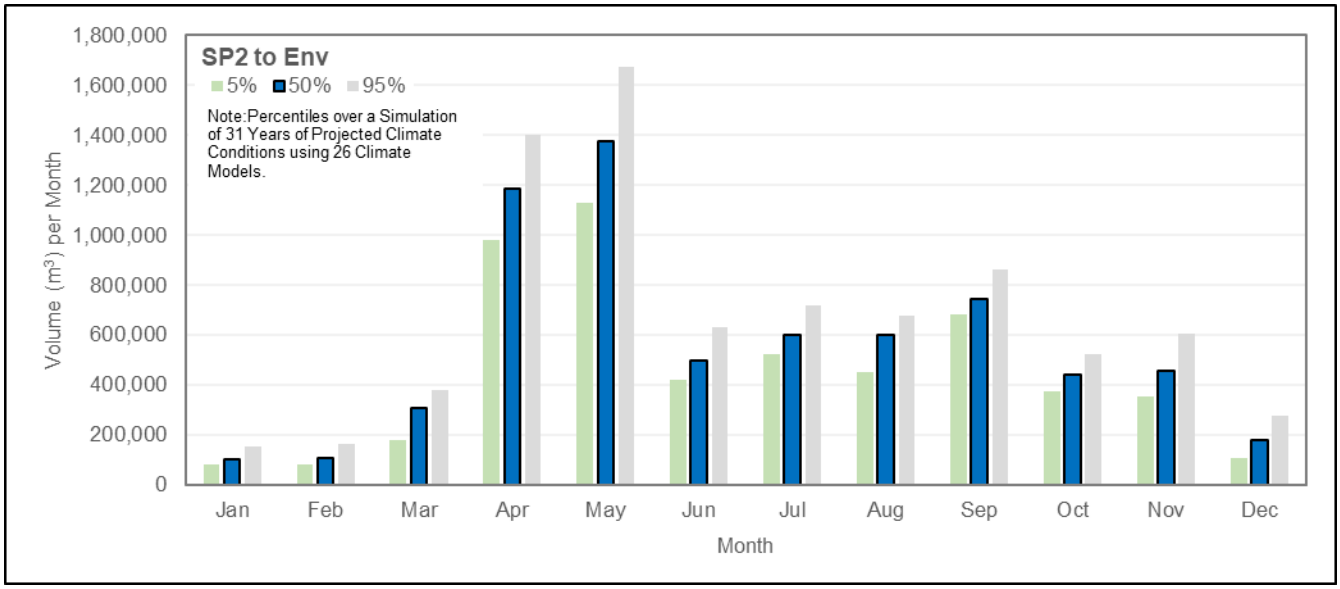


Figure C1.3 - 8: Estimated SP4 Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP2 - 4.5

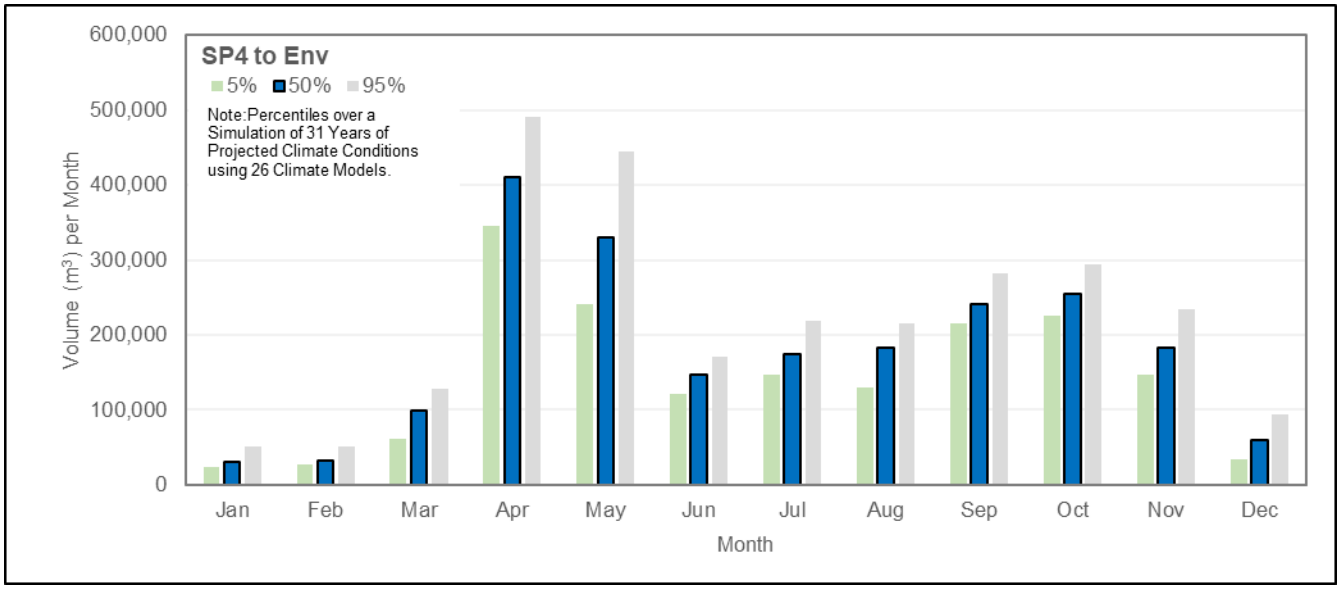
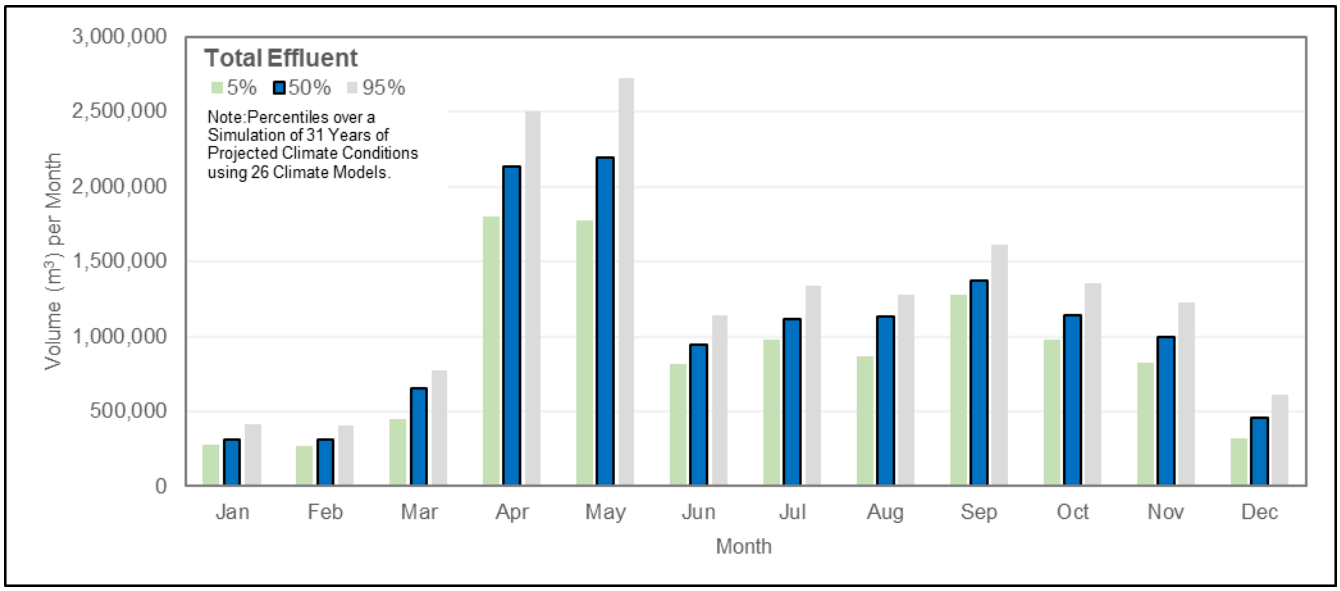


Figure C1.3 - 9: Estimated Total Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP2 - 4.5



1.4 Year 1/2 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP5 - 8.5

Figure C1.4 - 1: Estimated TSF Pond Water Levels for Year 1/2 and Climate Change Projection Scenario SSP5 - 8.5

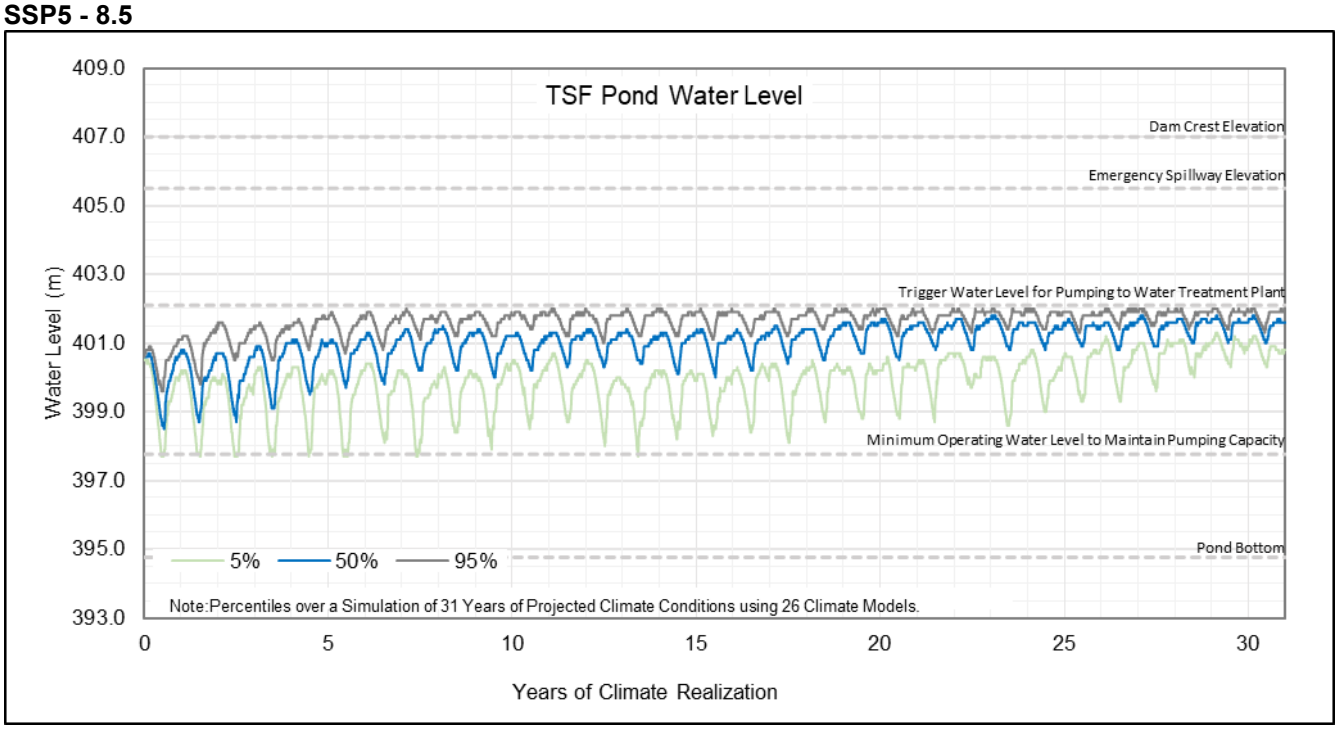


Figure C1.4 - 2: Estimated TSF Pond Water Volumes for Year 1/2 and Climate Change Projection Scenario SSP5 - 8.5

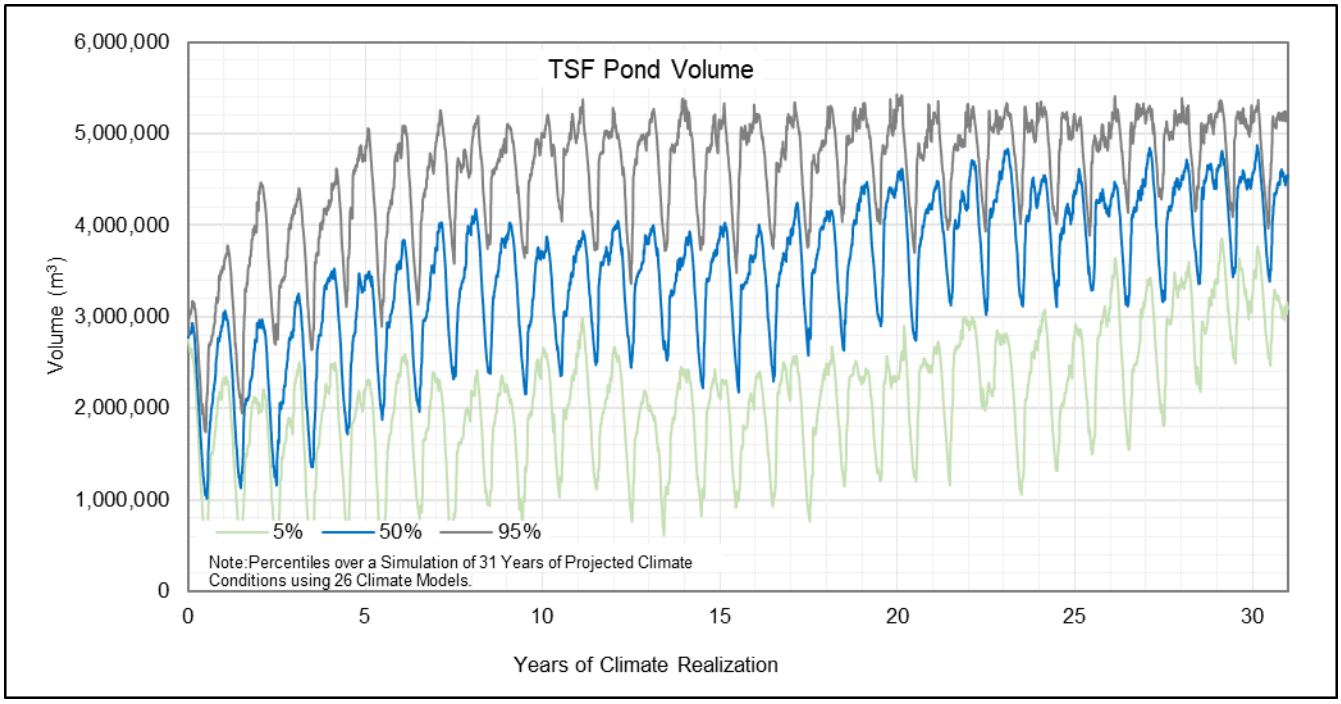


Figure C1.4 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 1/2 and Climate Change Projection Scenario SSP5 - 8.5

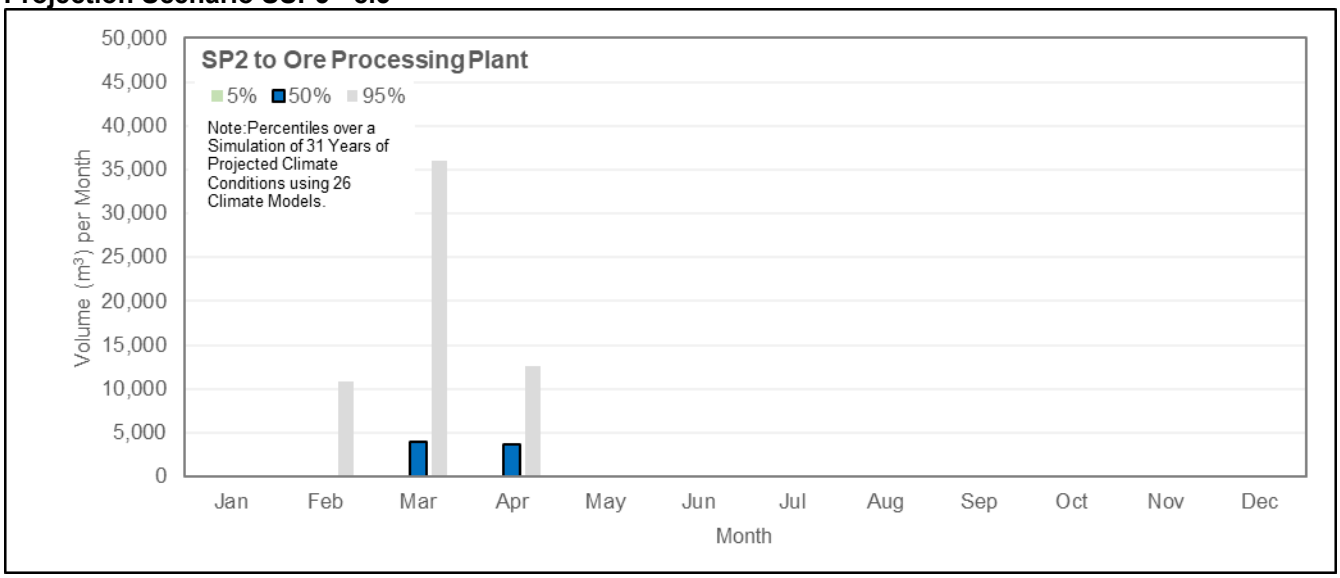


Figure C1.4 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 1/2 and Climate Change Projection Scenario SSP5 - 8.5

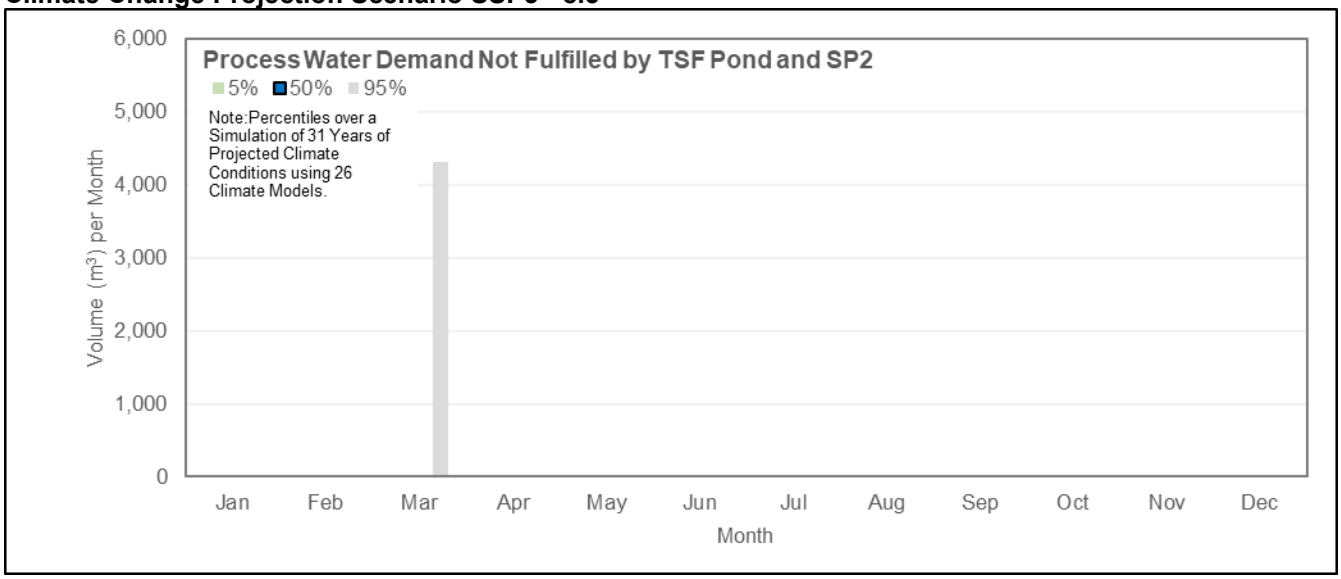


Figure C1.4 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP5 - 8.5

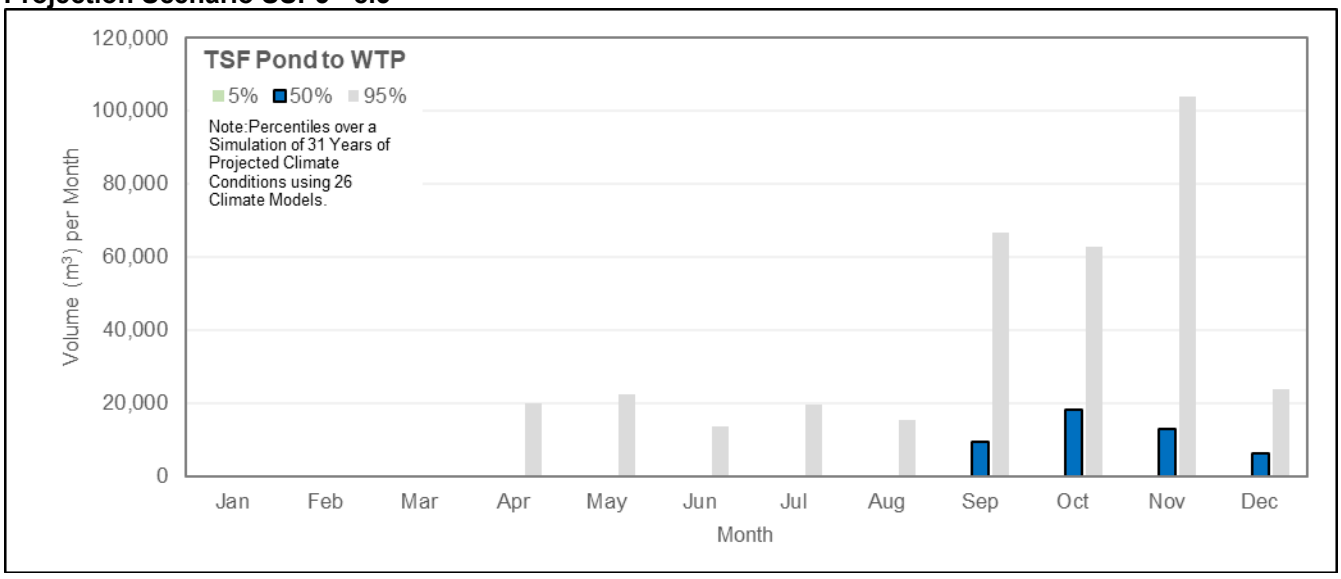


Figure C1.4 - 6: Estimated SP1 Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP5 - 8.5

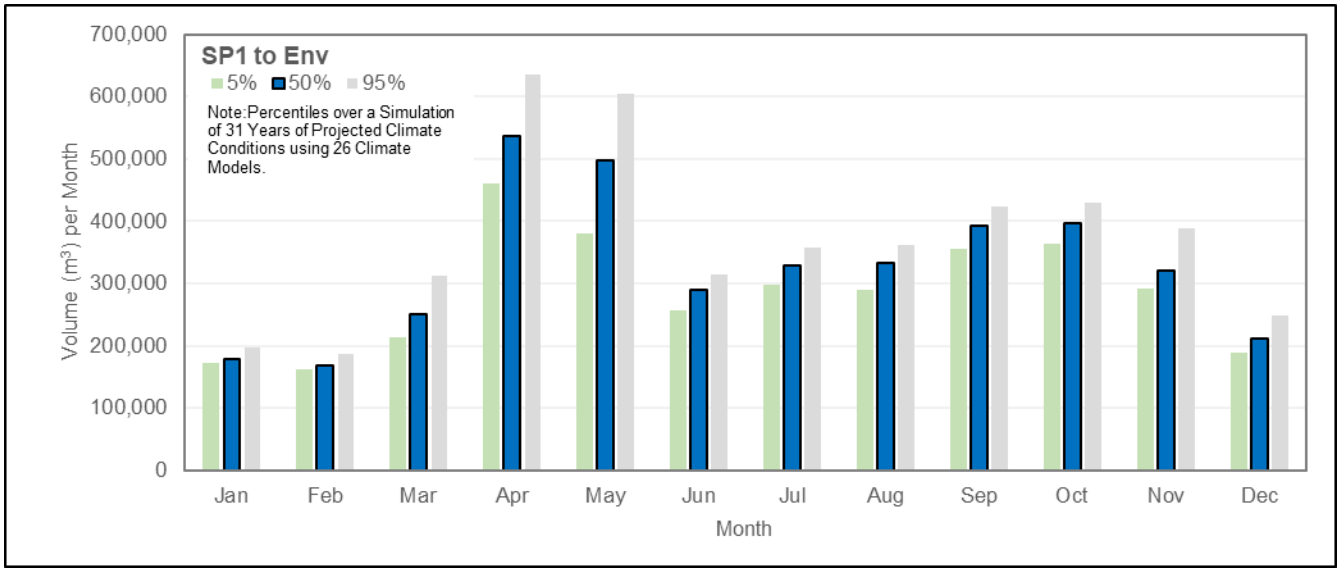


Figure C1.4 - 7: Estimated SP2 Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP5 - 8.5

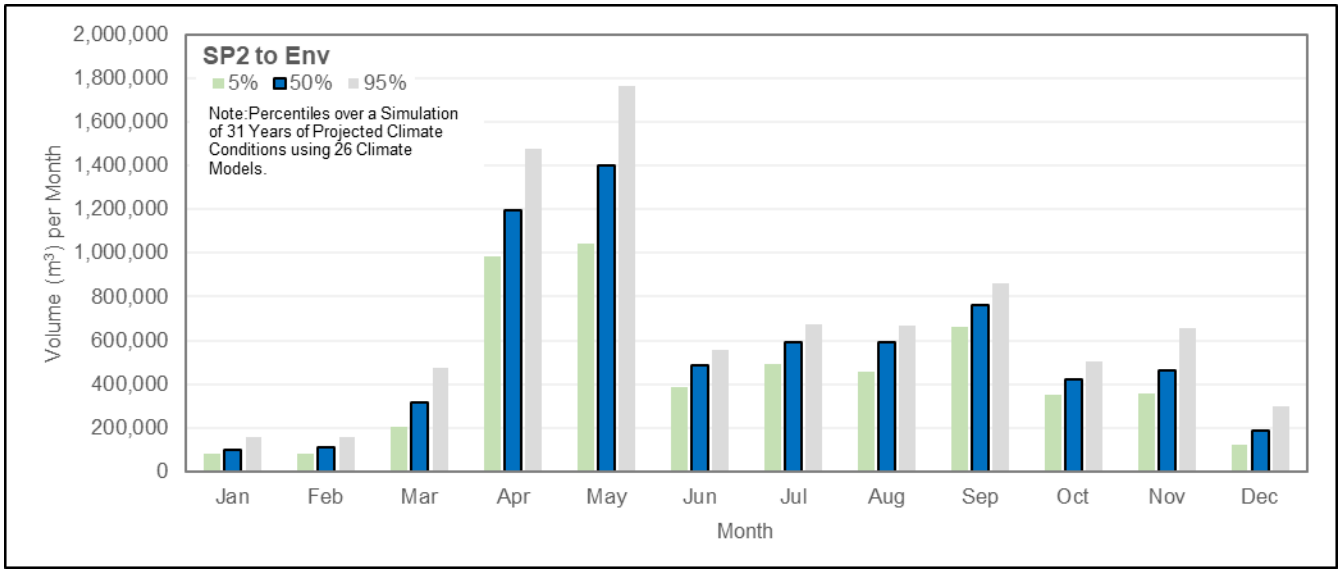


Figure C1.4 - 8: Estimated SP4 Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP5 - 8.5

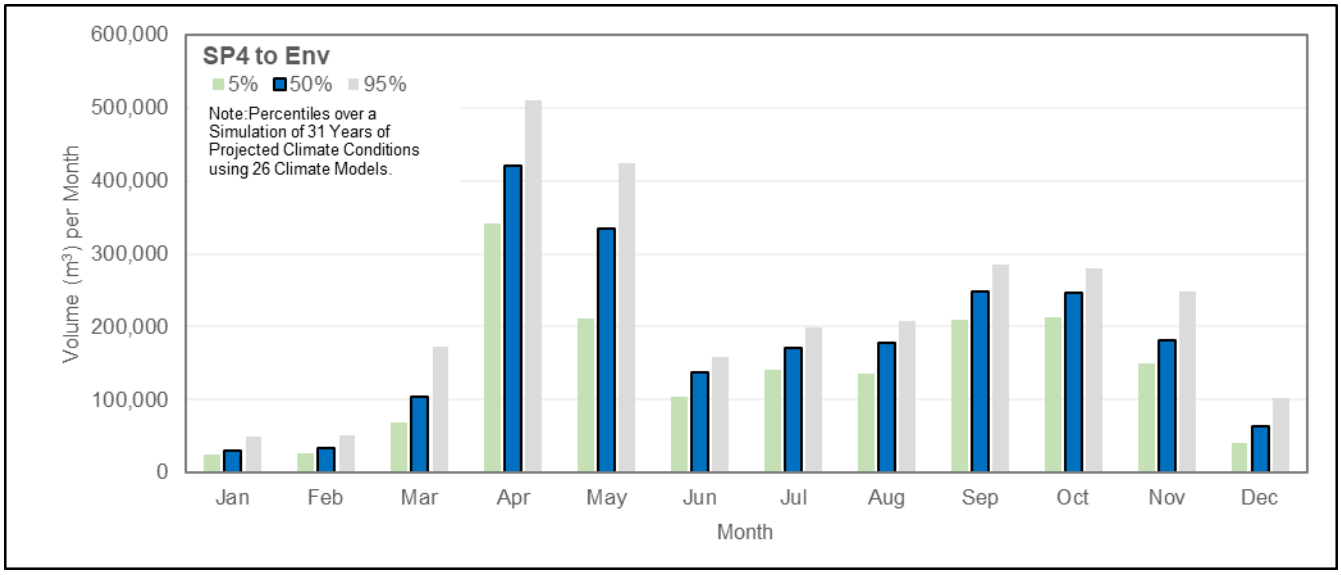
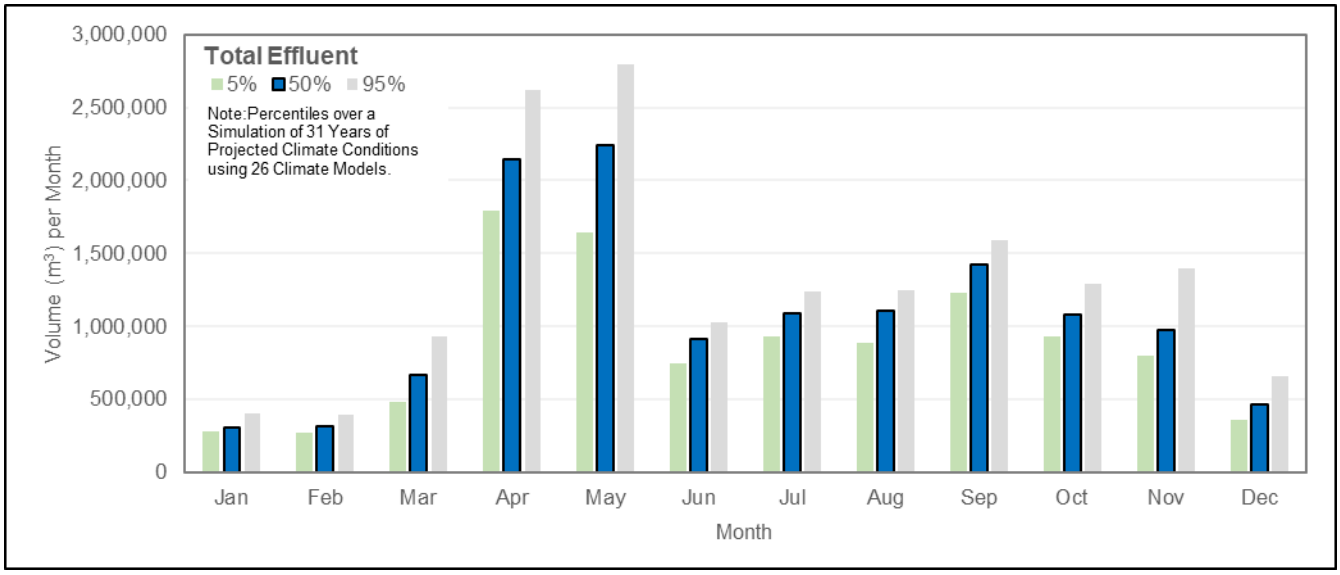


Figure C1.4 - 9: Estimated Total Effluent Fluxes for Year 1/2 and Climate Change Projection Scenario SSP5 - 8.5



1.5 Year 1/2 – Simulation of Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

Figure C1.5 - 1: Estimated TSF Pond Water Levels for Year 1/2 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

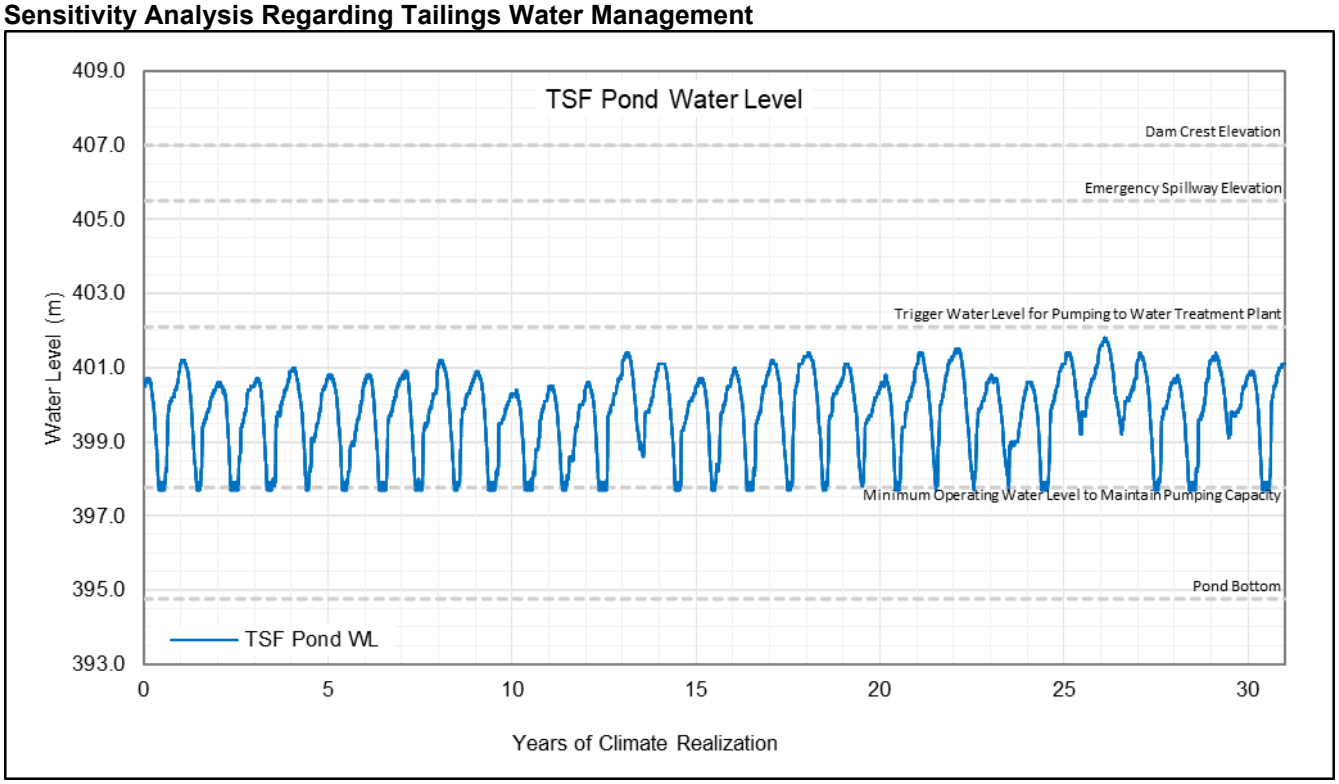


Figure C1.5 - 2: Estimated TSF Pond Water Volumes for Year 1/2 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

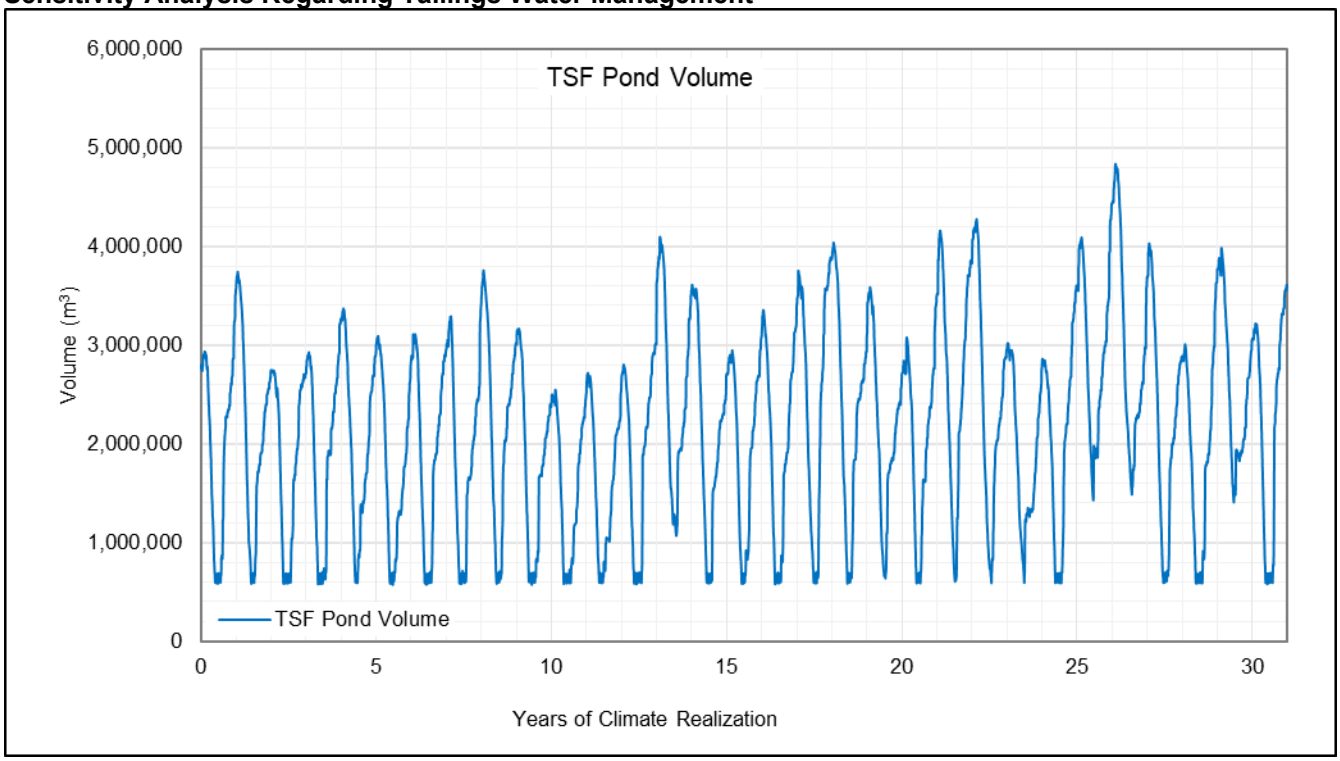


Figure C1.5 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 1/2 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

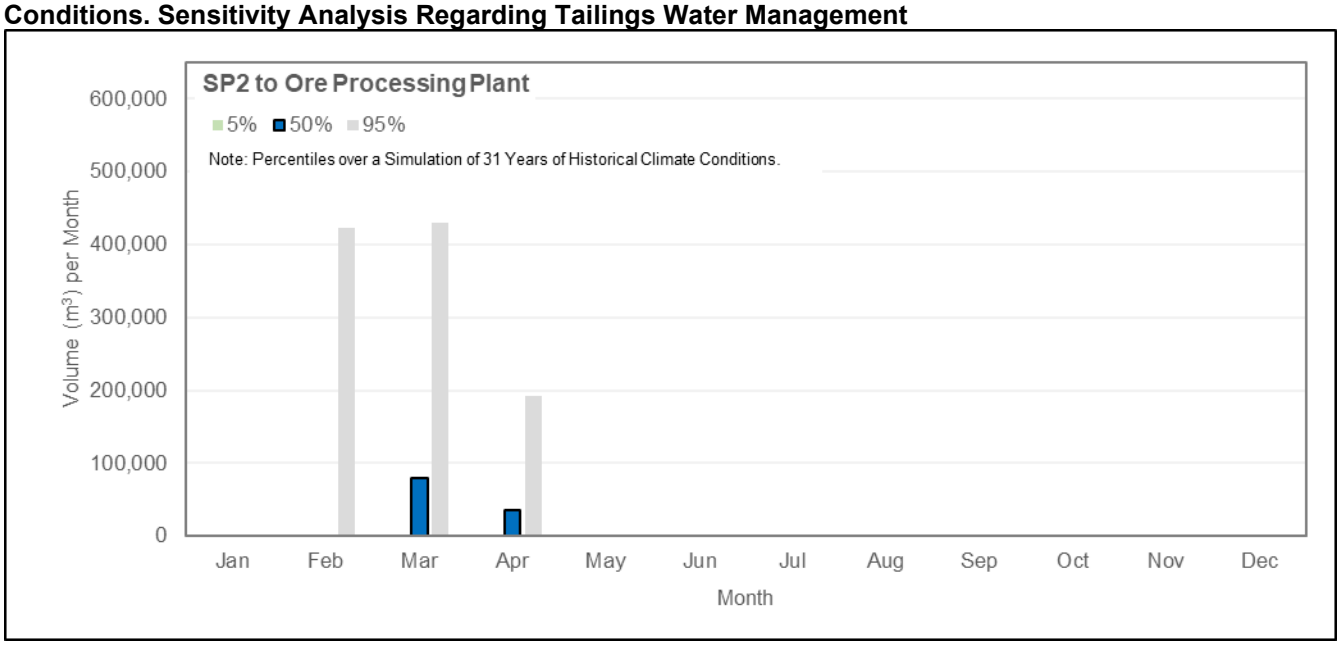


Figure C1.5 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 1/2 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

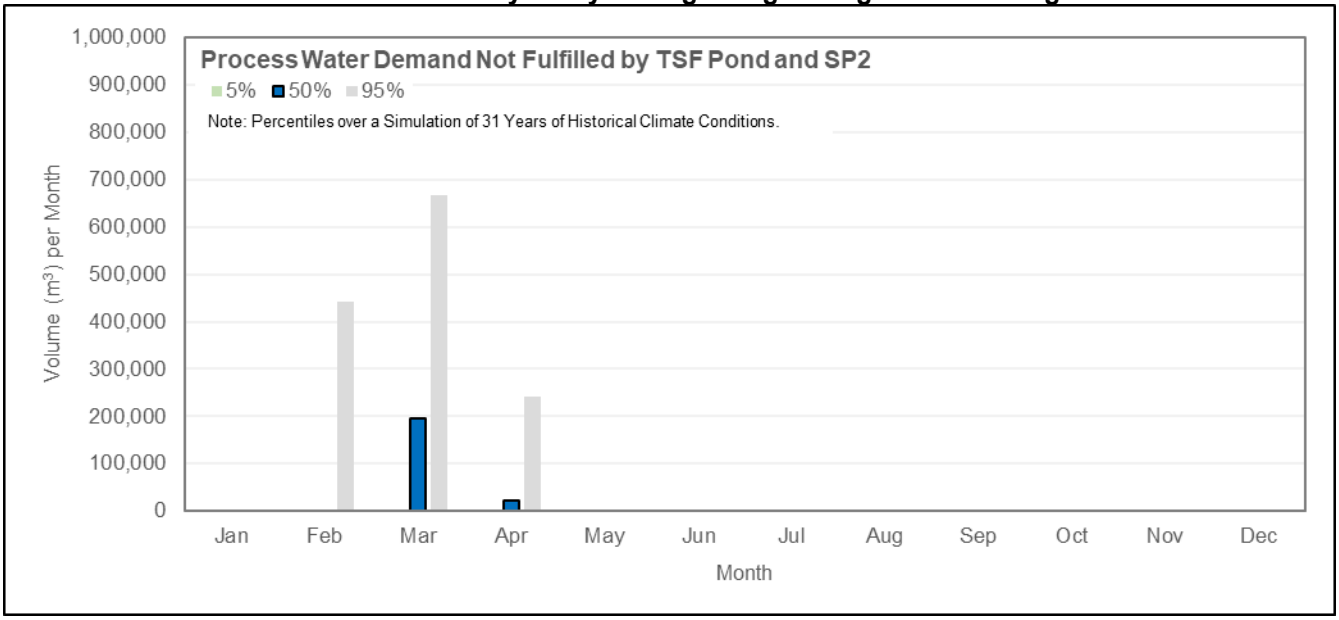


Figure C1.5 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 1/2 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

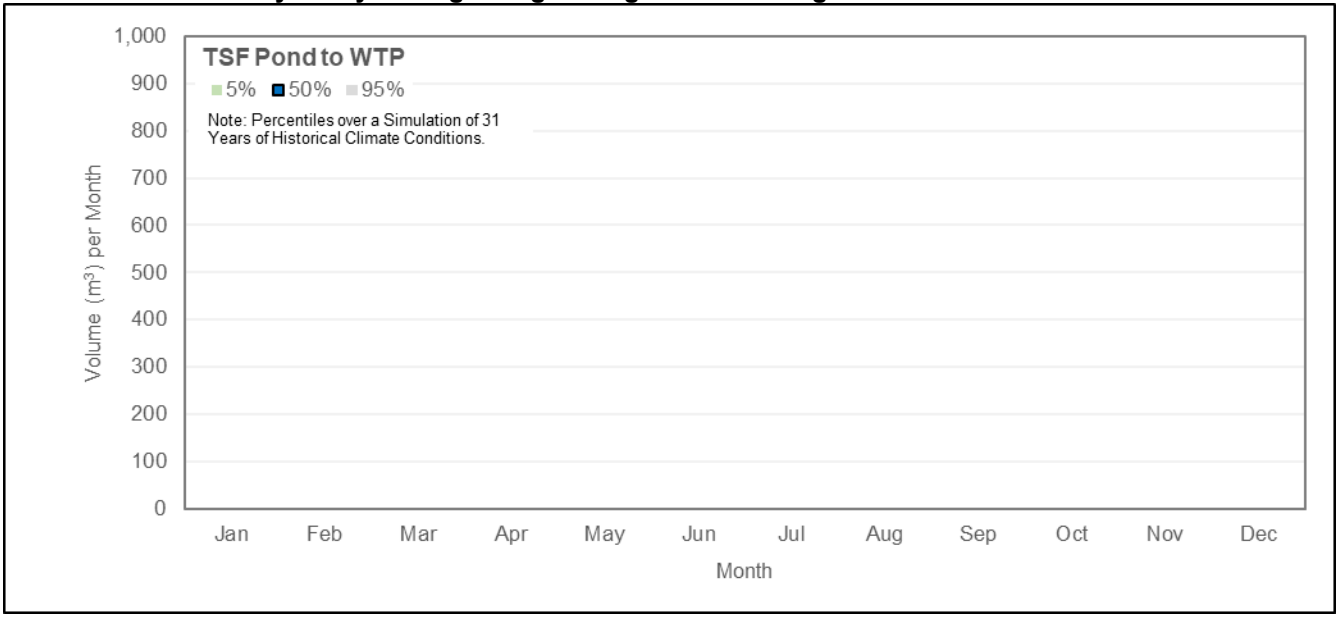


Figure C1.5 - 6: Estimated SP1 Effluent Fluxes for Year 1/2 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

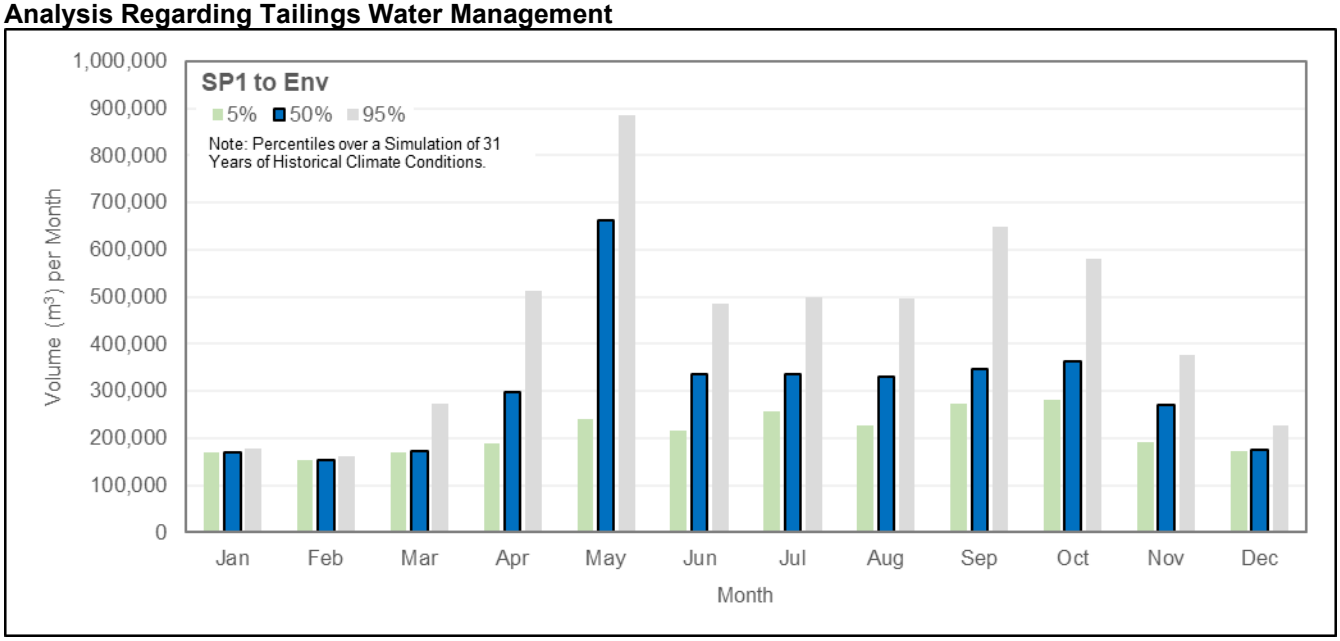


Figure C1.5 - 7: Estimated SP2 Effluent Fluxes for Year 1/2 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

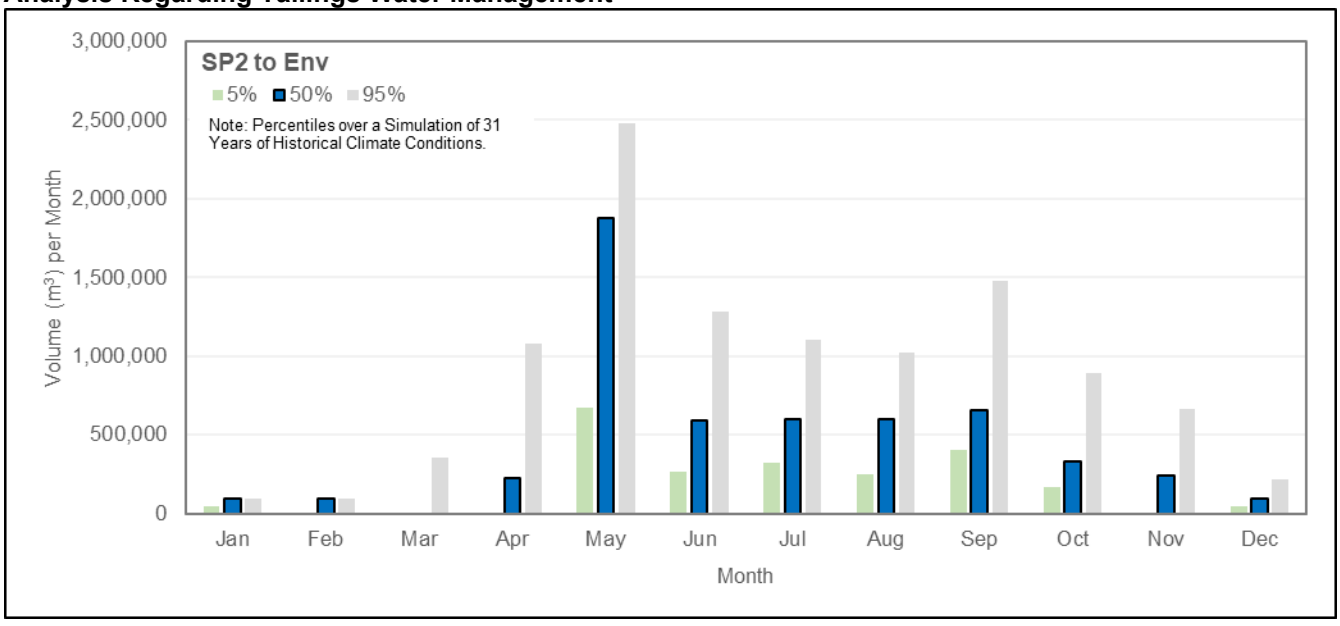


Figure C1.5 - 8: Estimated SP4 Effluent Fluxes for Year 1/2 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

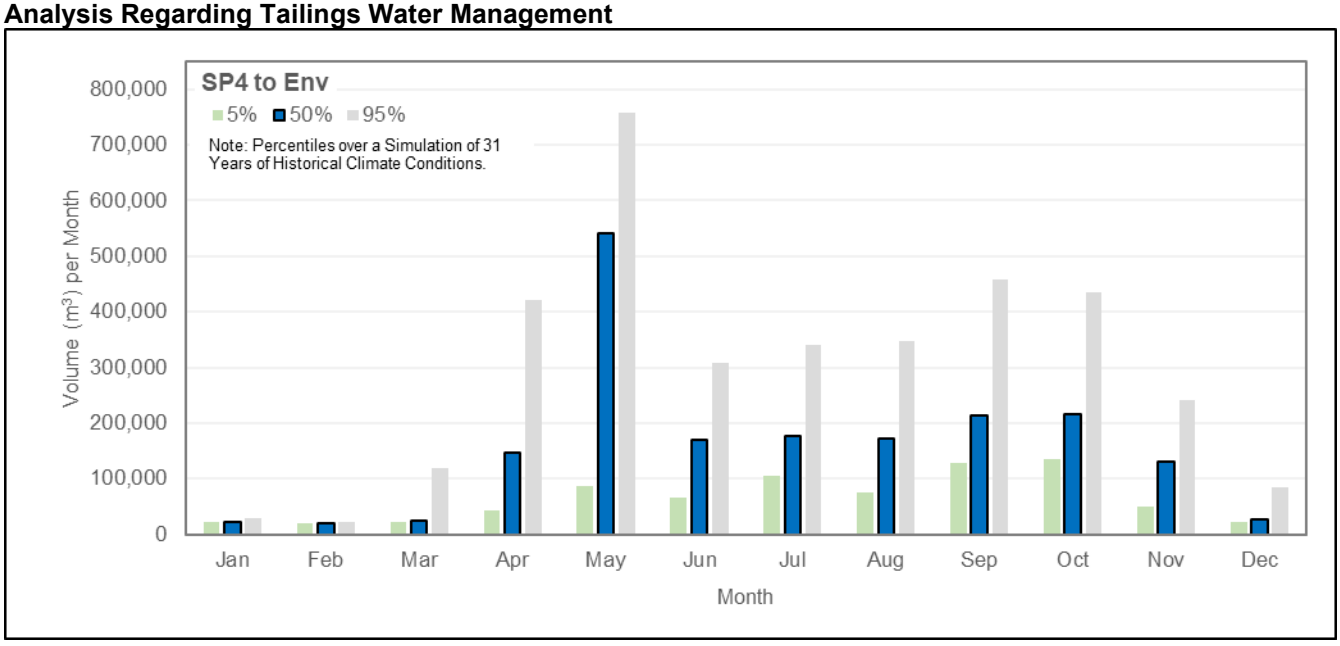
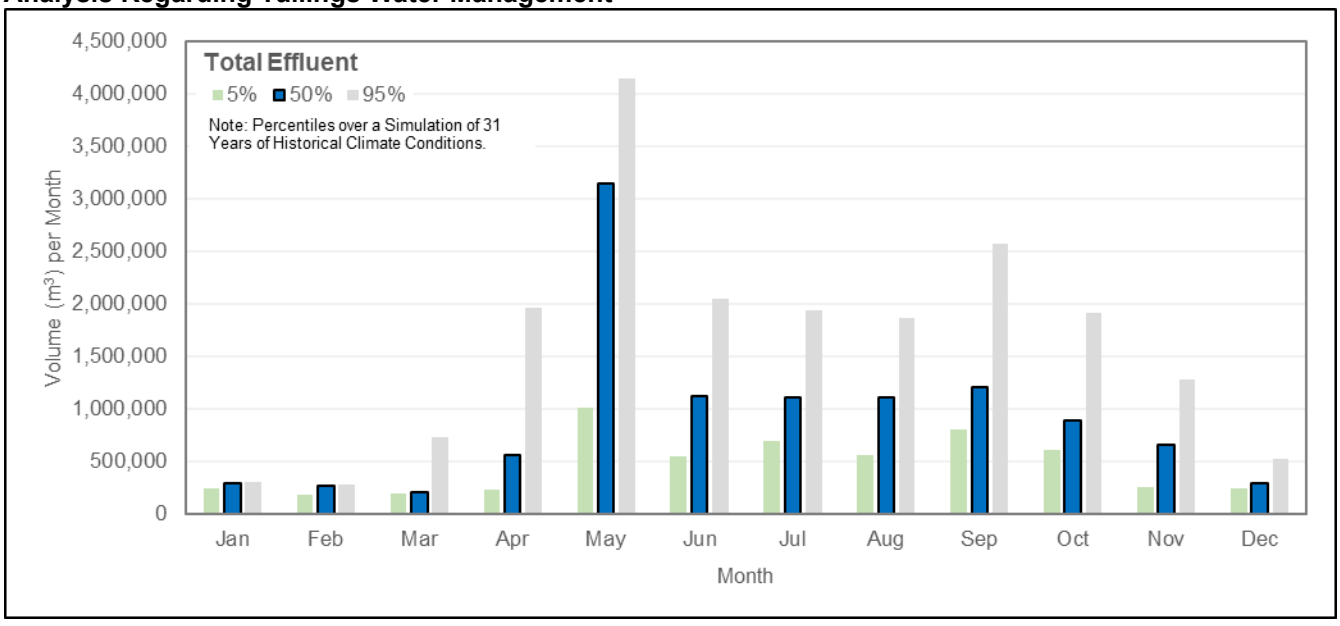


Figure C1.5 - 9: Estimated Total Effluent Fluxes for Year 1/2 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management



2.0 YEAR 9 (LAST YEAR OF TAILINGS DEPOSITION IN THE TAILINGS STORAGE FACILITY)

2.1 Year 9 – Simulation of Historical Climate Conditions

Figure C2.1 - 1: Estimated TSF Pond Water Levels for Year 9 and Historical Climate Conditions

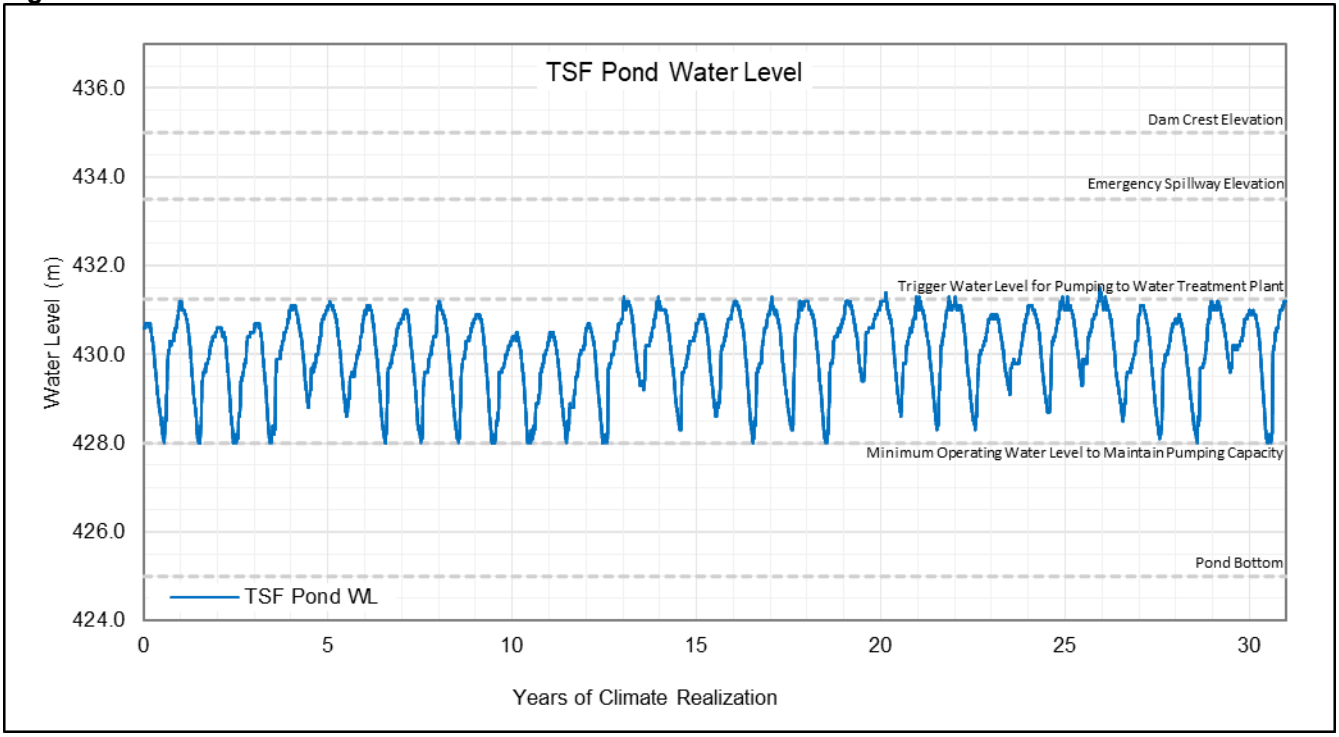


Figure C2.1 - 2: Estimated TSF Pond Water Volumes for Year 9 and Historical Climate Conditions

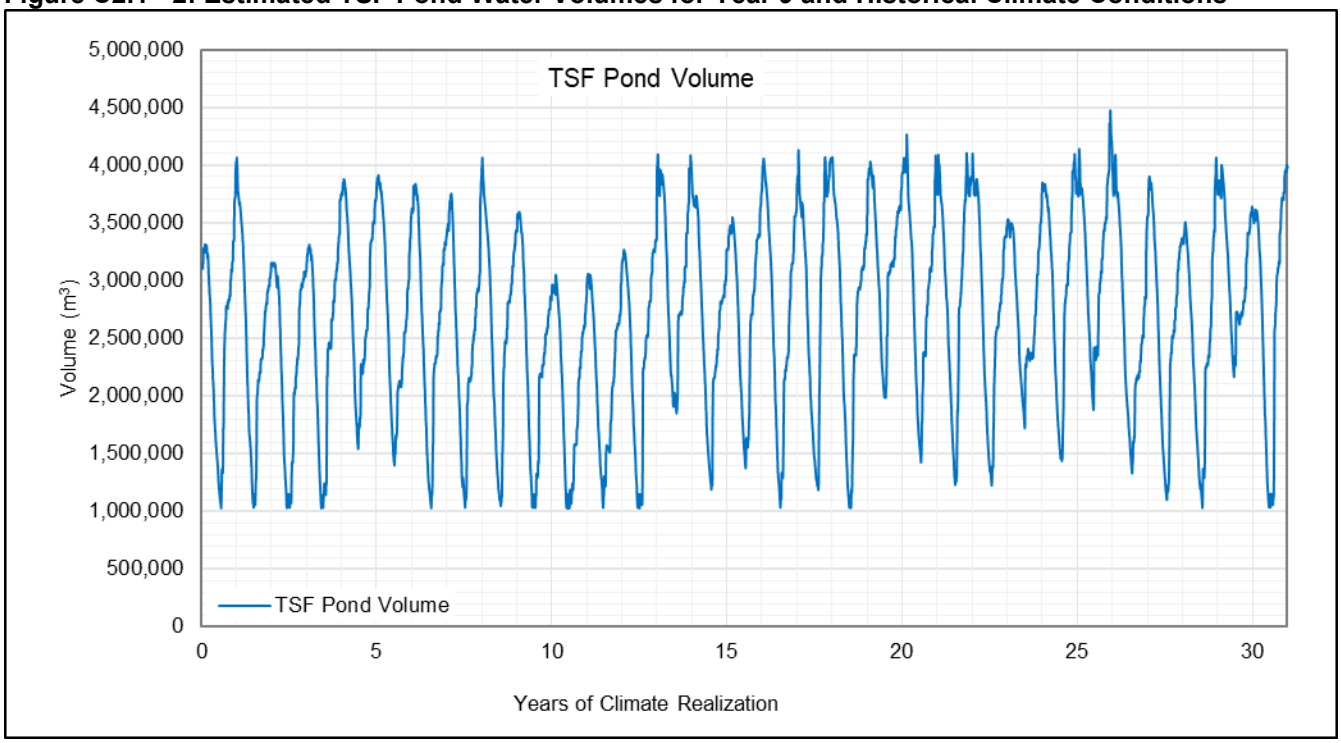


Figure C2.1 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 9 and Historical Climate Conditions

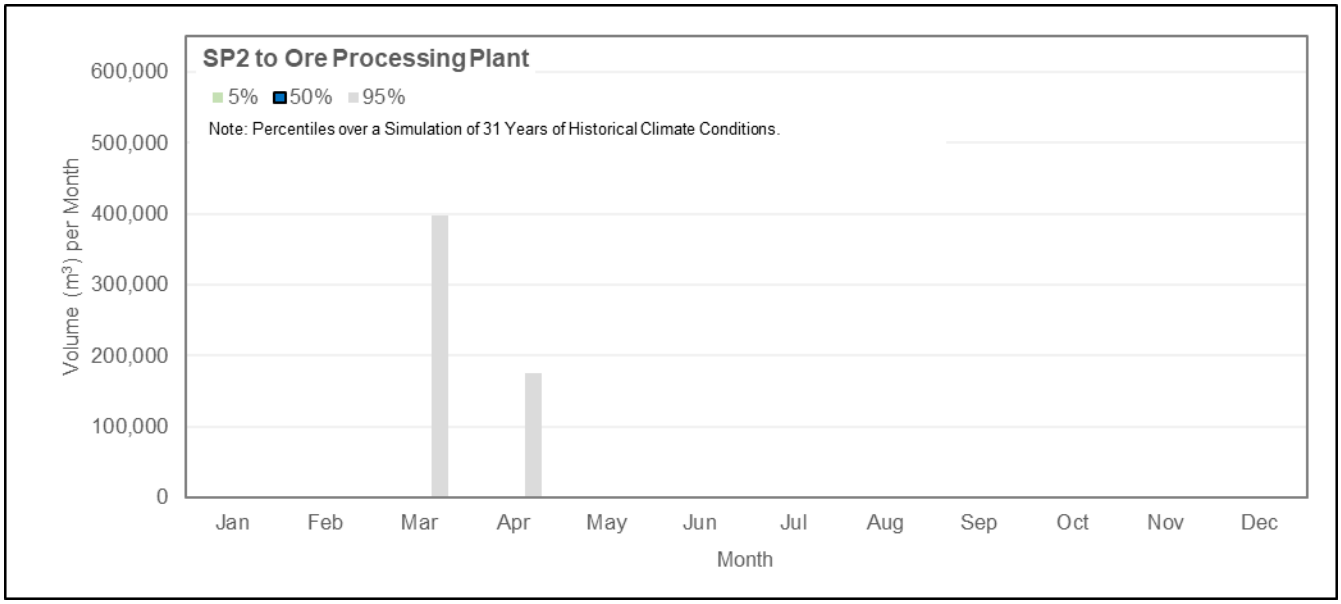


Figure C2.1 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 9 and Historical Climate Conditions

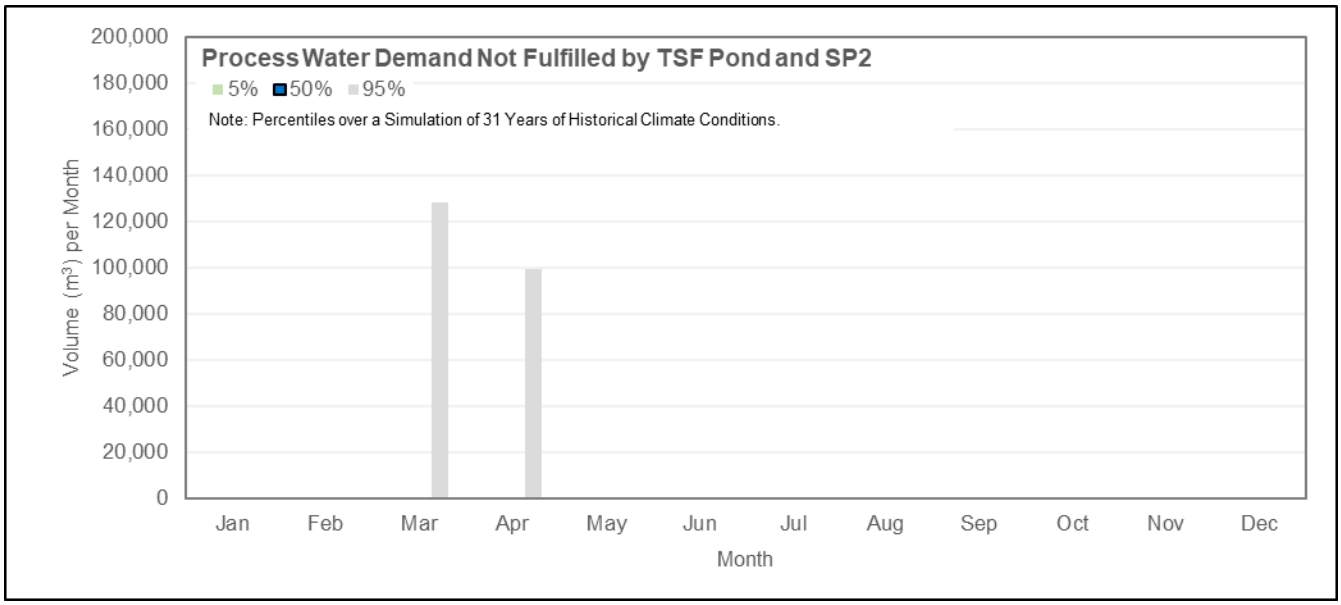


Figure C2.1 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 9 and Historical Climate Conditions

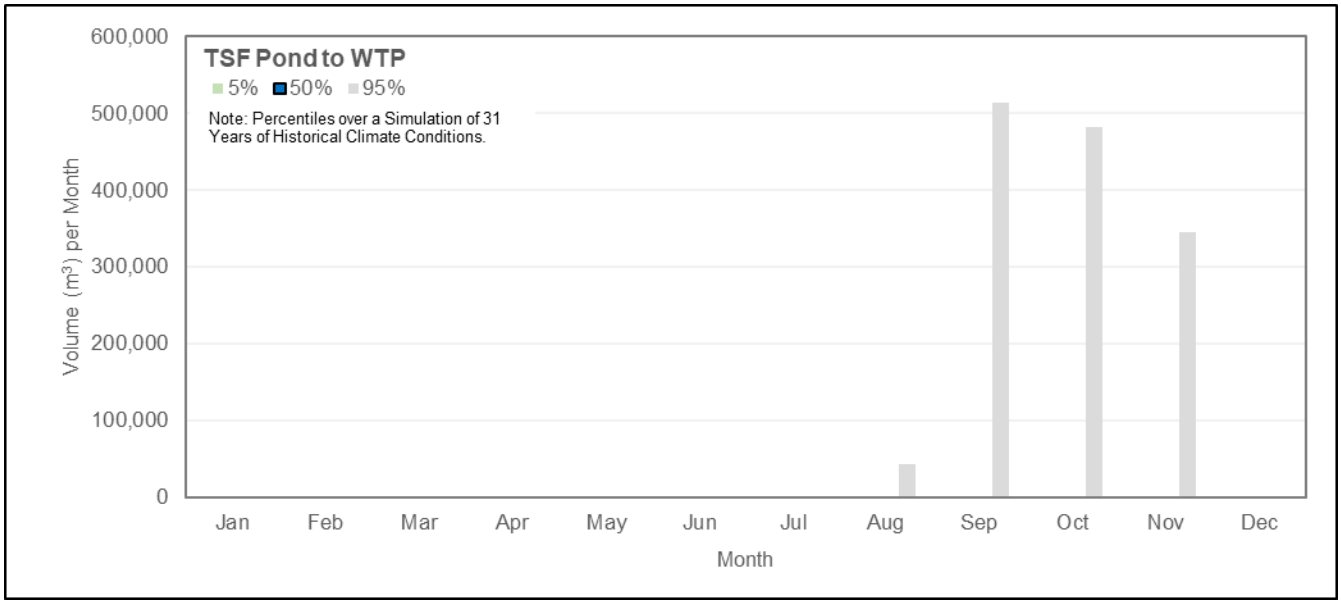


Figure C2.1 - 6: Estimated SP1 Effluent Fluxes for Year 9 and Historical Climate Conditions

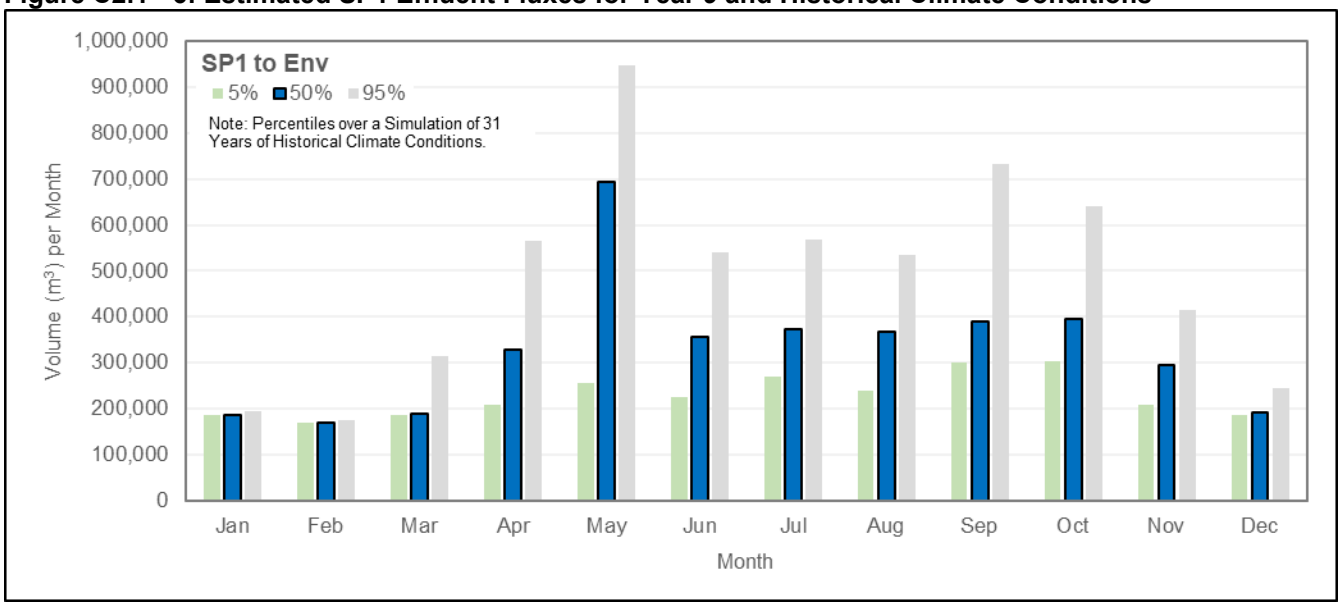


Figure C2.1 - 7: Estimated SP2 Effluent Fluxes for Year 9 and Historical Climate Conditions

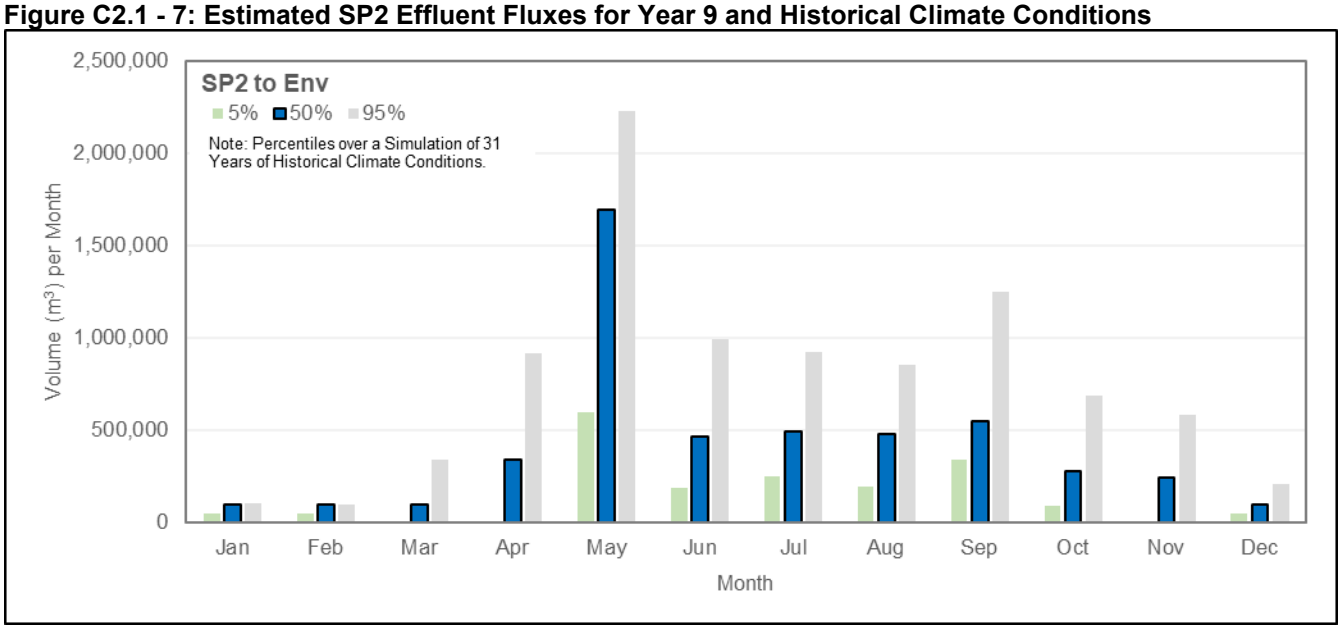


Figure C2.1 - 8: Estimated SP3 Effluent Fluxes for Year 9 and Historical Climate Conditions

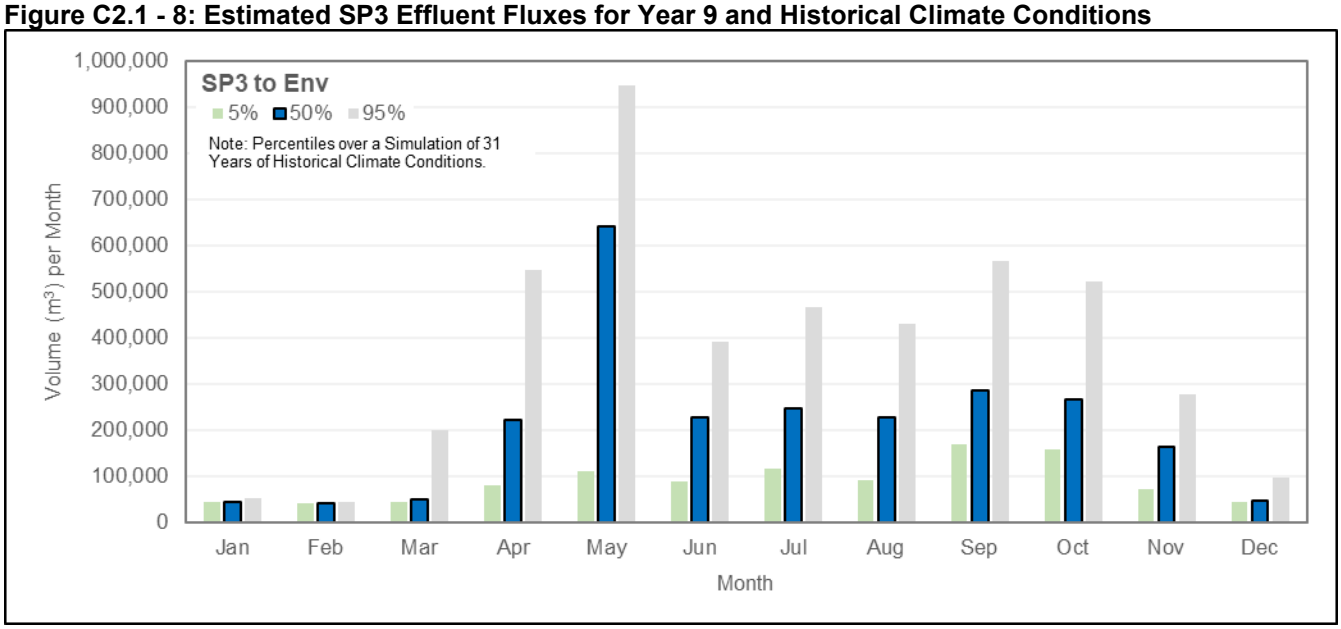


Figure C2.1 - 9: Estimated SP4 Effluent Fluxes for Year 9 and Historical Climate Conditions

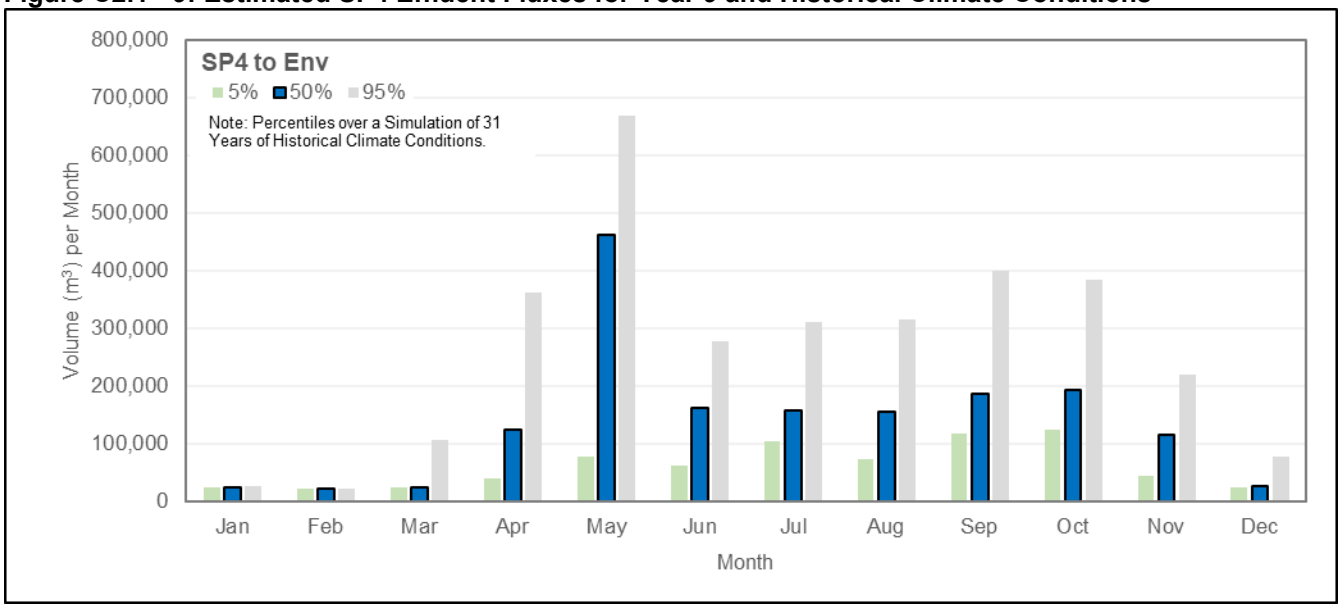


Figure C2.1 - 10: Estimated Total Effluent Fluxes for Year 9 and Historical Climate Conditions

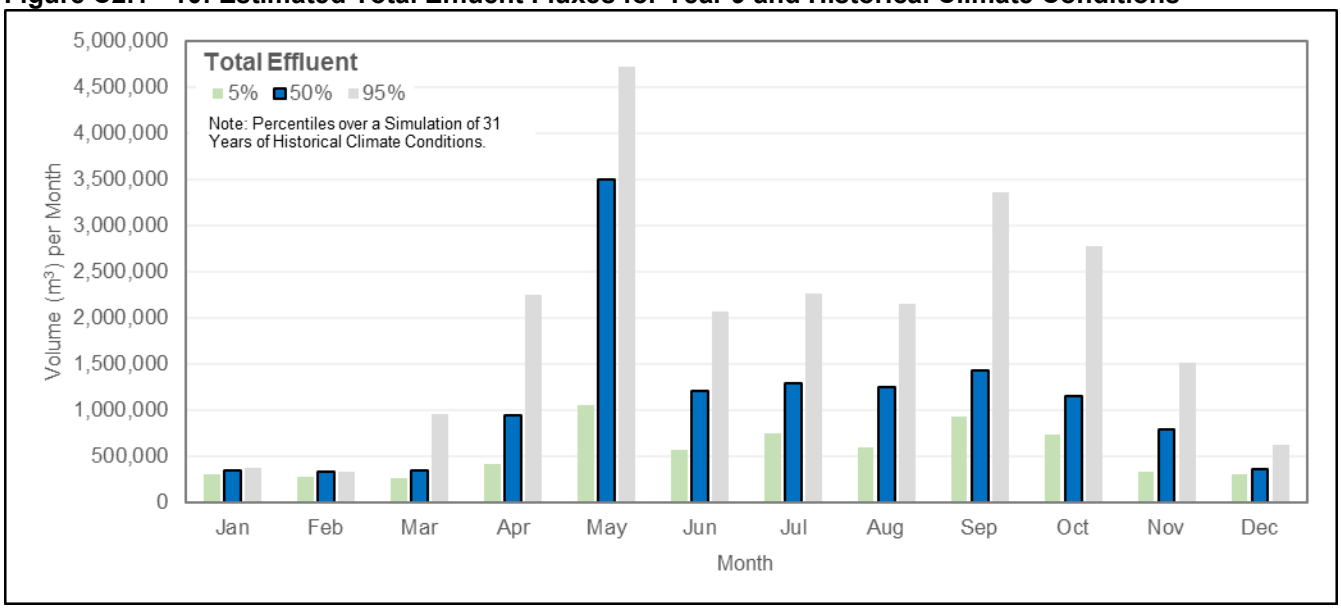
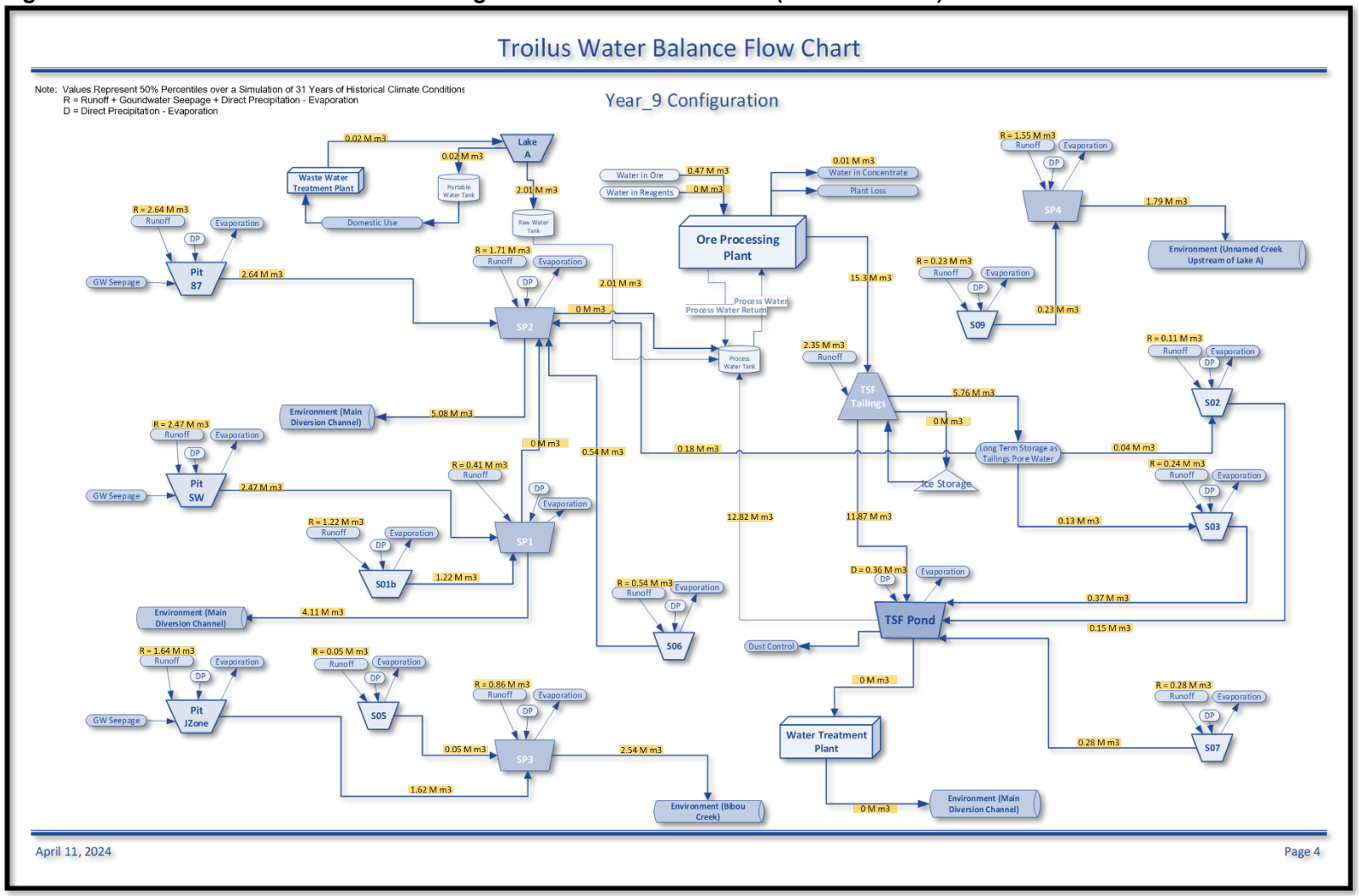


Figure C2.1 - 11: Estimated Annual Flow Diagram for Year 9 and Median (50th Percentile) Historical Climate Condition



2.2 Year 9 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP1 - 2.6

Figure C2.2 - 1: Estimated TSF Pond Water Levels for Year 9 and Climate Change Projection Scenario SSP1 - 2.6

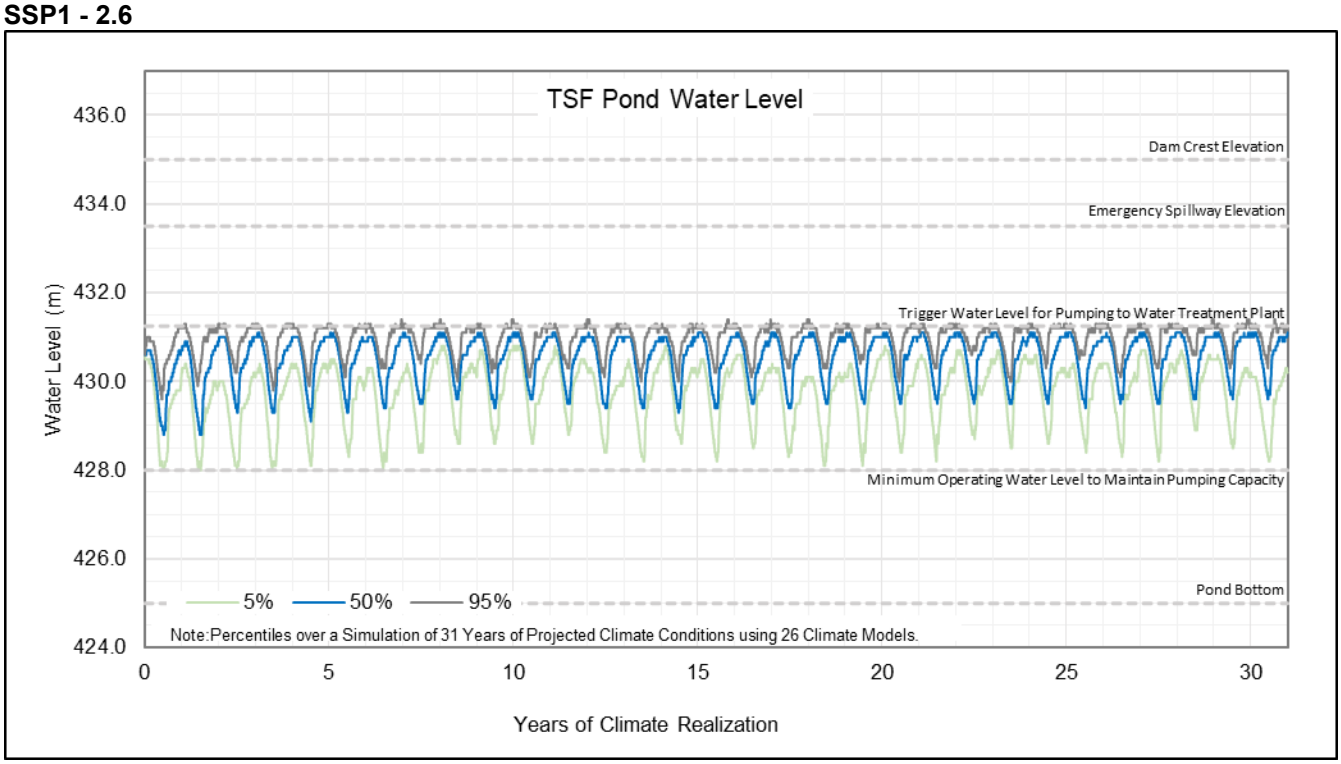


Figure C2.2 - 2: Estimated TSF Pond Water Volumes for Year 9 and Climate Change Projection Scenario SSP1 - 2.6

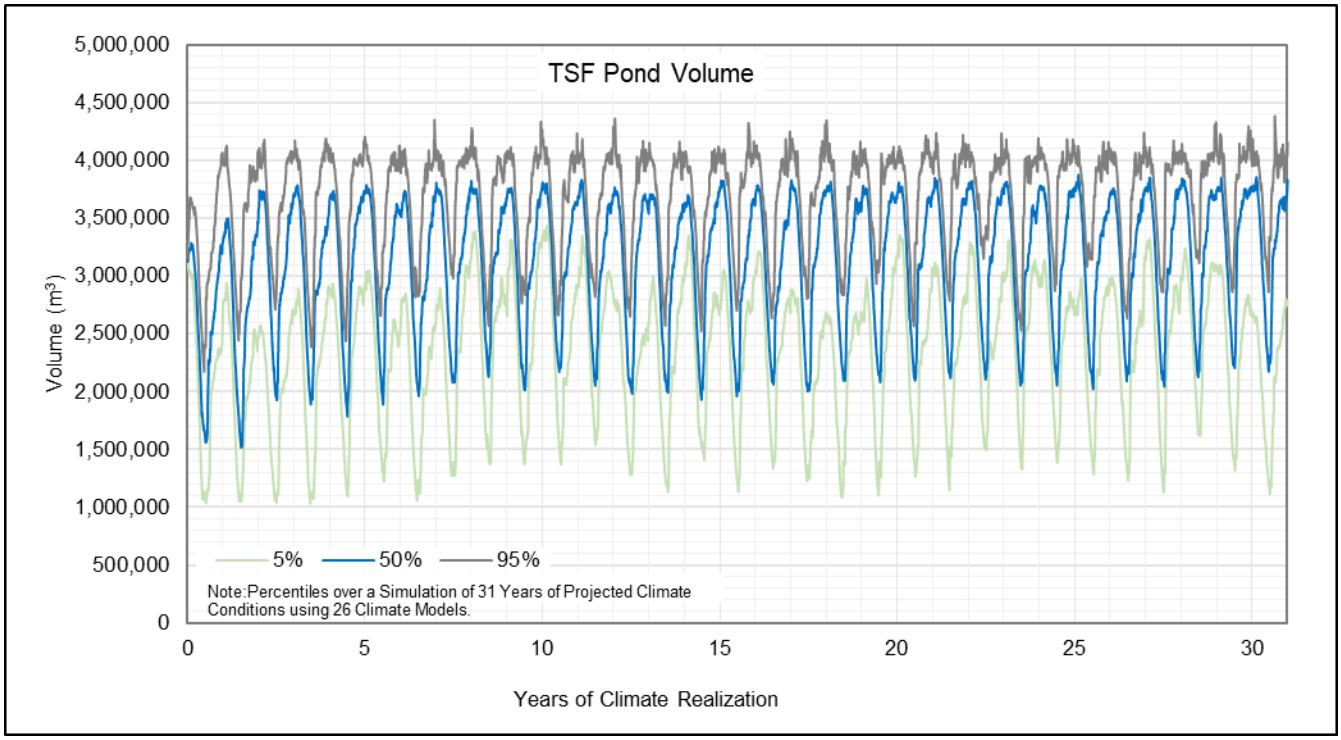


Figure C2.2 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 9 and Climate Change Projection Scenario SSP1 - 2.6

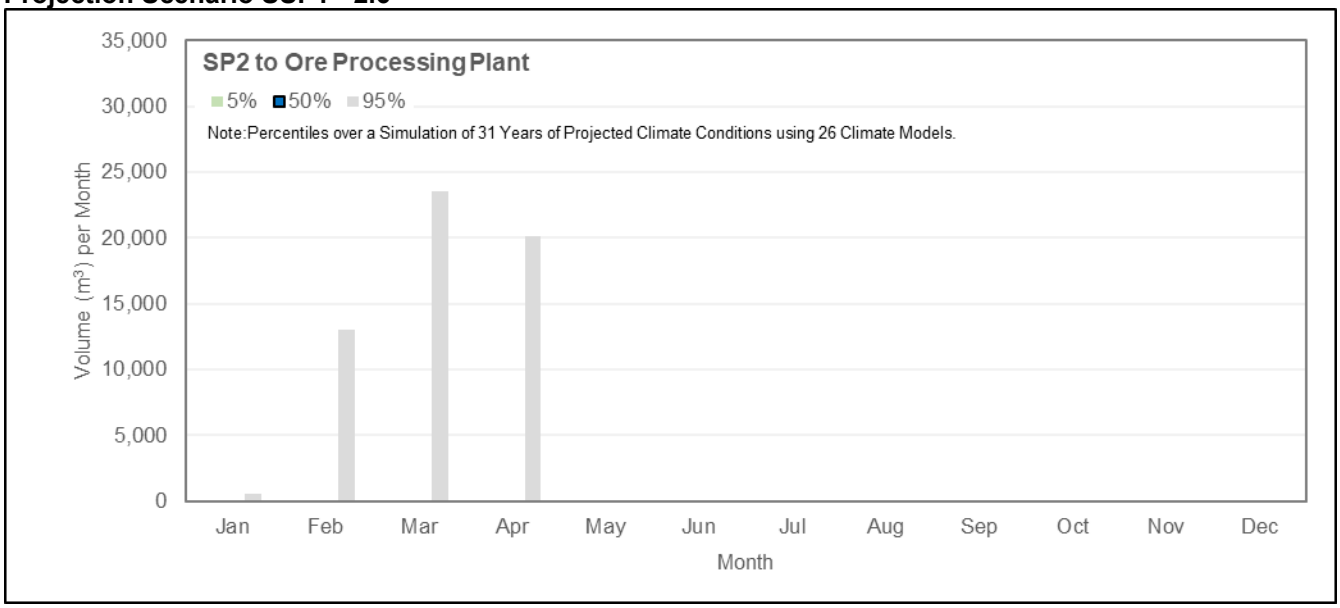


Figure C2.2 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 9 and Climate Change Projection Scenario SSP1 - 2.6

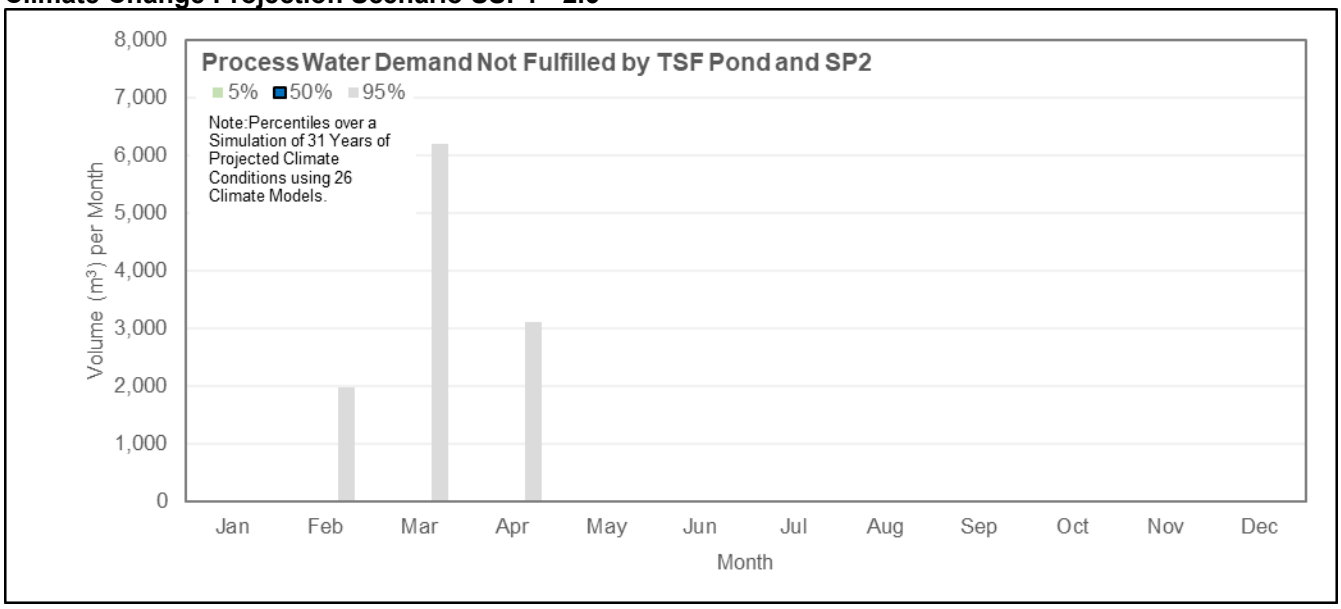


Figure C2.2 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP1 - 2.6

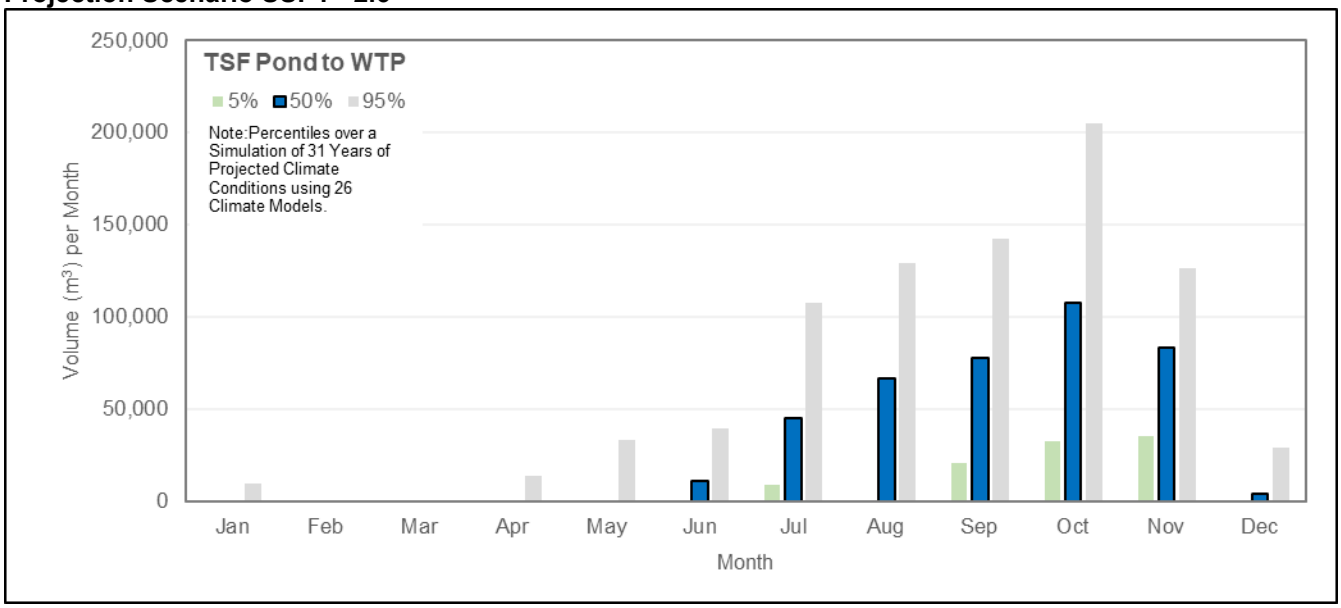


Figure C2.2 - 6: Estimated SP1 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP1 - 2.6

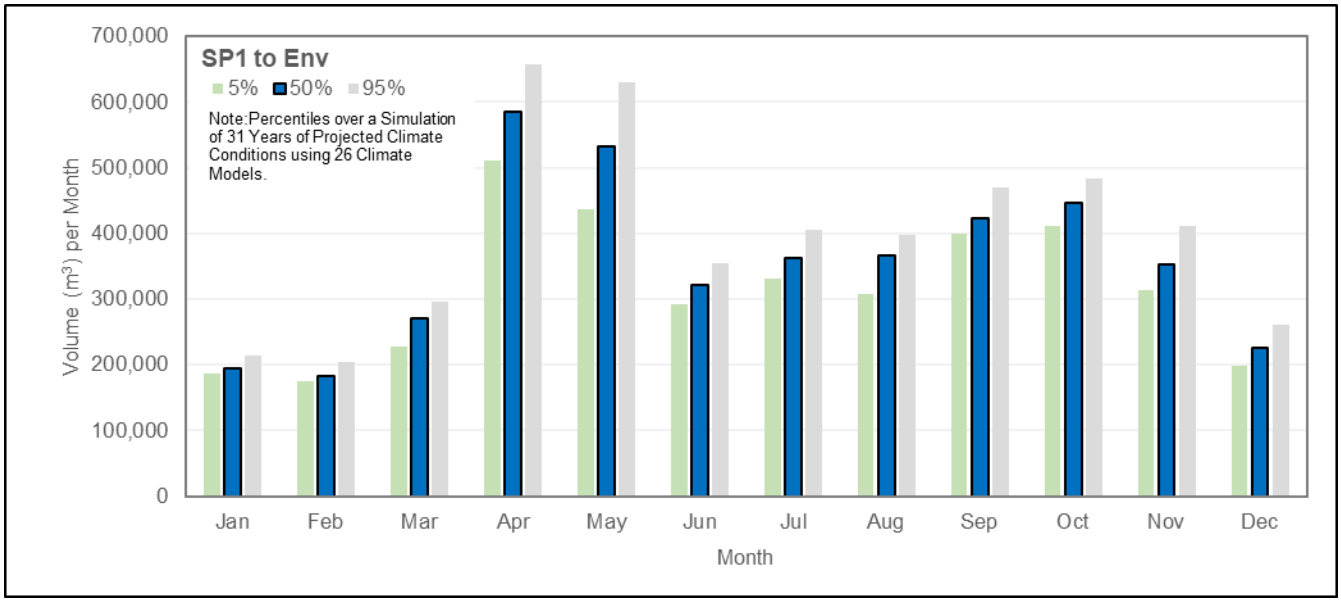


Figure C2.2 - 7: Estimated SP2 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP1 - 2.6

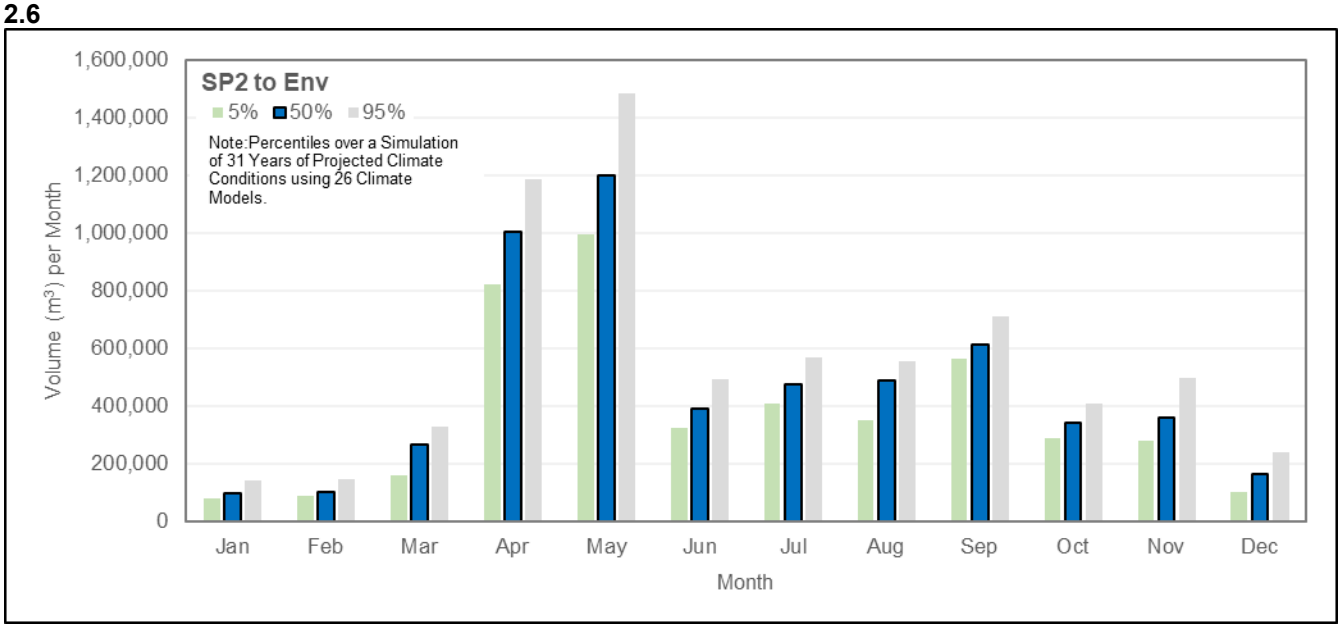


Figure C2.2 - 8: Estimated SP3 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP1 - 2.6

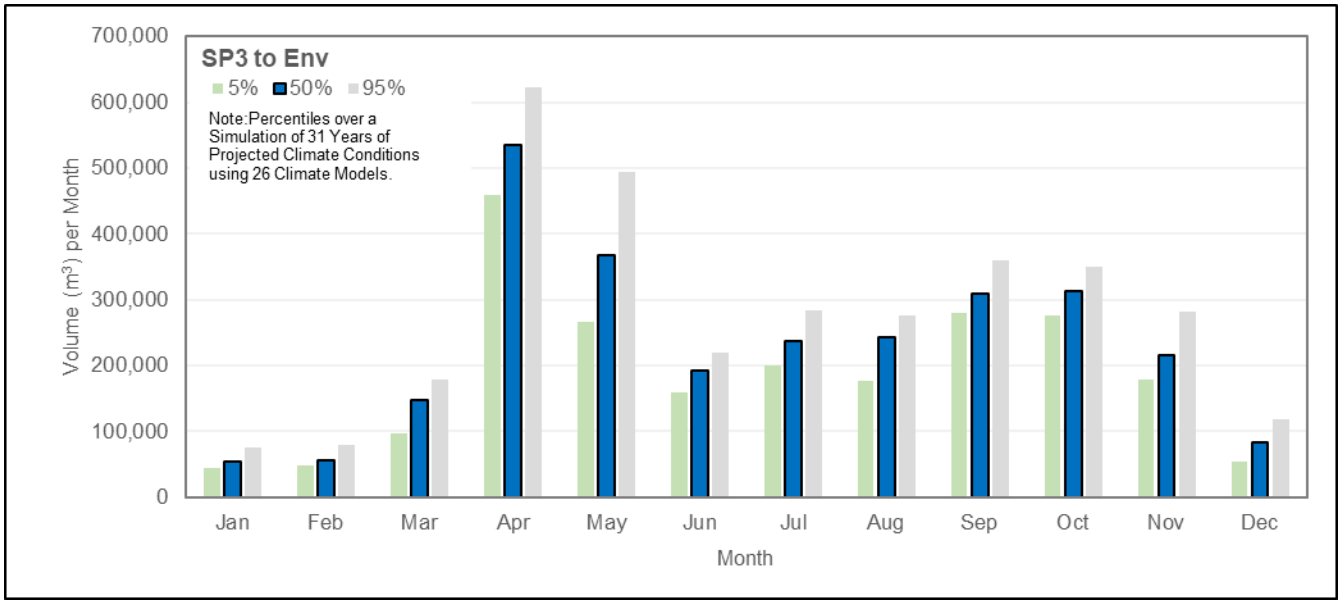


Figure C2.2 - 9: Estimated SP4 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP1 - 2.6

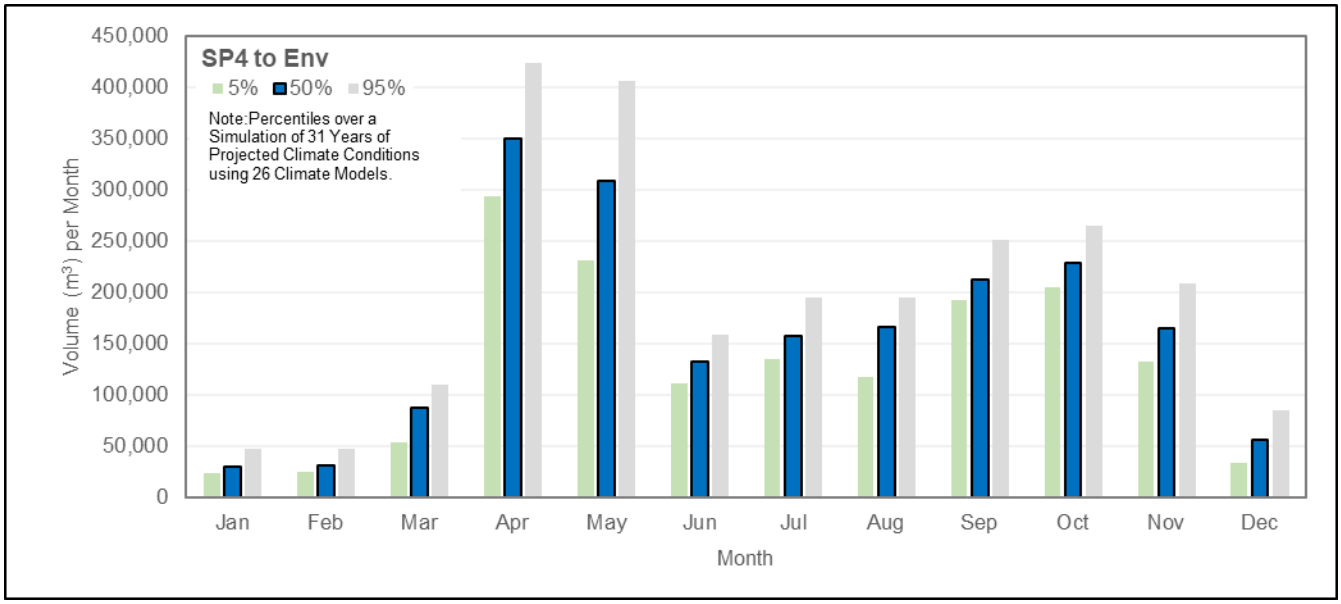
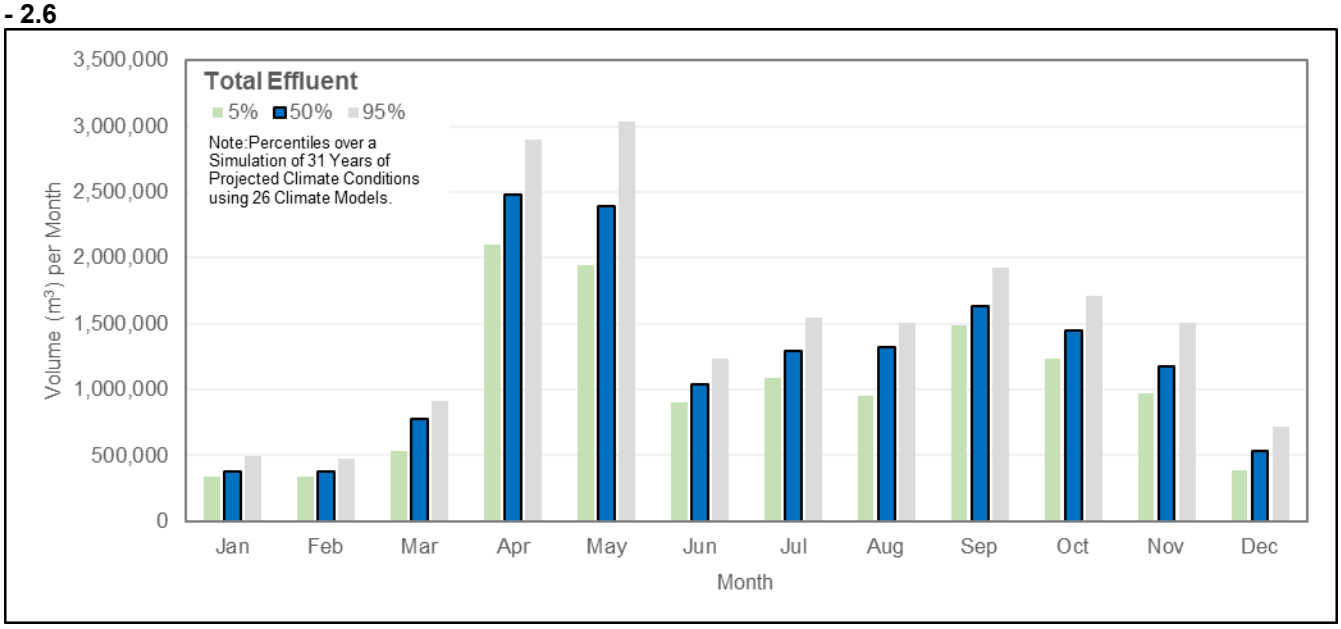


Figure C2.2 - 10: Estimated Total Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP1 - 2.6



2.3 Year 9 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP2 - 4.5

Figure C2.3 - 1: Estimated TSF Pond Water Levels for Year 9 and Climate Change Projection Scenario SSP2 - 4.5

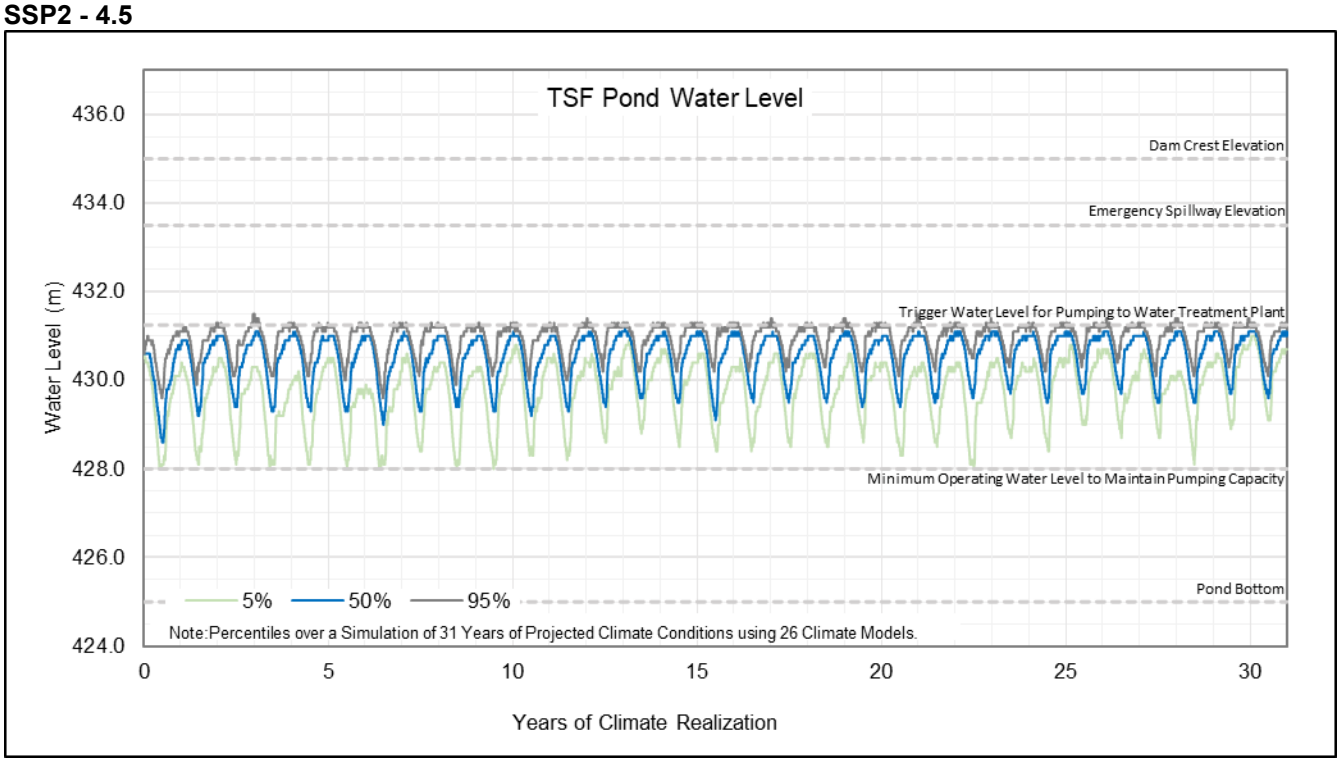


Figure C2.3 - 2: Estimated TSF Pond Water Volumes for Year 9 and Climate Change Projection Scenario SSP2 - 4.5

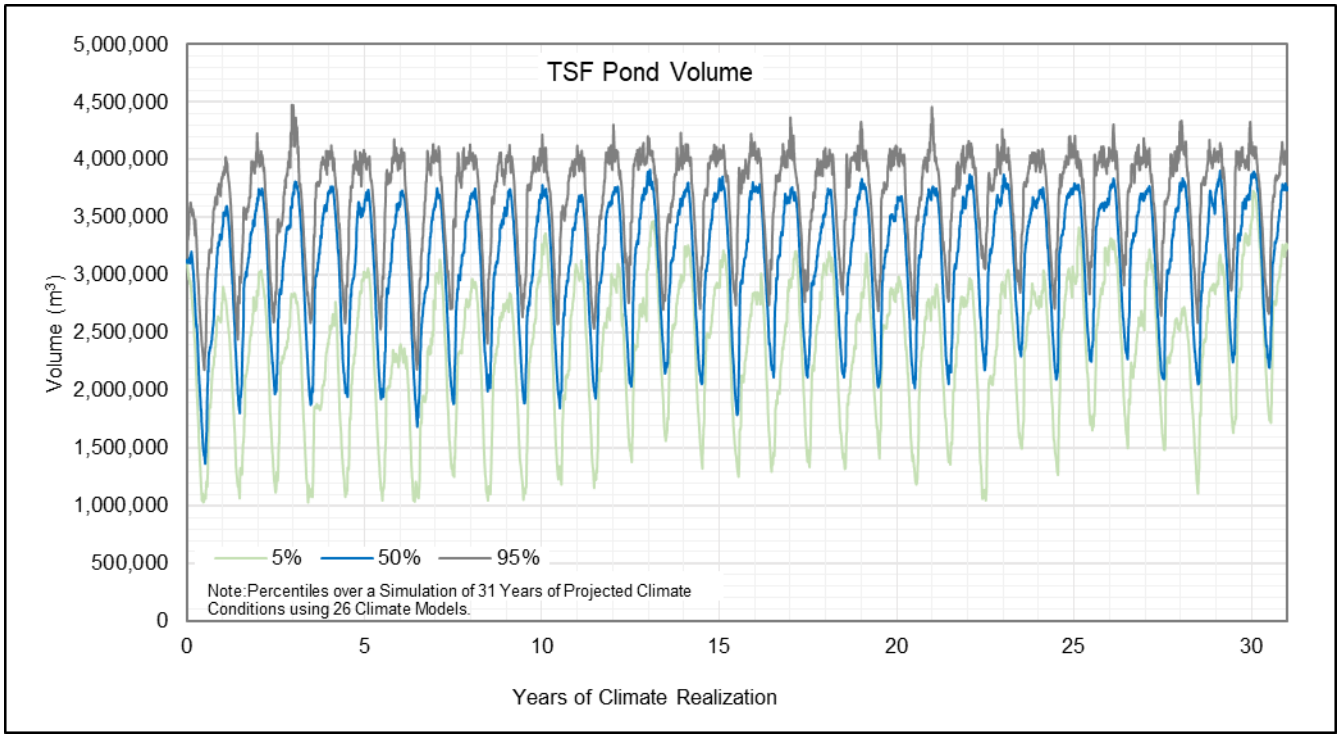


Figure C2.3 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 9 and Climate Change Projection Scenario SSP2 - 4.5

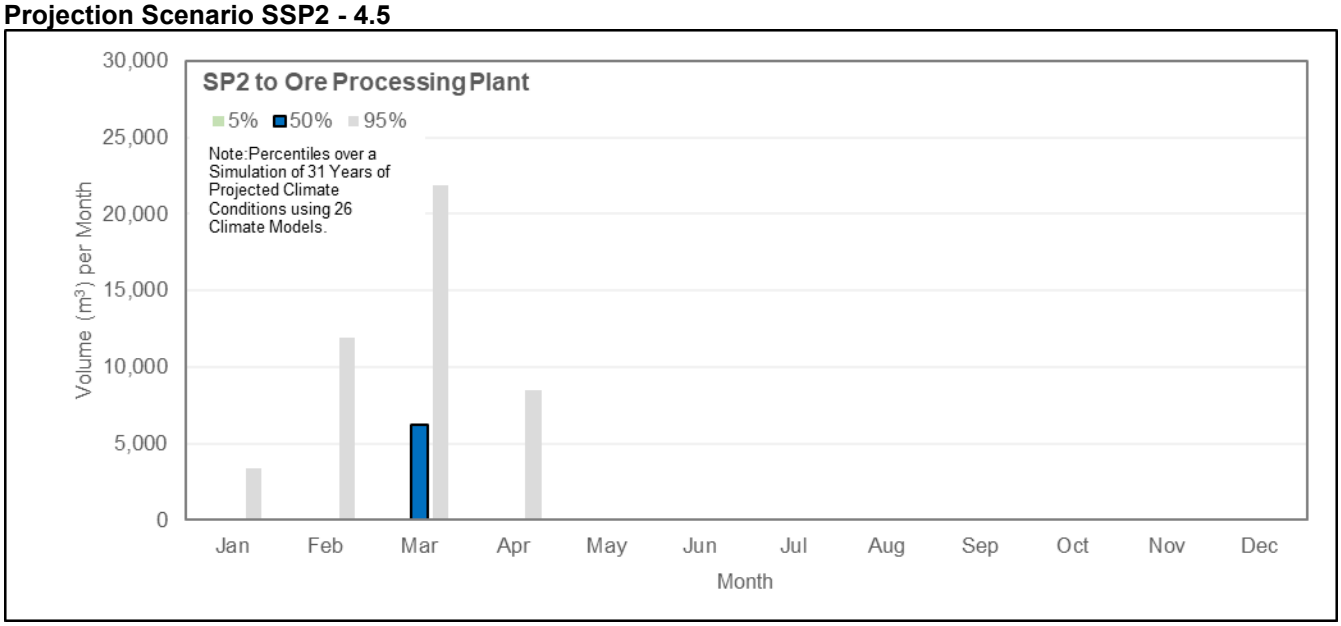


Figure C2.3 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 9 and Climate Change Projection Scenario SSP2 - 4.5

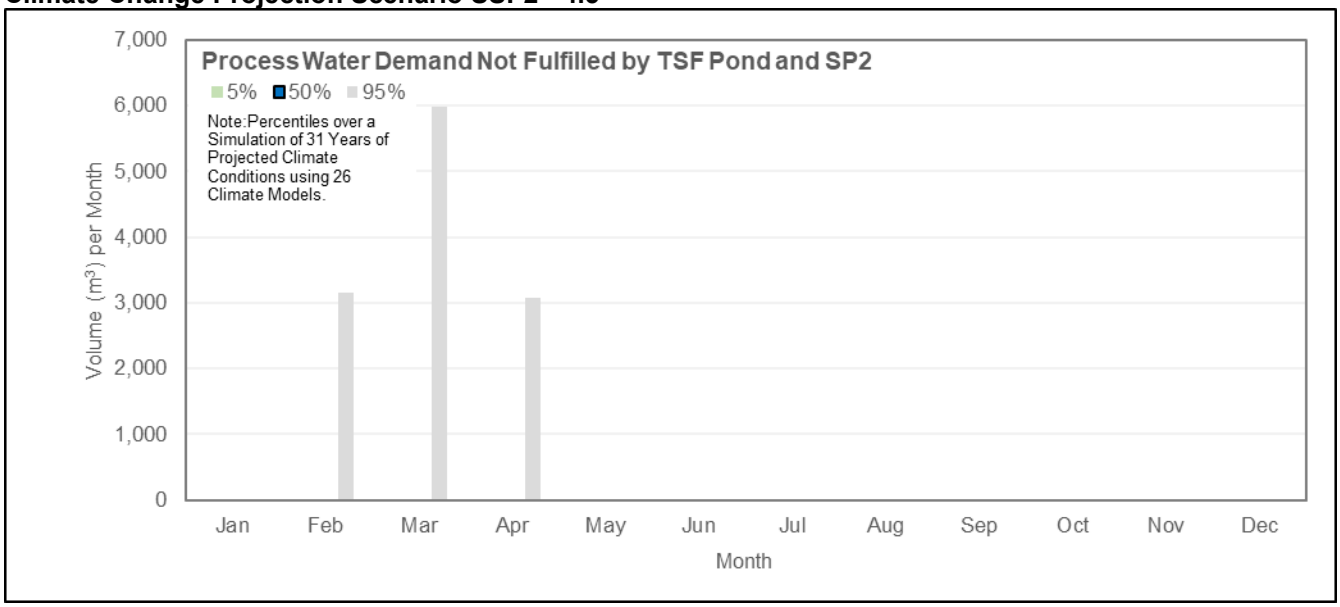


Figure C2.3 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP2 - 4.5

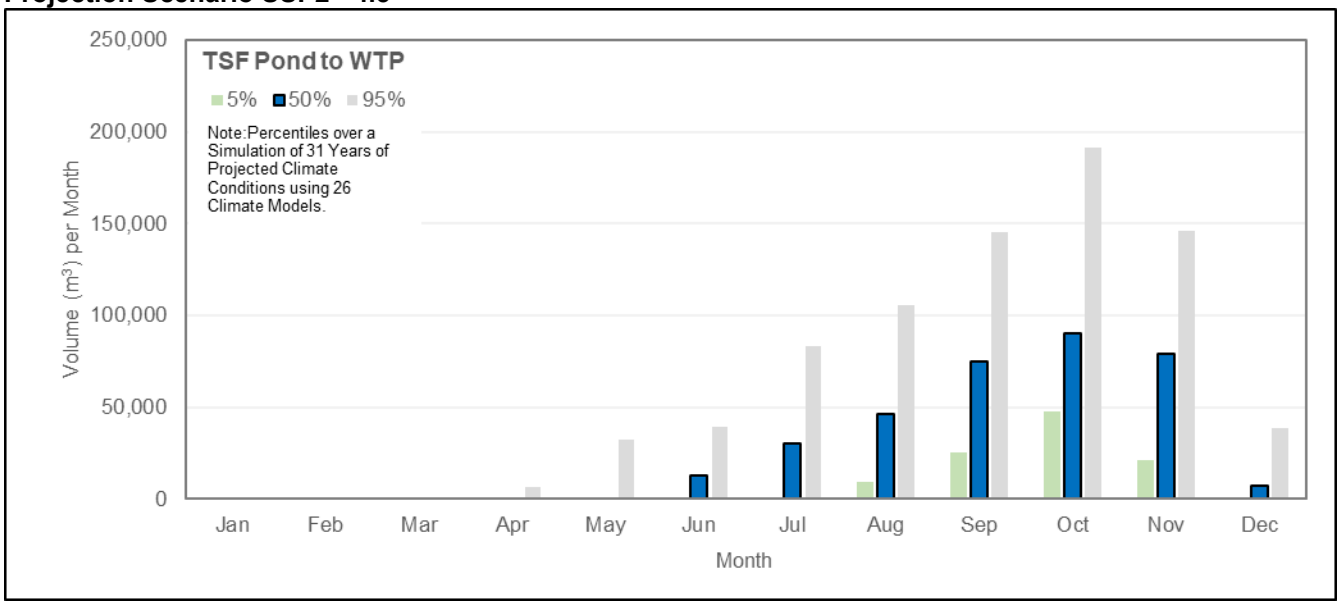


Figure C2.3 - 6: Estimated SP1 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP2 - 4.5

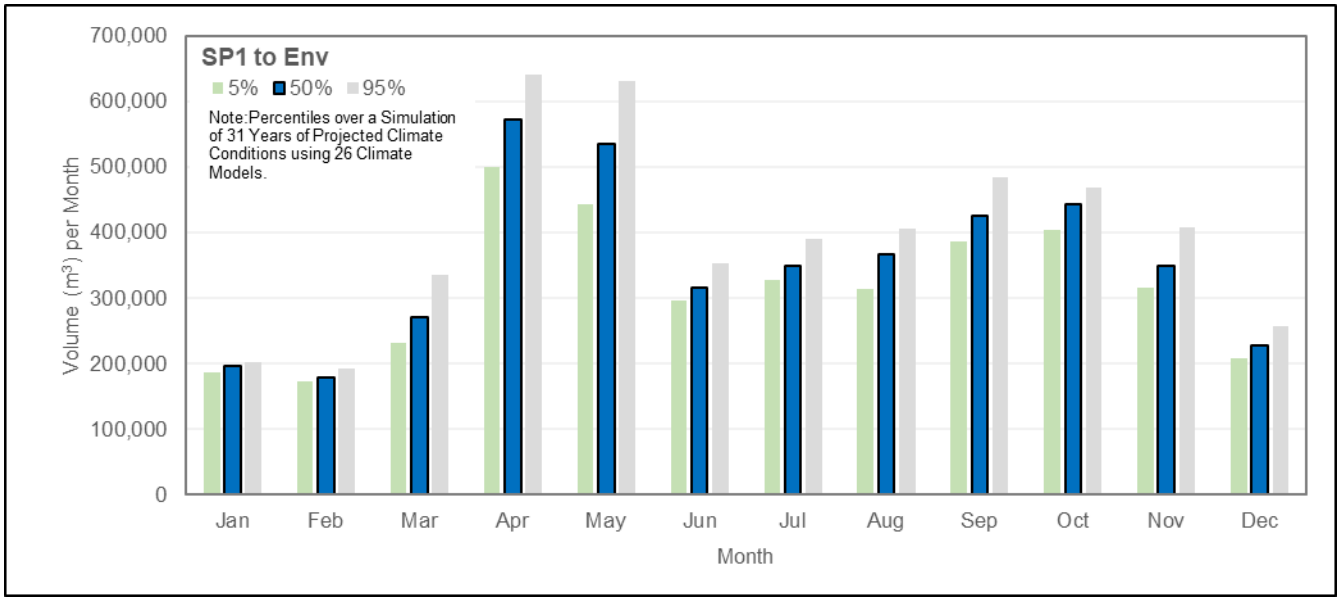


Figure C2.3 - 7: Estimated SP2 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP2 - 4.5

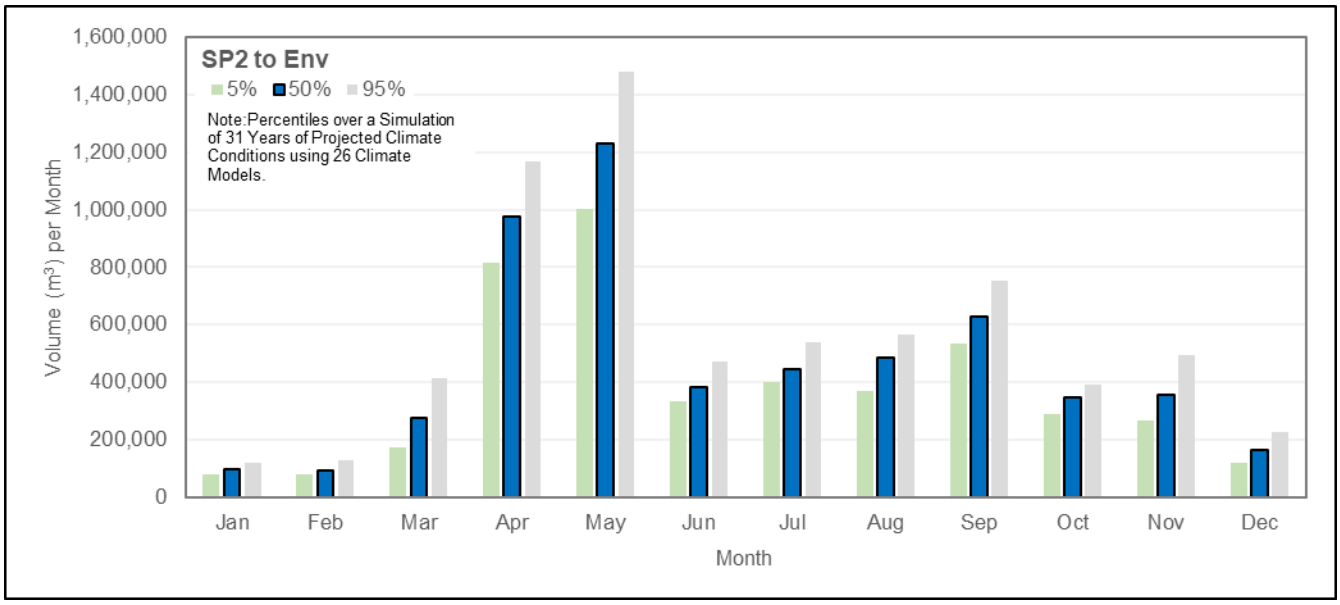


Figure C2.3 - 8: Estimated SP3 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP2 - 4.5

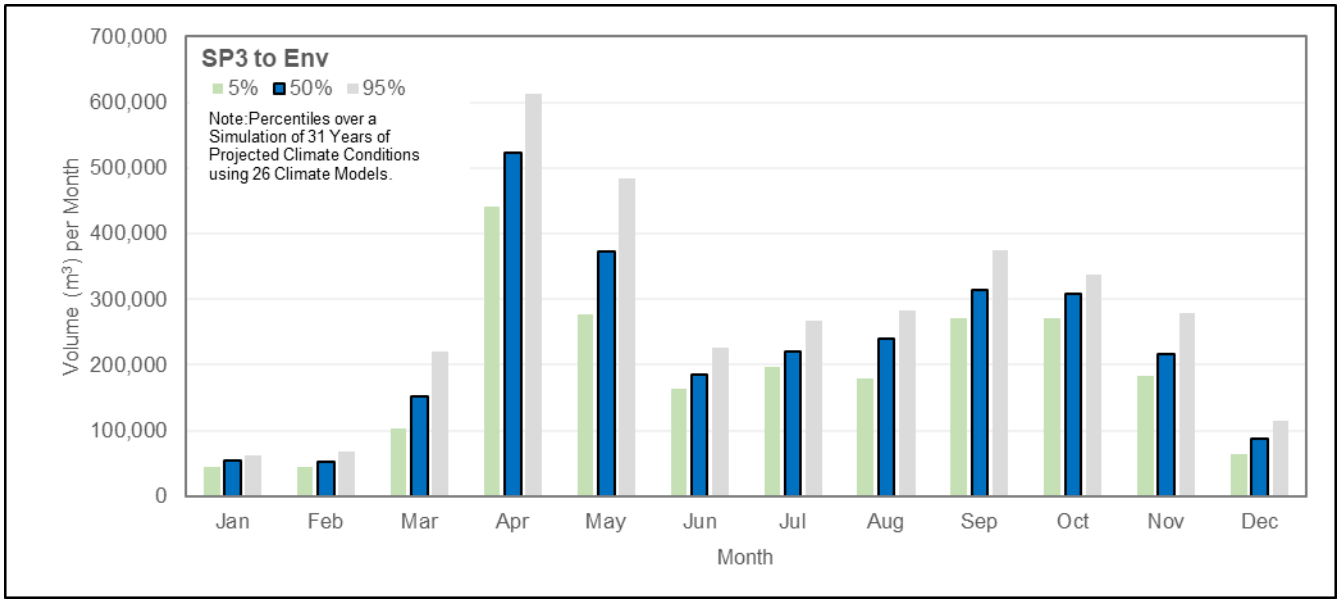


Figure C2.3 - 9: Estimated SP4 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP2 - 4.5

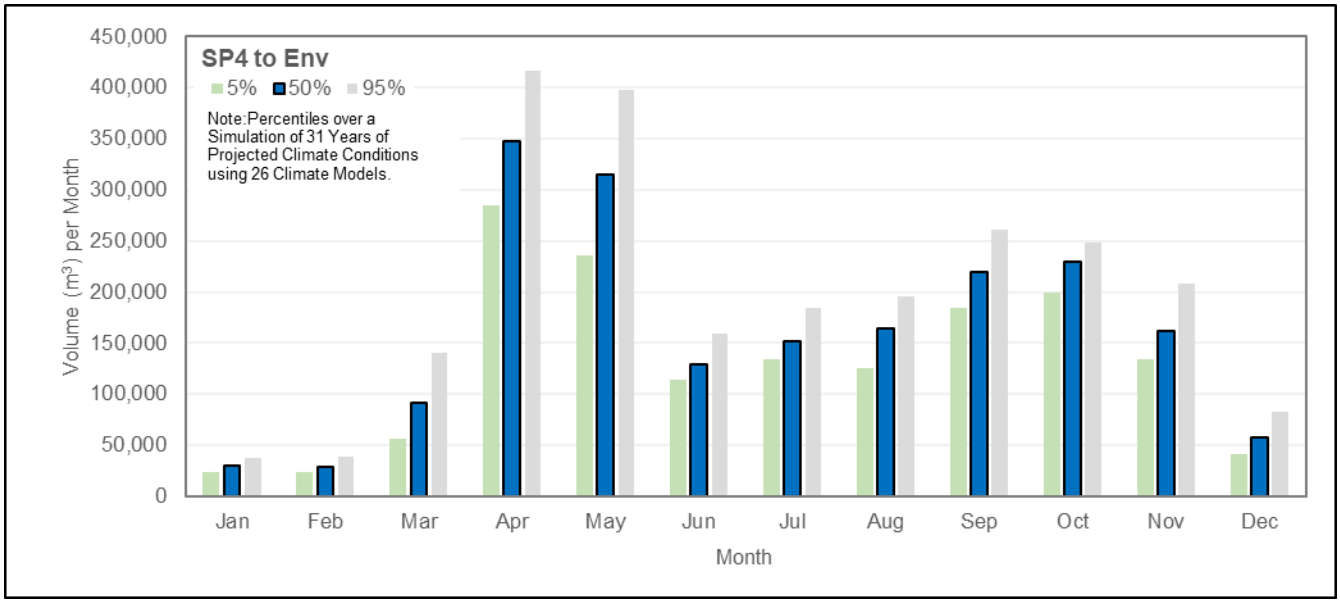
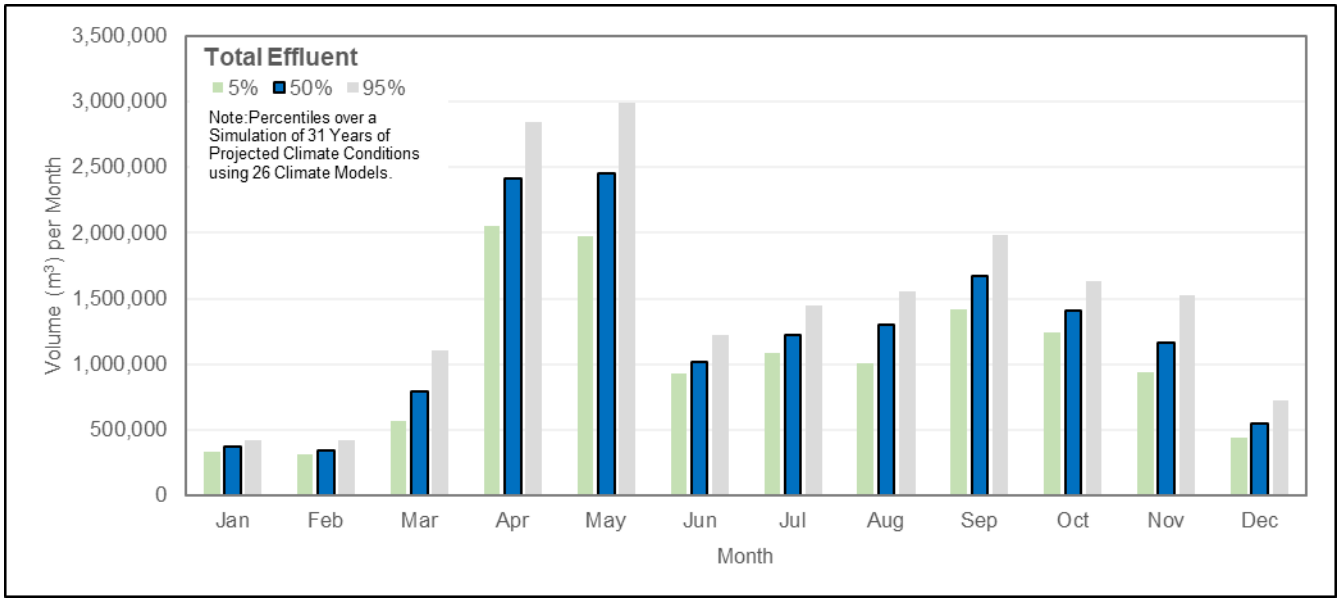


Figure C2.3 - 10: Estimated Total Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP2 - 4.5



2.4 Year 9 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP5 - 8.5

Figure C2.4 - 1: Estimated TSF Pond Water Levels for Year 9 and Climate Change Projection Scenario SSP5 - 8.5

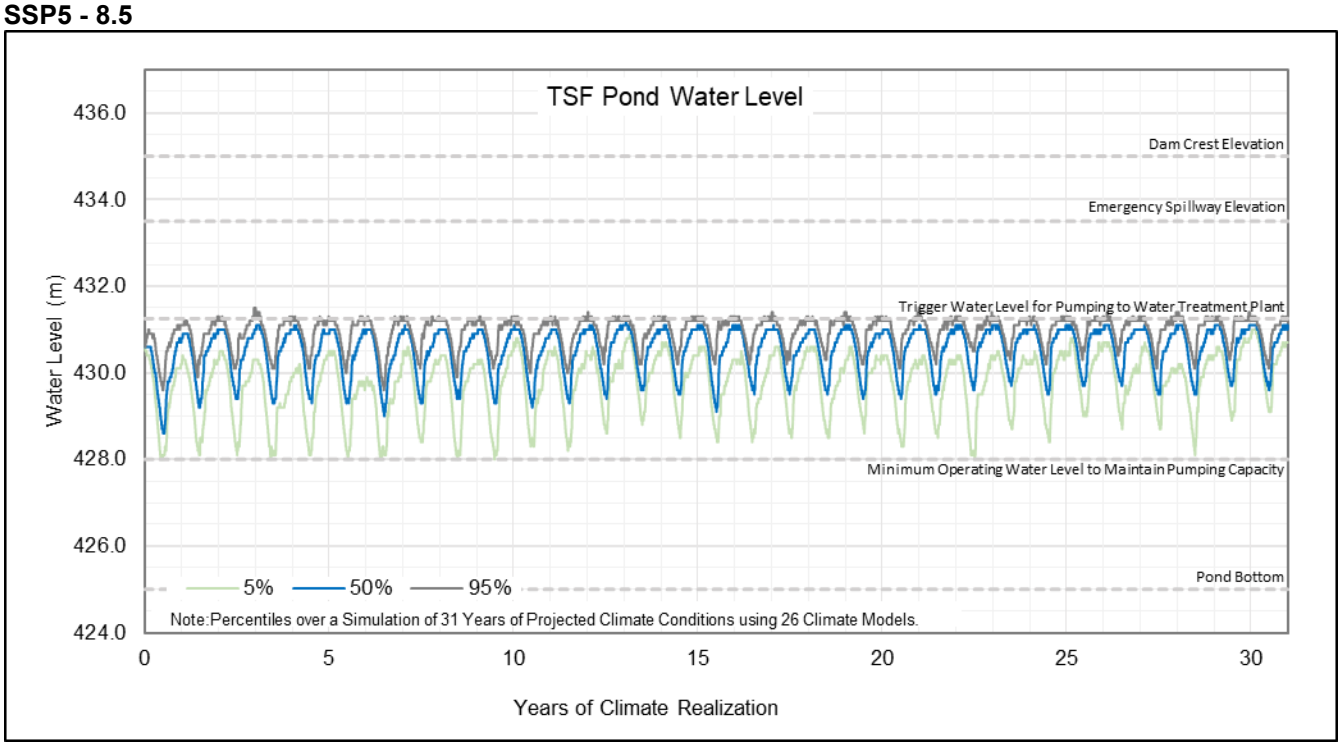


Figure C2.4 - 2: Estimated TSF Pond Water Volumes for Year 9 and Climate Change Projection Scenario SSP5 - 8.5

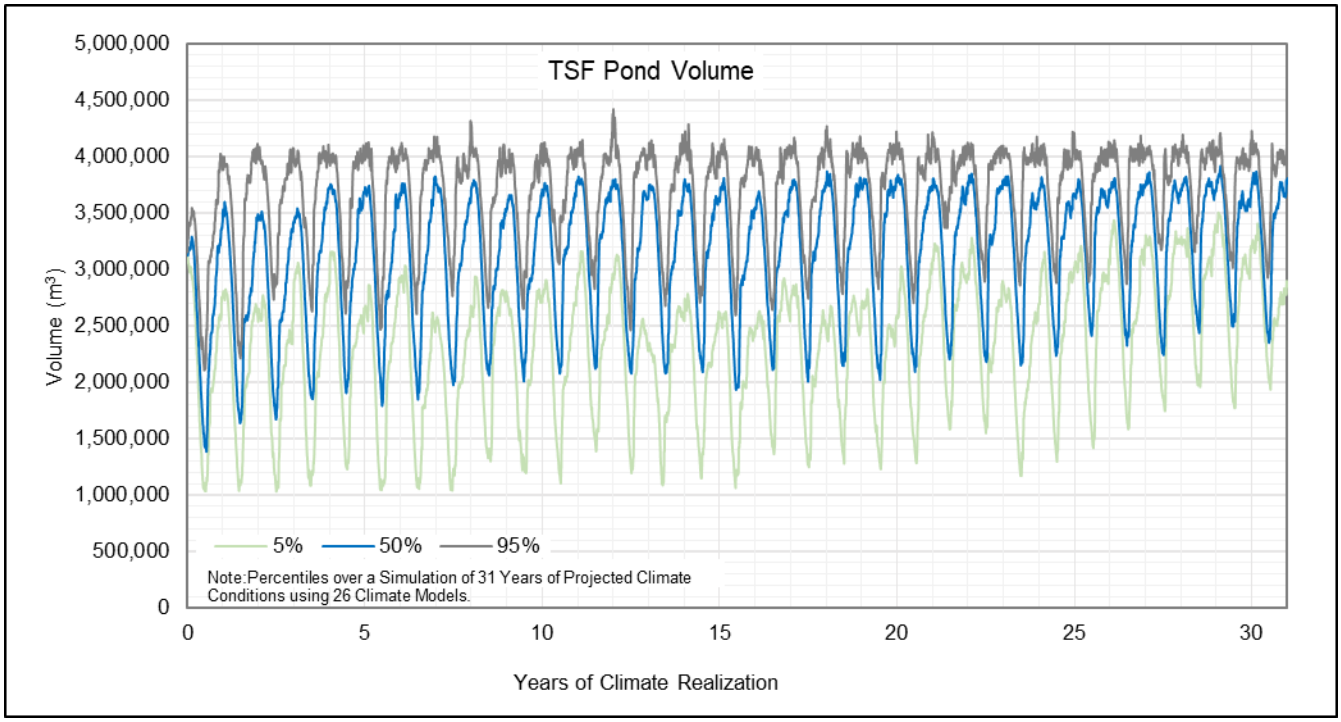


Figure C2.4 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 9 and Climate Change Projection Scenario SSP5 - 8.5

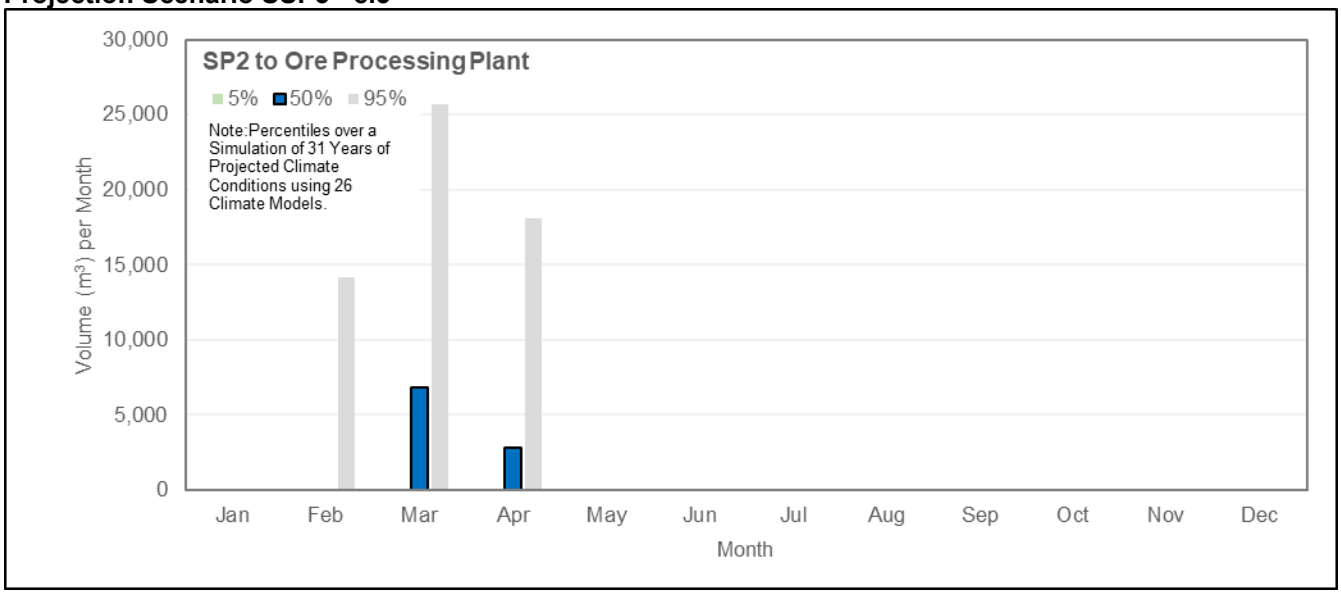


Figure C2.4 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 9 and Climate Change Projection Scenario SSP5 - 8.5

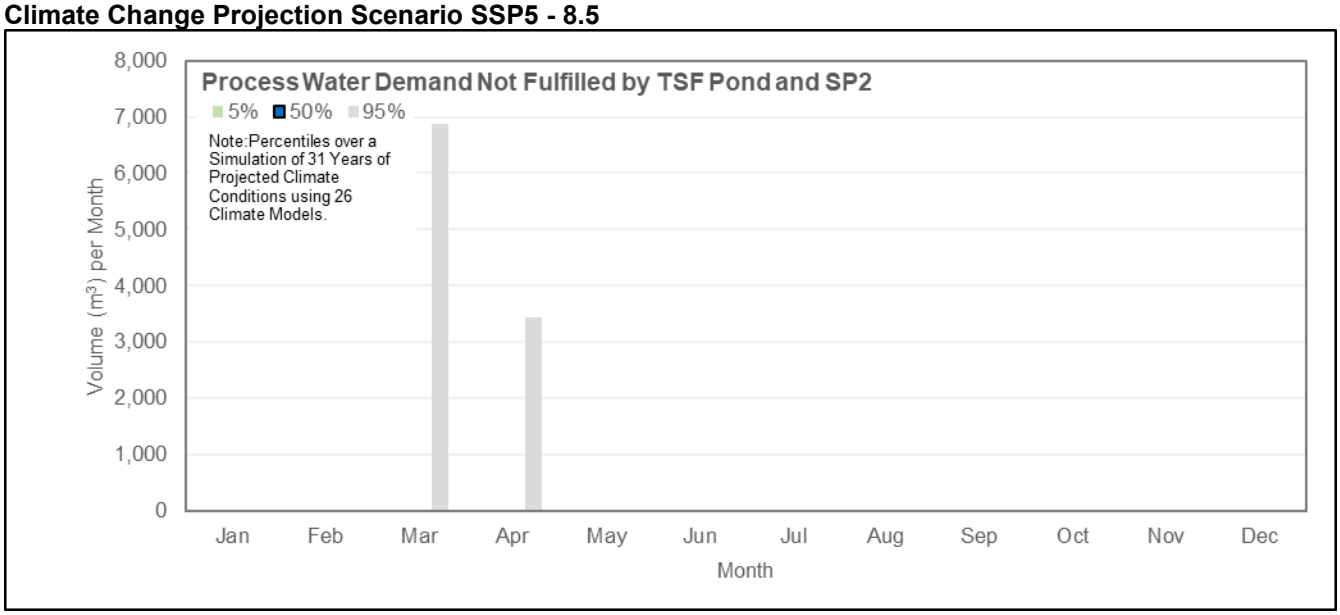


Figure C2.4 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP5 - 8.5

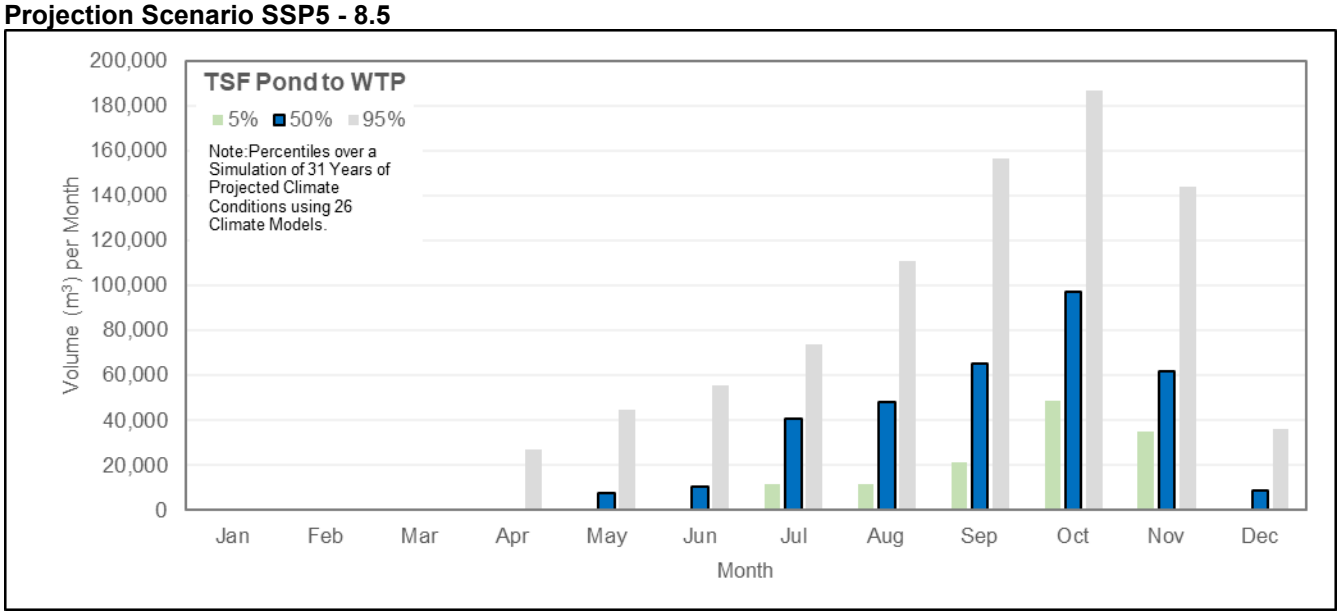


Figure C2.4 - 6: Estimated SP1 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP5 - 8.5

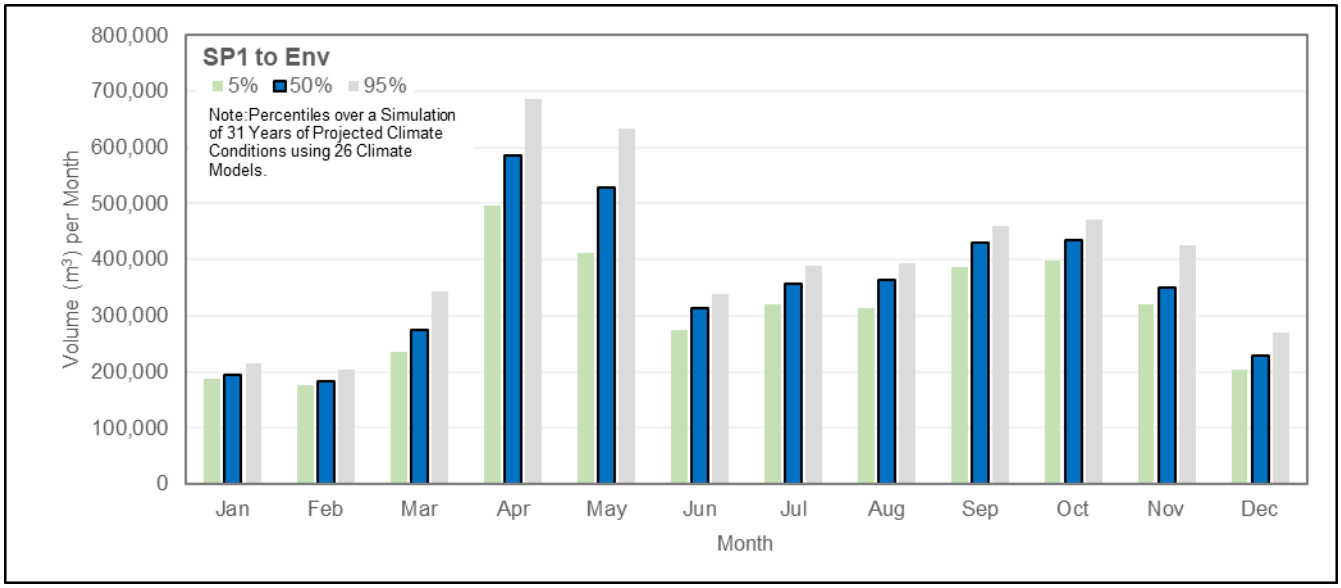


Figure C2.4 - 7: Estimated SP2 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP5 - 8.5

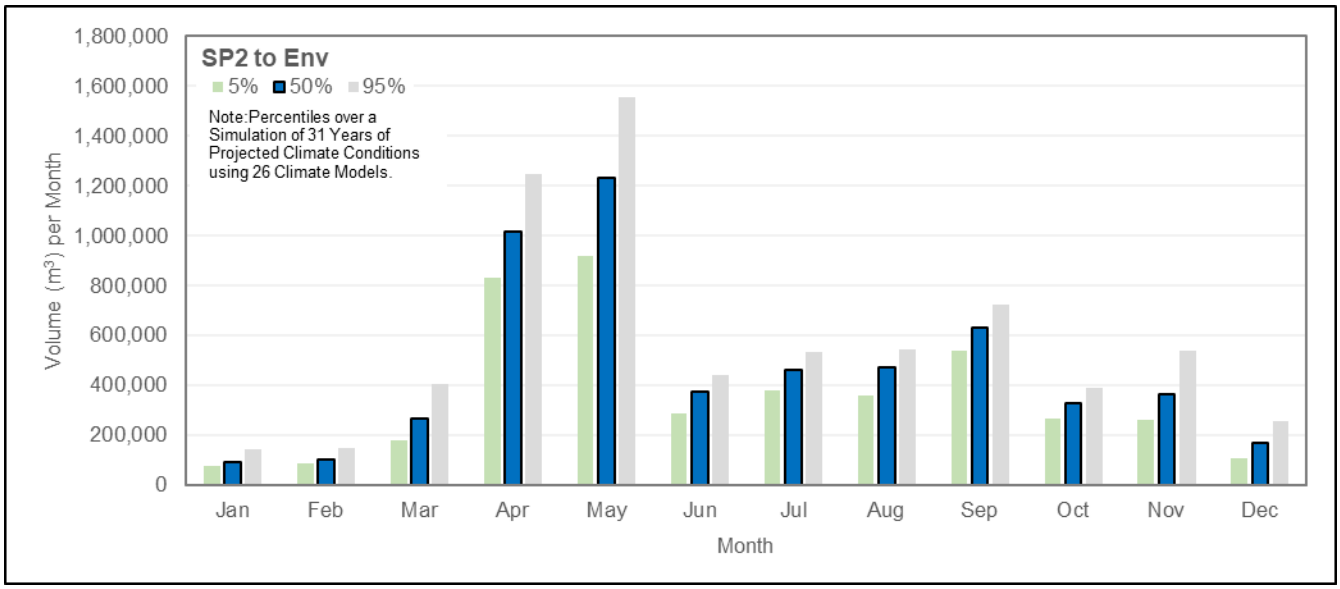


Figure C2.4 - 8: Estimated SP3 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP5 - 8.5

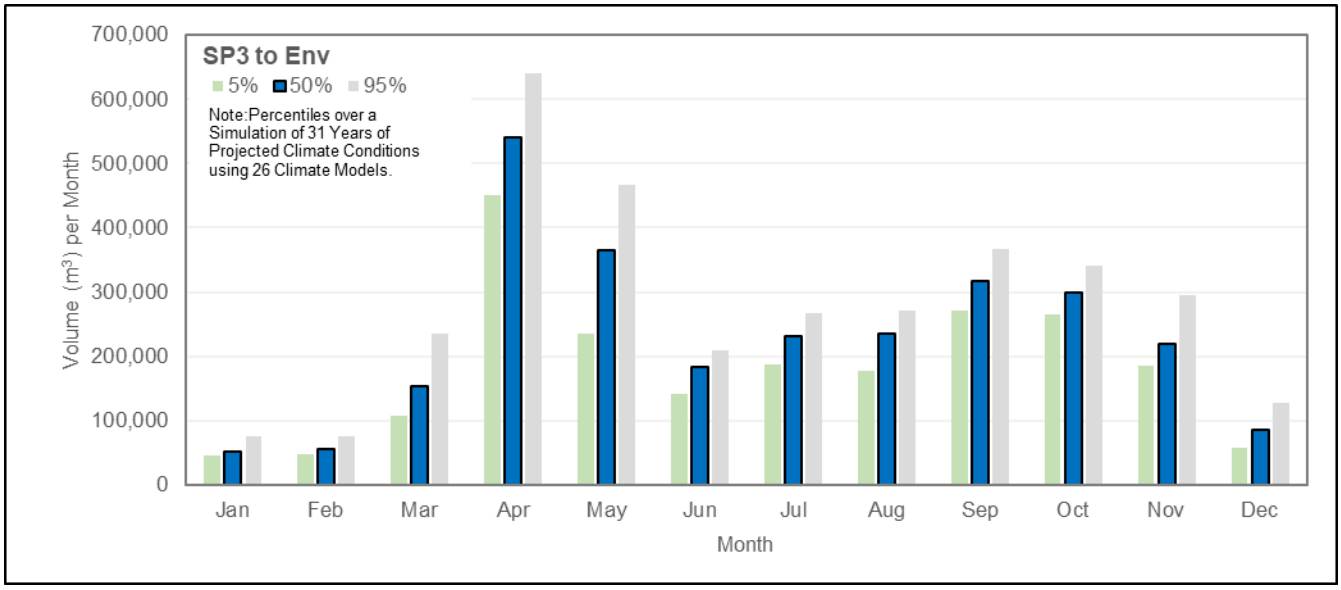


Figure C2.4 - 9: Estimated SP4 Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP5 - 8.5

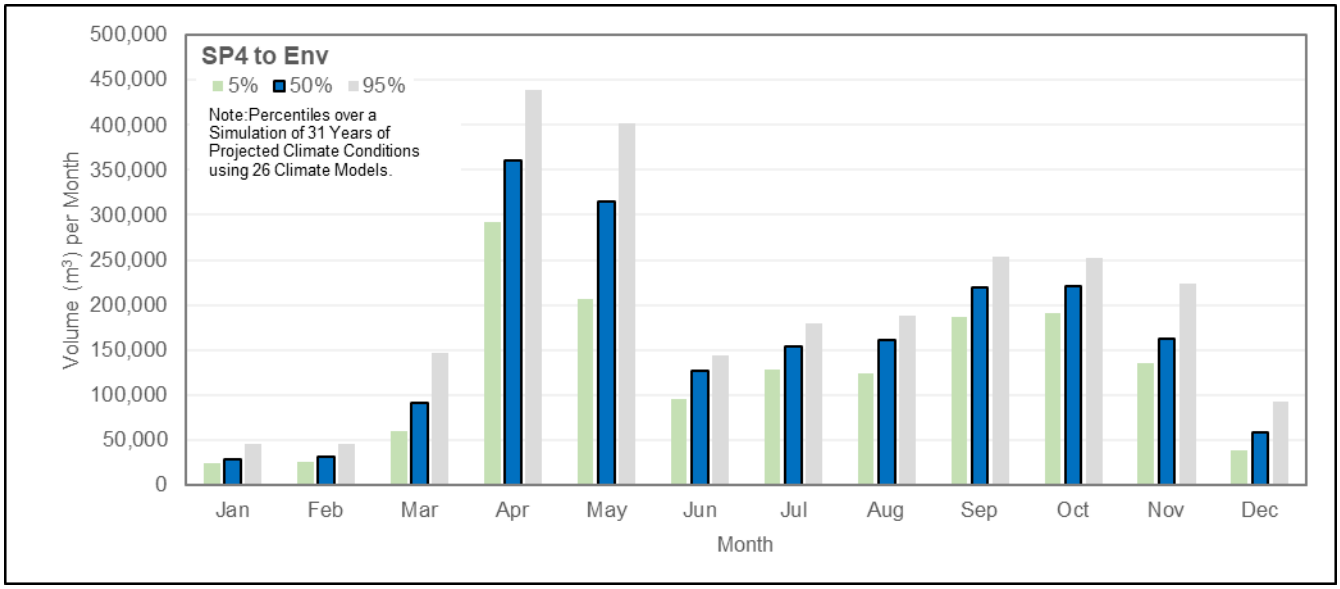
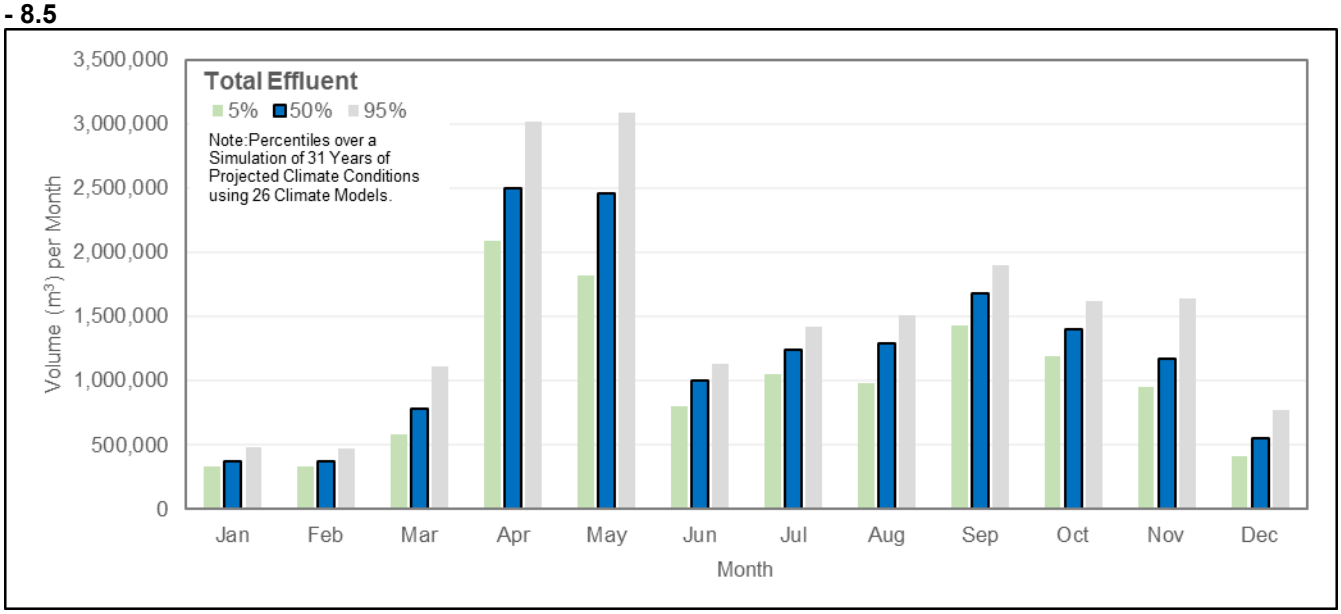


Figure C2.4 - 10: Estimated Total Effluent Fluxes for Year 9 and Climate Change Projection Scenario SSP5 - 8.5



2.5 Year 9 – Simulation of Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

Figure C2.5 - 1: Estimated TSF Pond Water Levels for Year 9 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

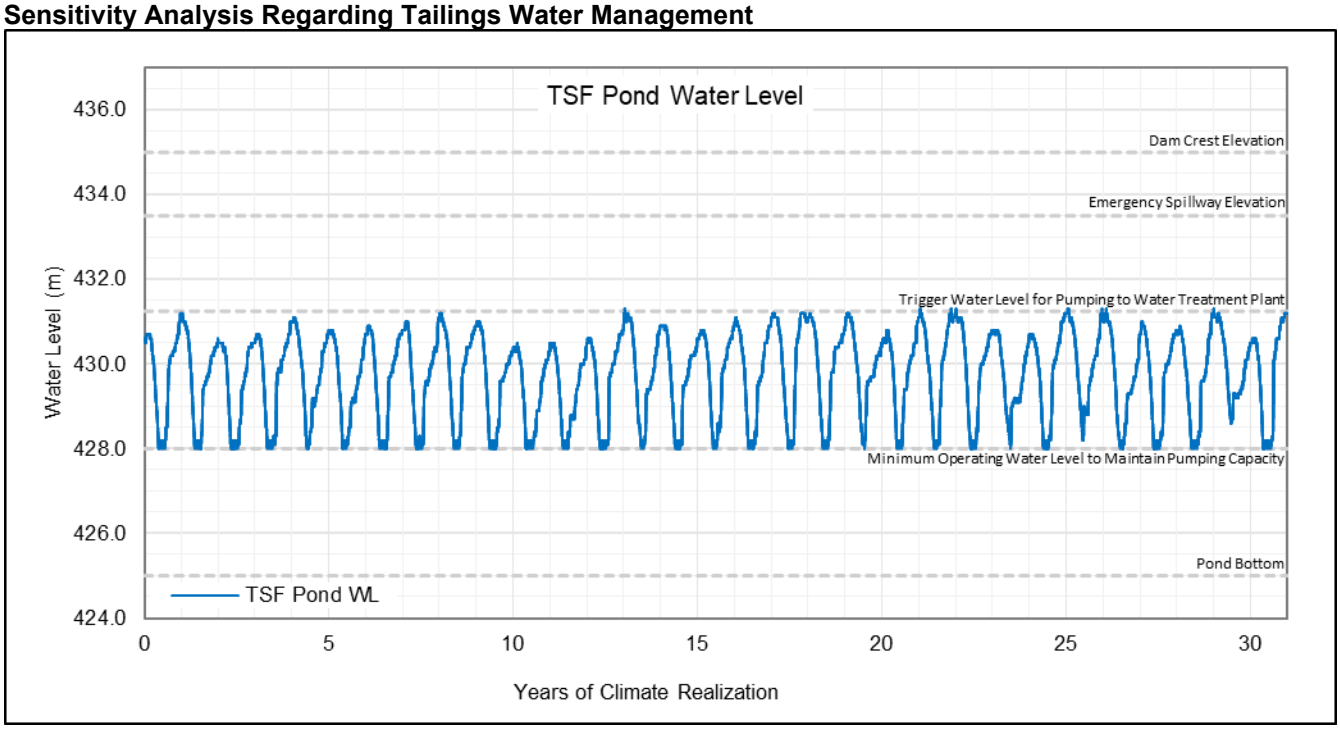


Figure C2.5 - 2: Estimated TSF Pond Water Volumes for Year 9 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

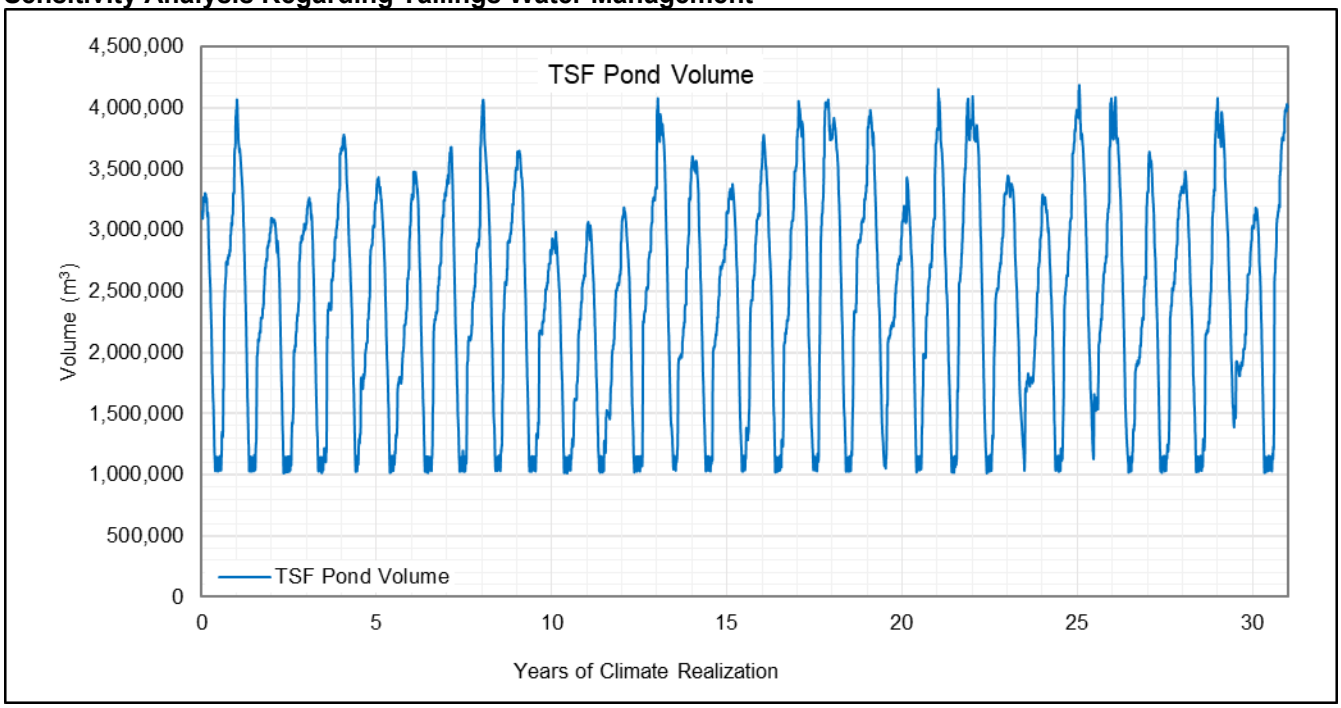


Figure C2.5 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 9 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

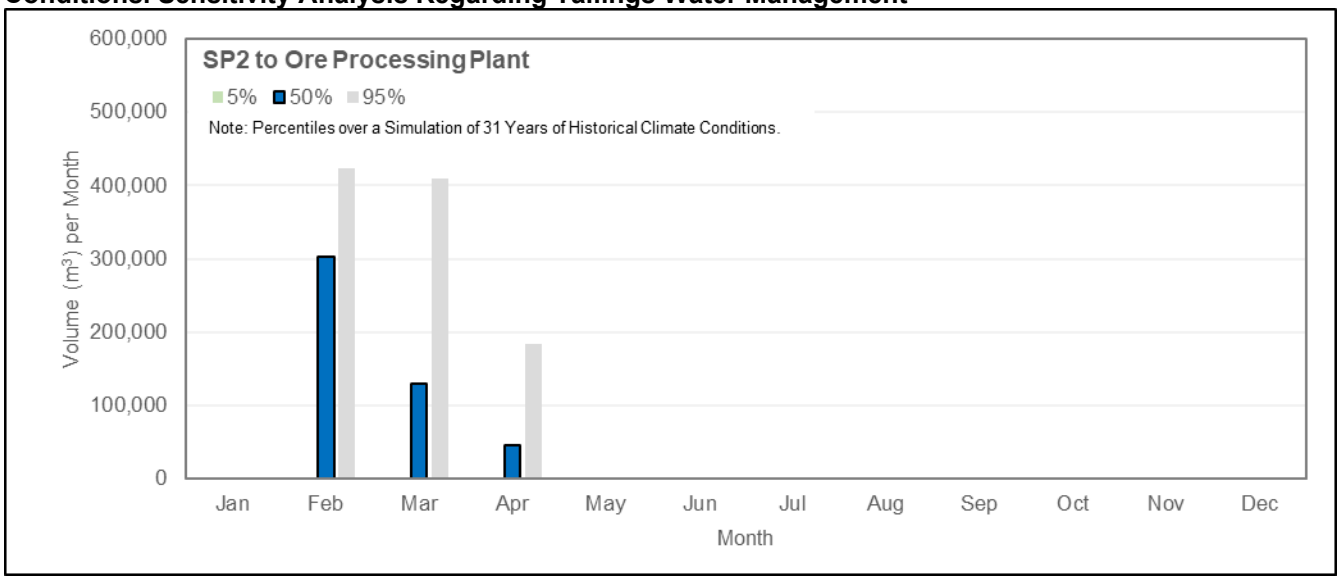


Figure C2.5 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 9 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

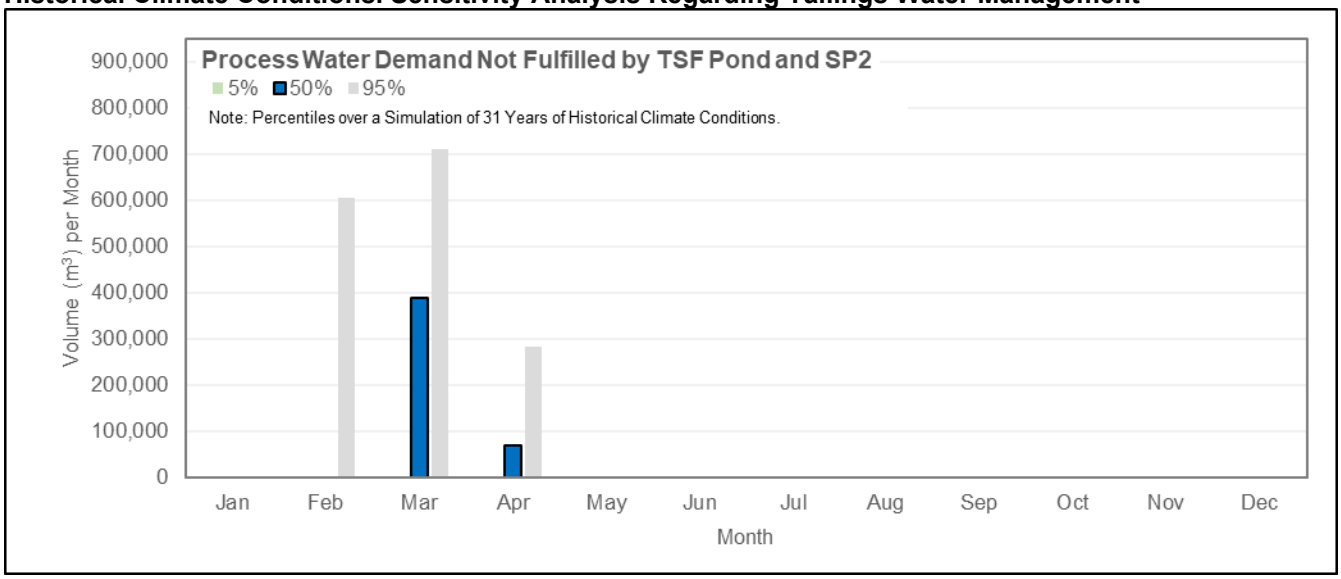


Figure C2.5 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 9 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

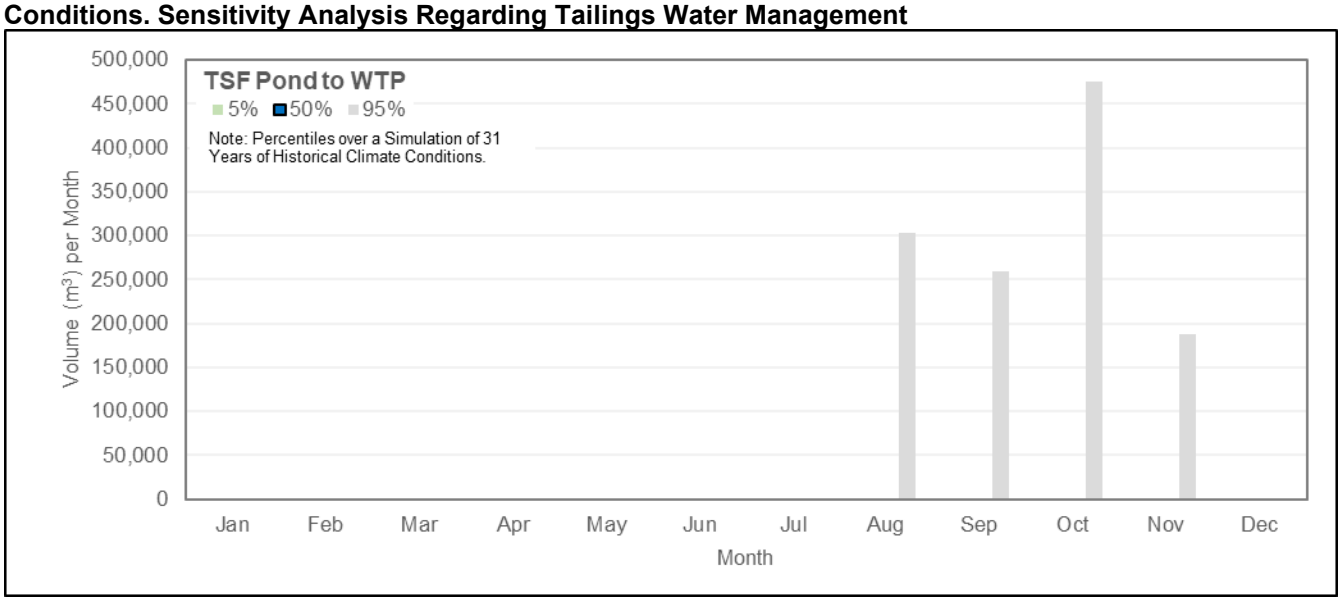


Figure C2.5 - 6: Estimated SP1 Effluent Fluxes for Year 9 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

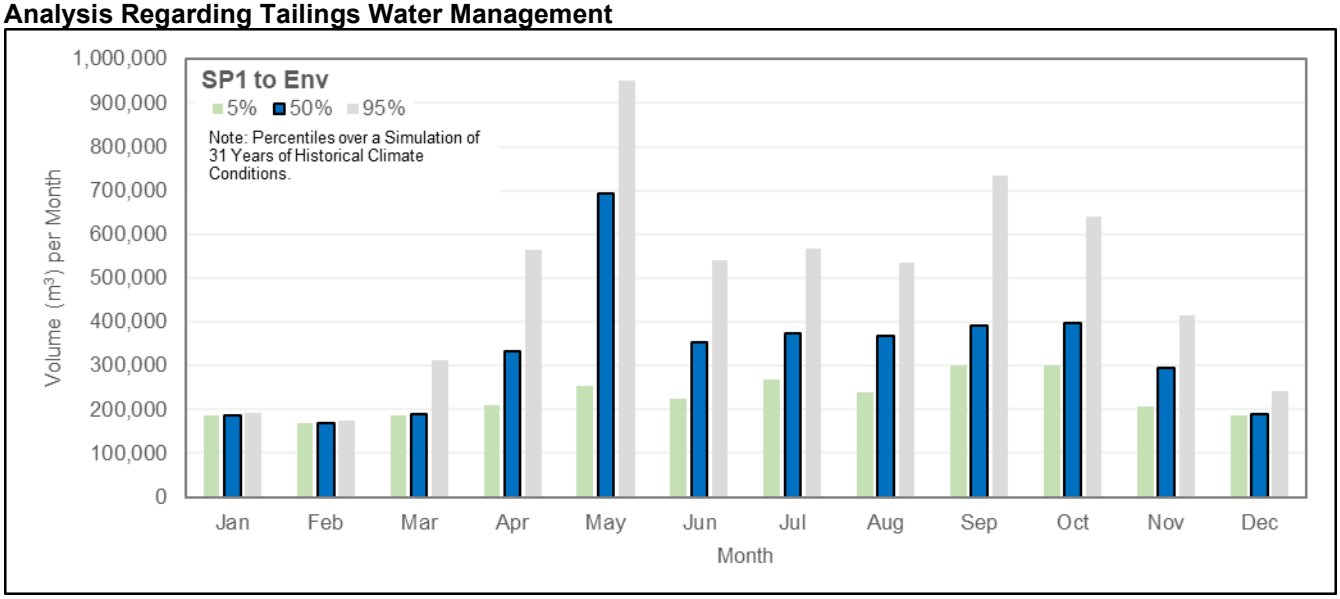


Figure C2.5 - 7: Estimated SP2 Effluent Fluxes for Year 9 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

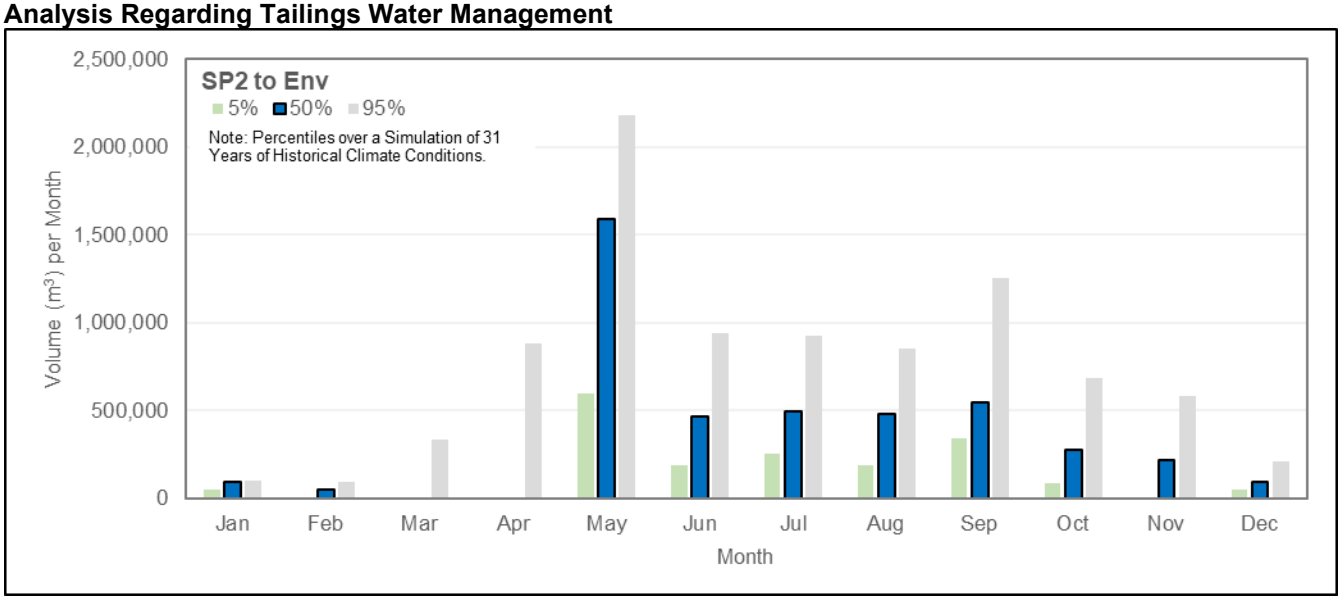


Figure C2.5 - 8: Estimated SP3 Effluent Fluxes for Year 9 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

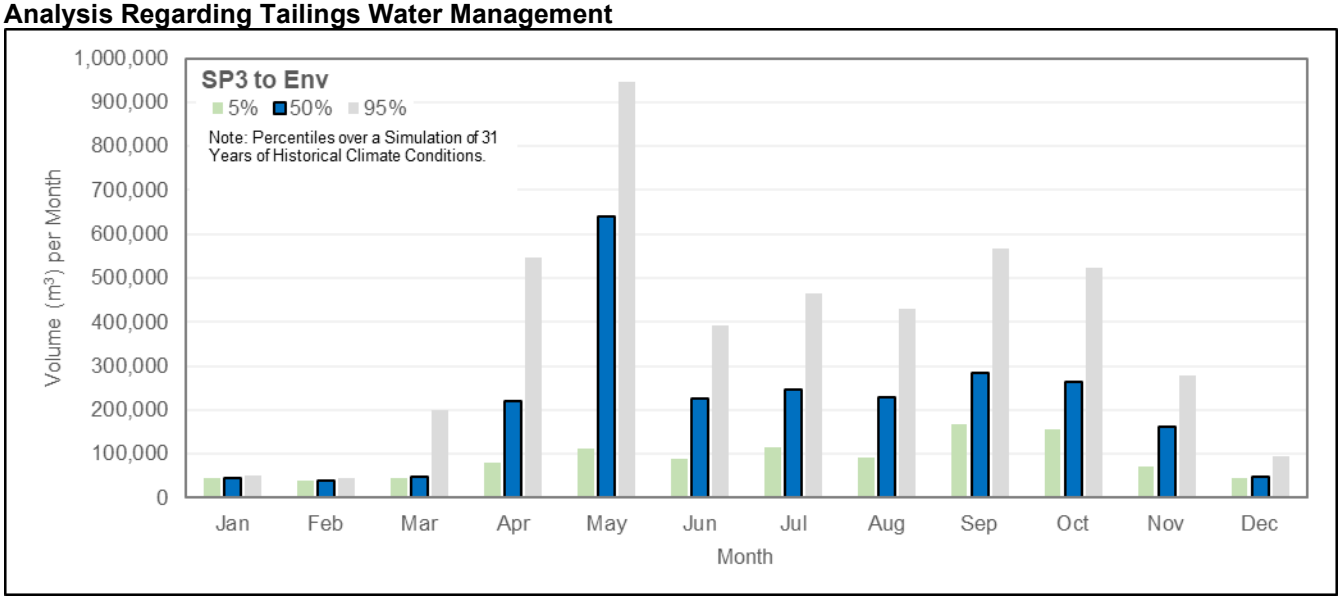


Figure C2.5 - 9: Estimated SP4 Effluent Fluxes for Year 9 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

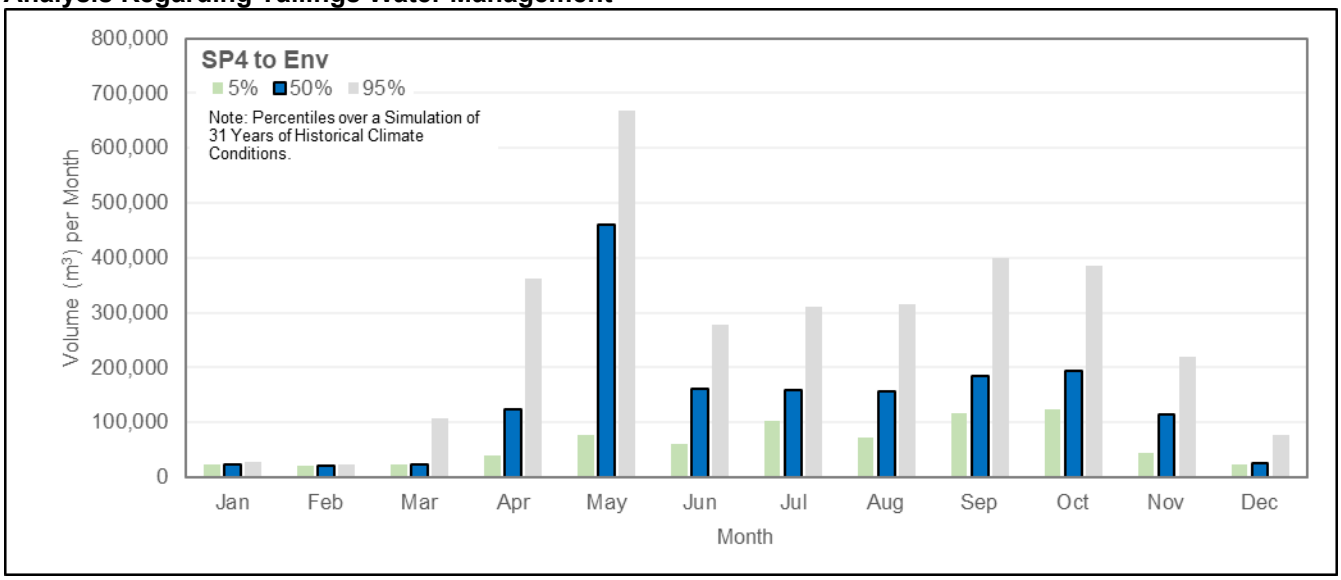
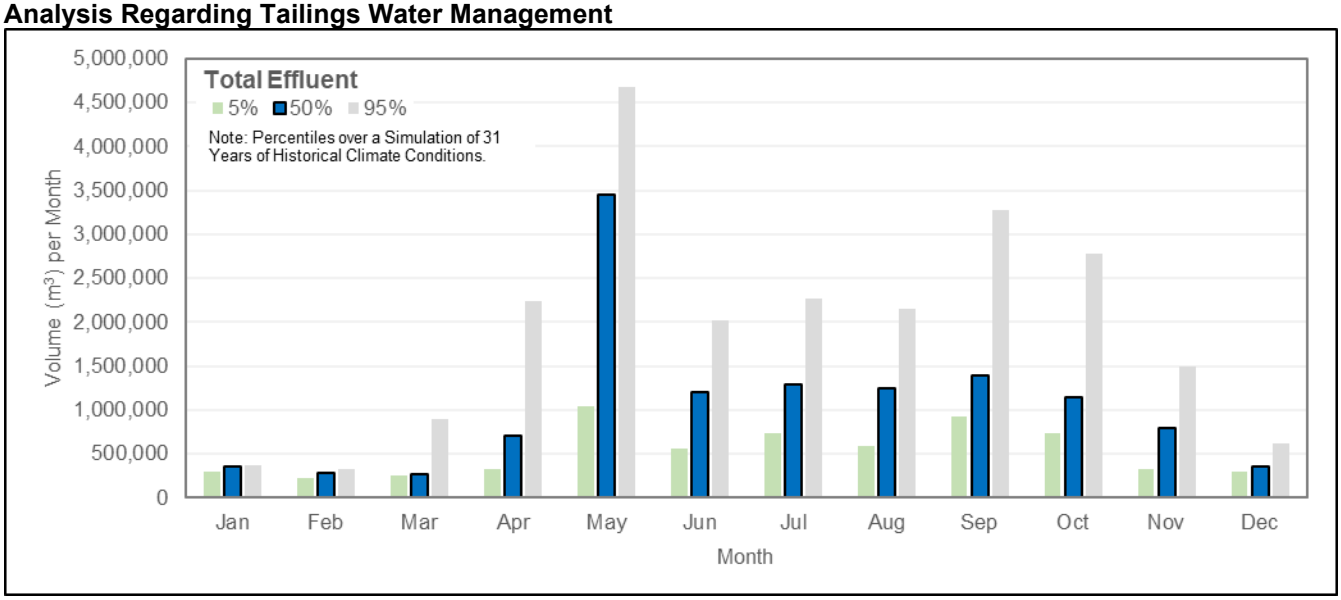


Figure C2.5 - 10: Estimated Total Effluent Fluxes for Year 9 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management



3.0 YEAR 21 (LAST YEAR IN THE LIFE OF MINE, TAILINGS DEPOSITION IN PIT 87)

3.1 Year 21 – Simulation of Historical Climate Conditions

Figure C3.1 - 1: Estimated TSF Pond Water Levels for Year 21 and Historical Climate Conditions

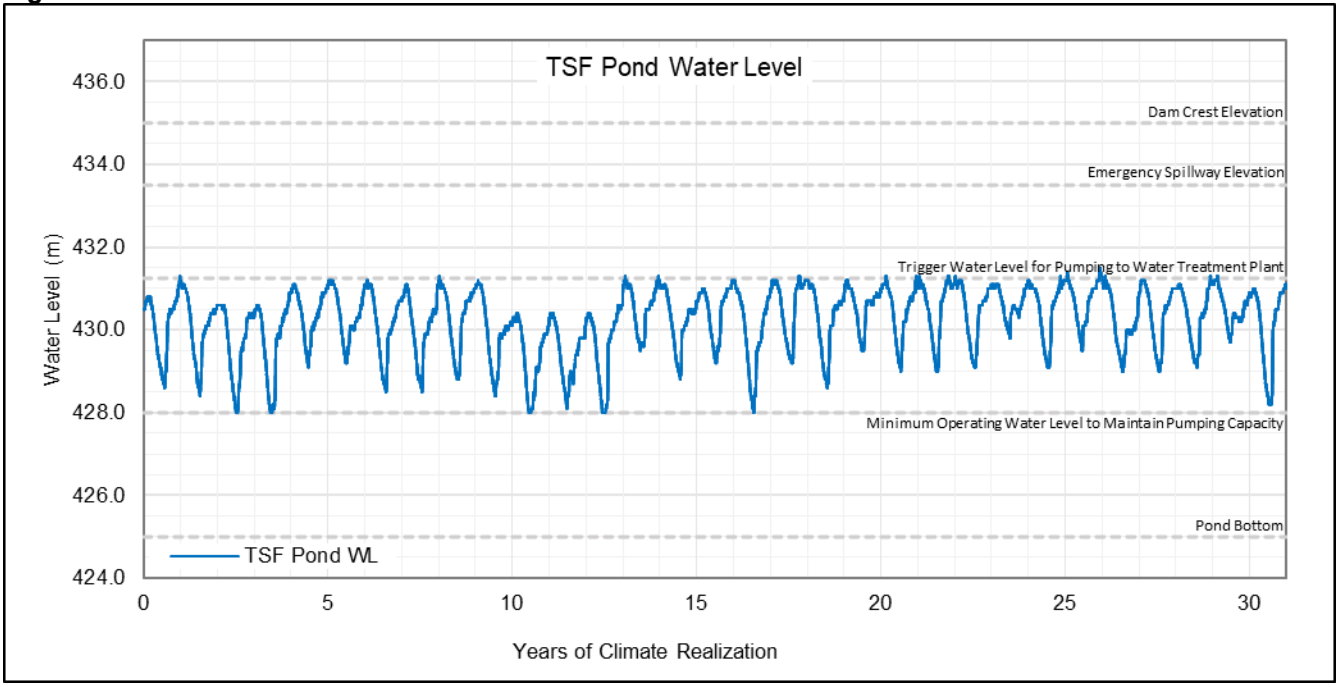


Figure C3.1 - 2: Estimated TSF Pond Water Volumes for Year 21 and Historical Climate Conditions

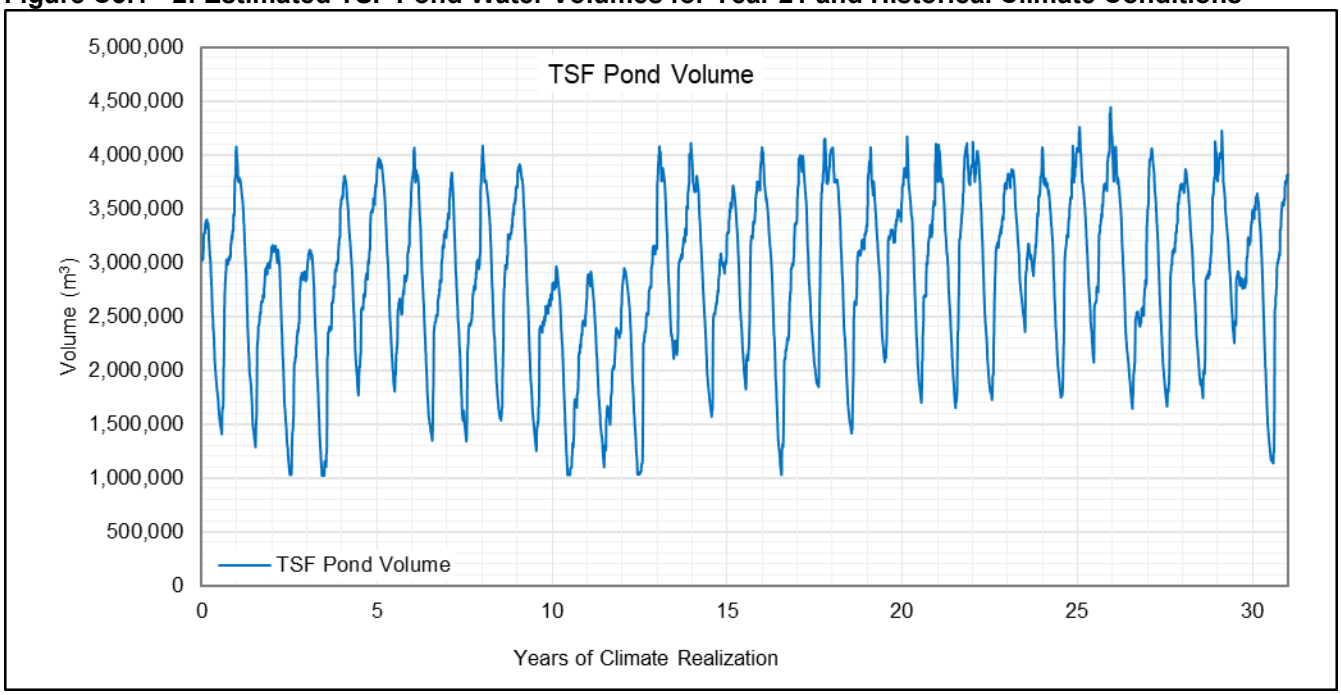


Figure C3.1 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 21 and Historical Climate Conditions

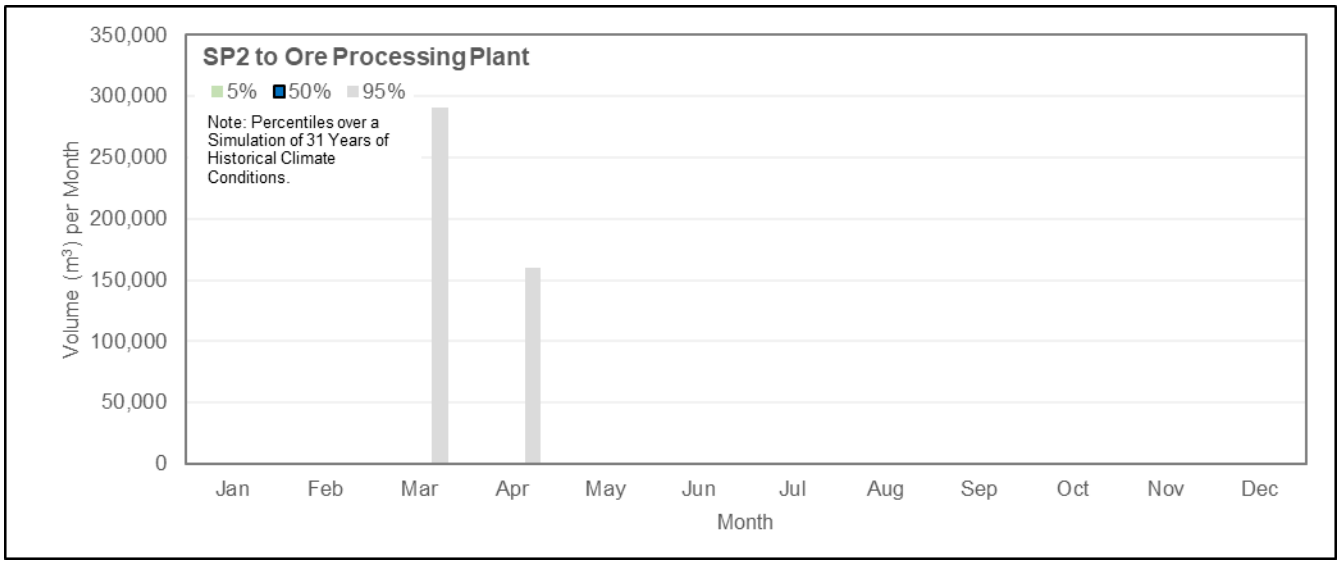


Figure C3.1 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 21 and Historical Climate Conditions

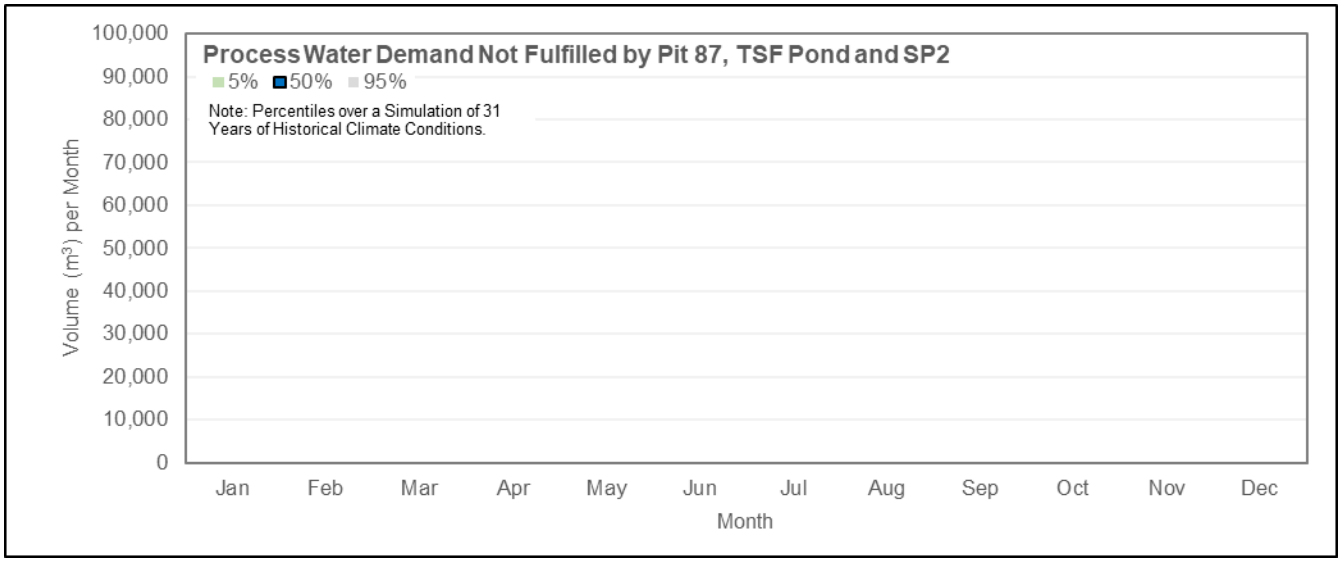


Figure C3.1 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 21 and Historical Climate Conditions

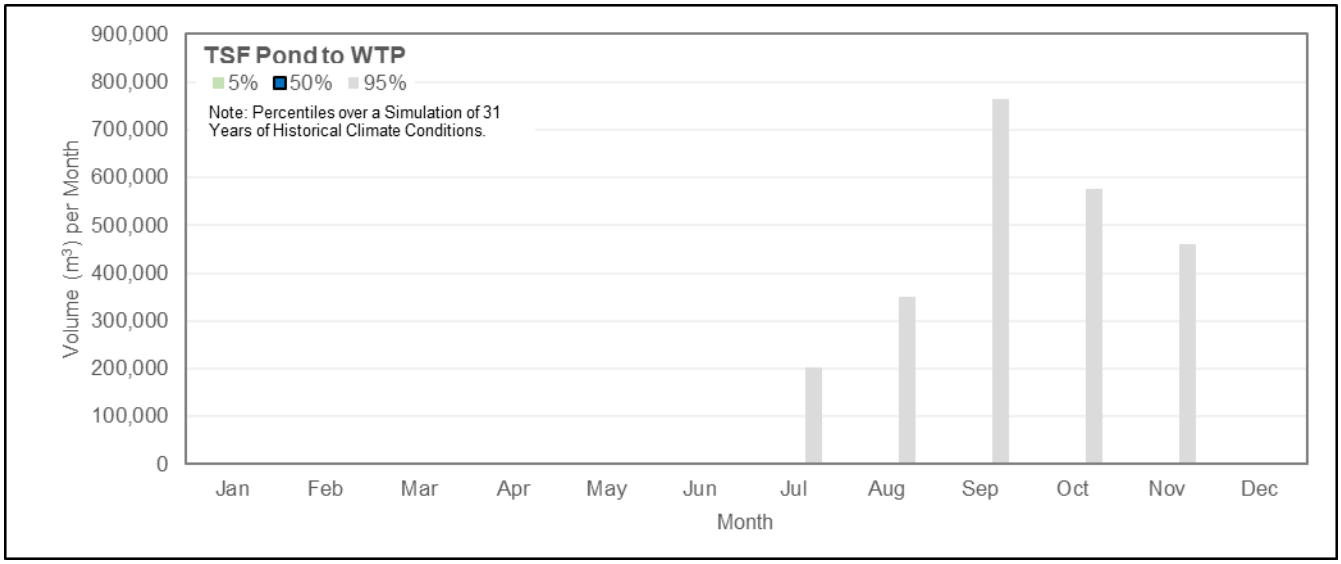


Figure C3.1 - 6: Estimated SP1 Effluent Fluxes for Year 21 and Historical Climate Conditions

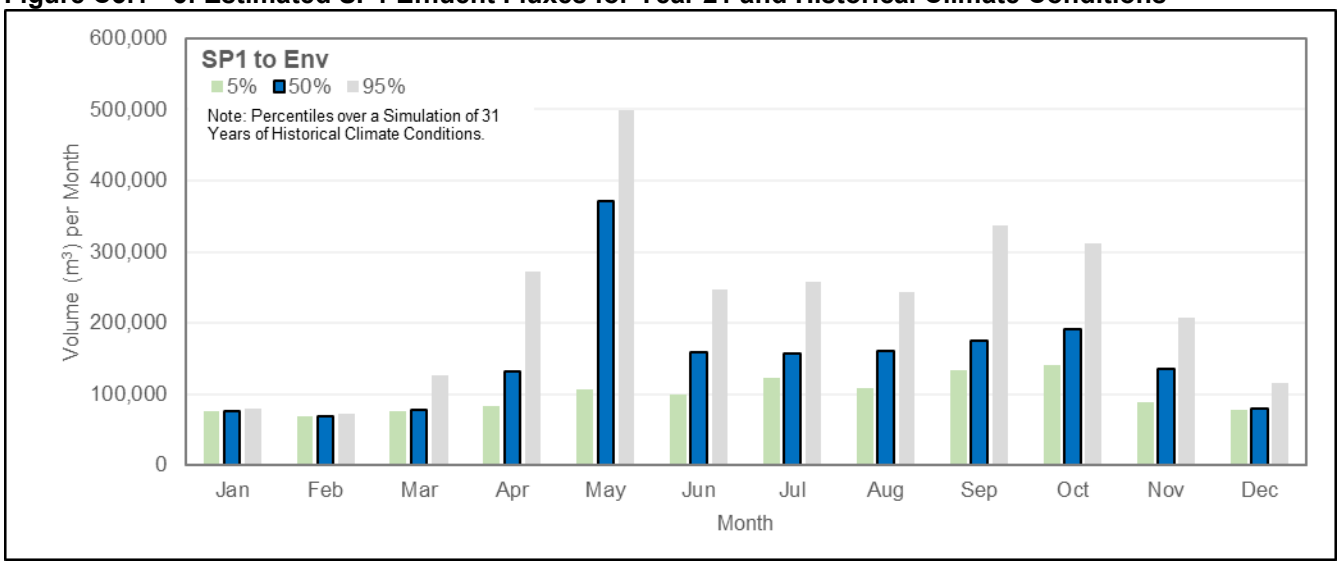


Figure C3.1 - 7: Estimated SP2 Effluent Fluxes for Year 21 and Historical Climate Conditions

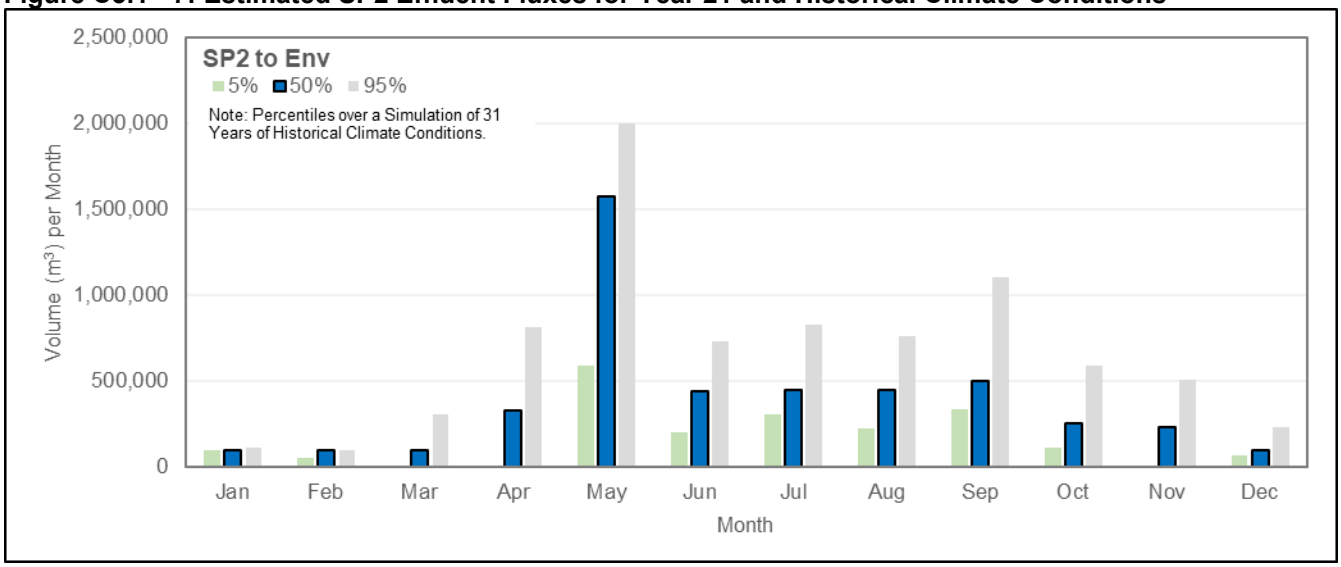


Figure C3.1 - 8: Estimated SP3 Effluent Fluxes for Year 21 and Historical Climate Conditions

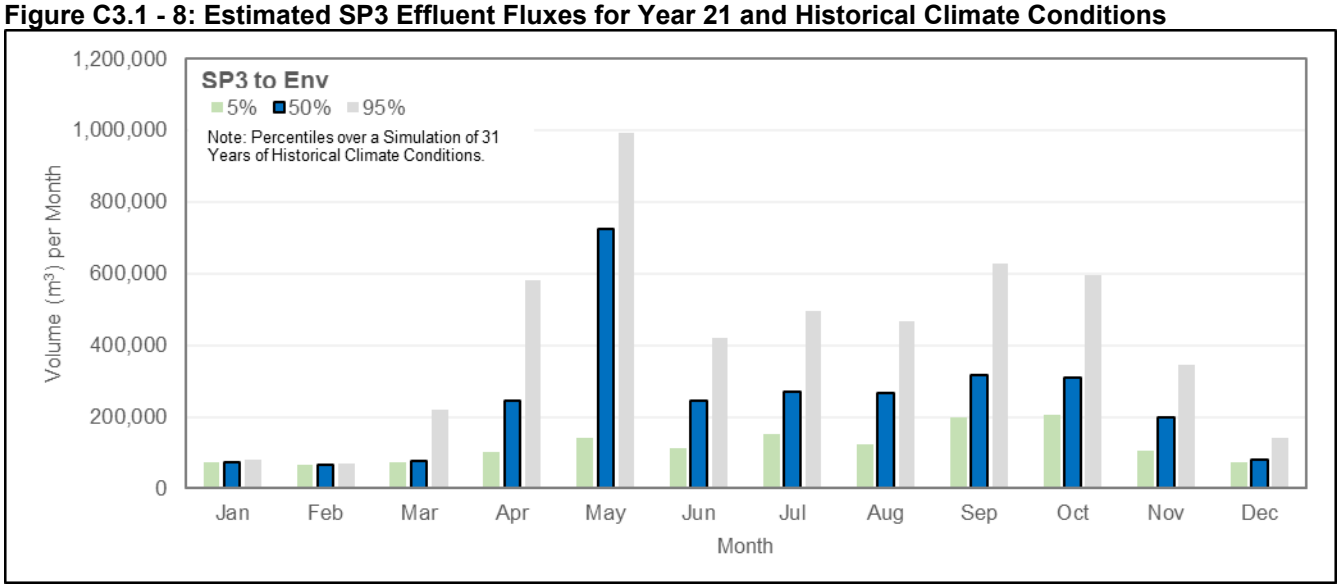


Figure C3.1 - 9: Estimated SP4 Effluent Fluxes for Year 21 and Historical Climate Conditions

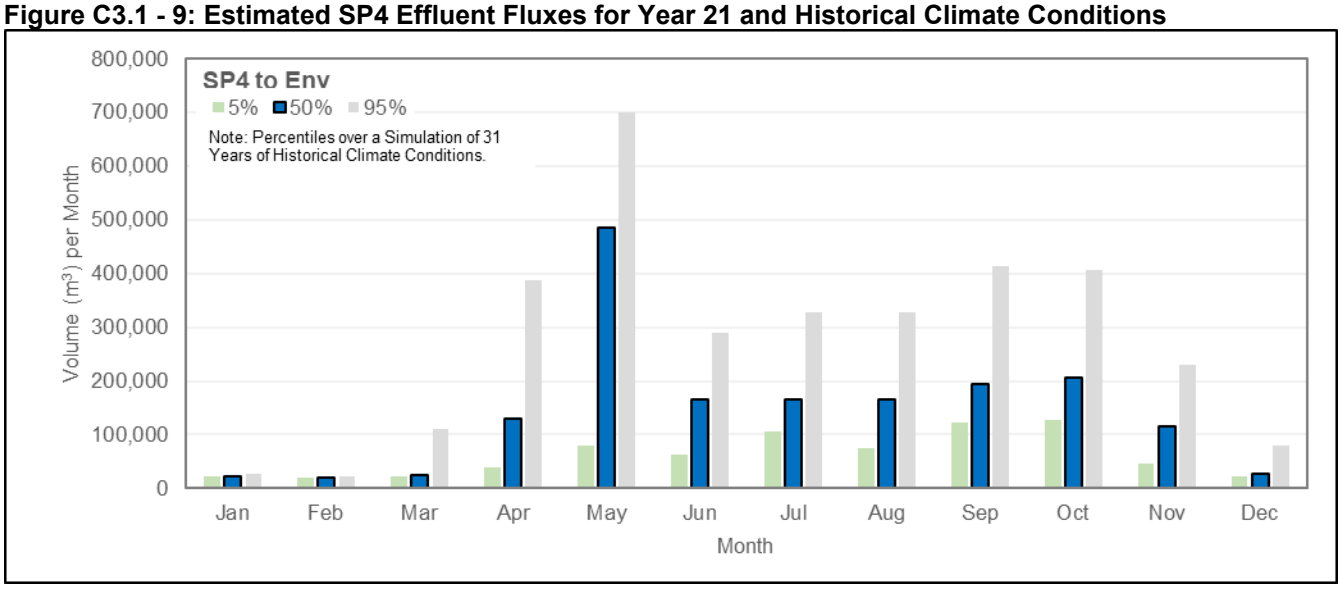


Figure C3.1 - 10: Estimated Total Effluent Fluxes for Year 21 and Historical Climate Conditions

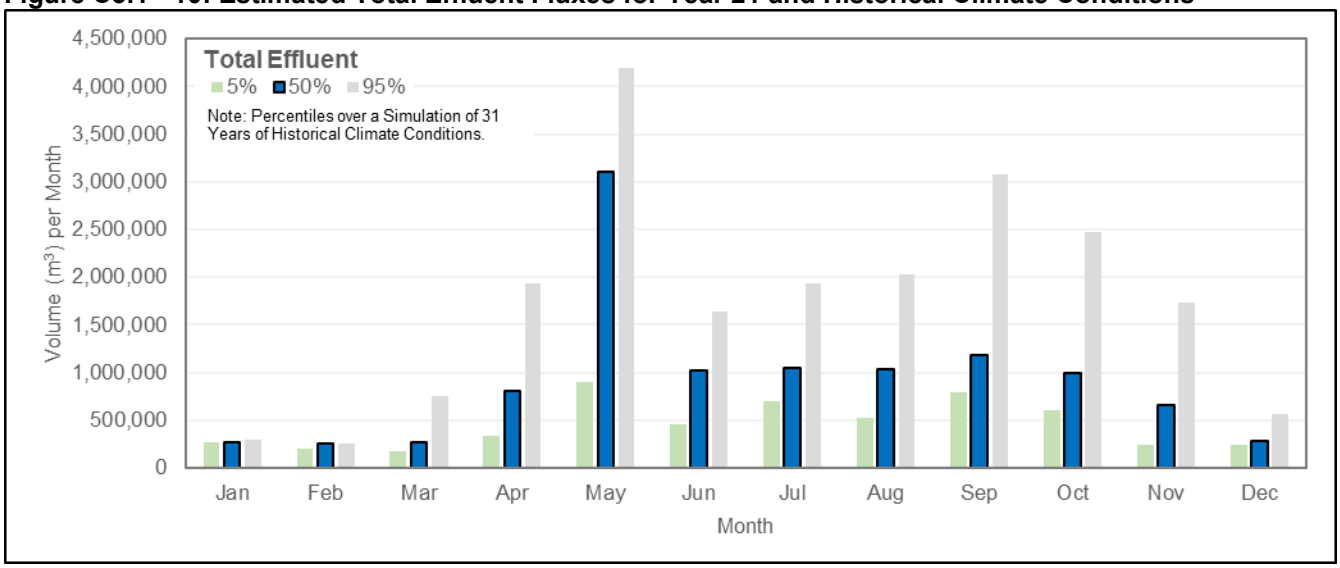
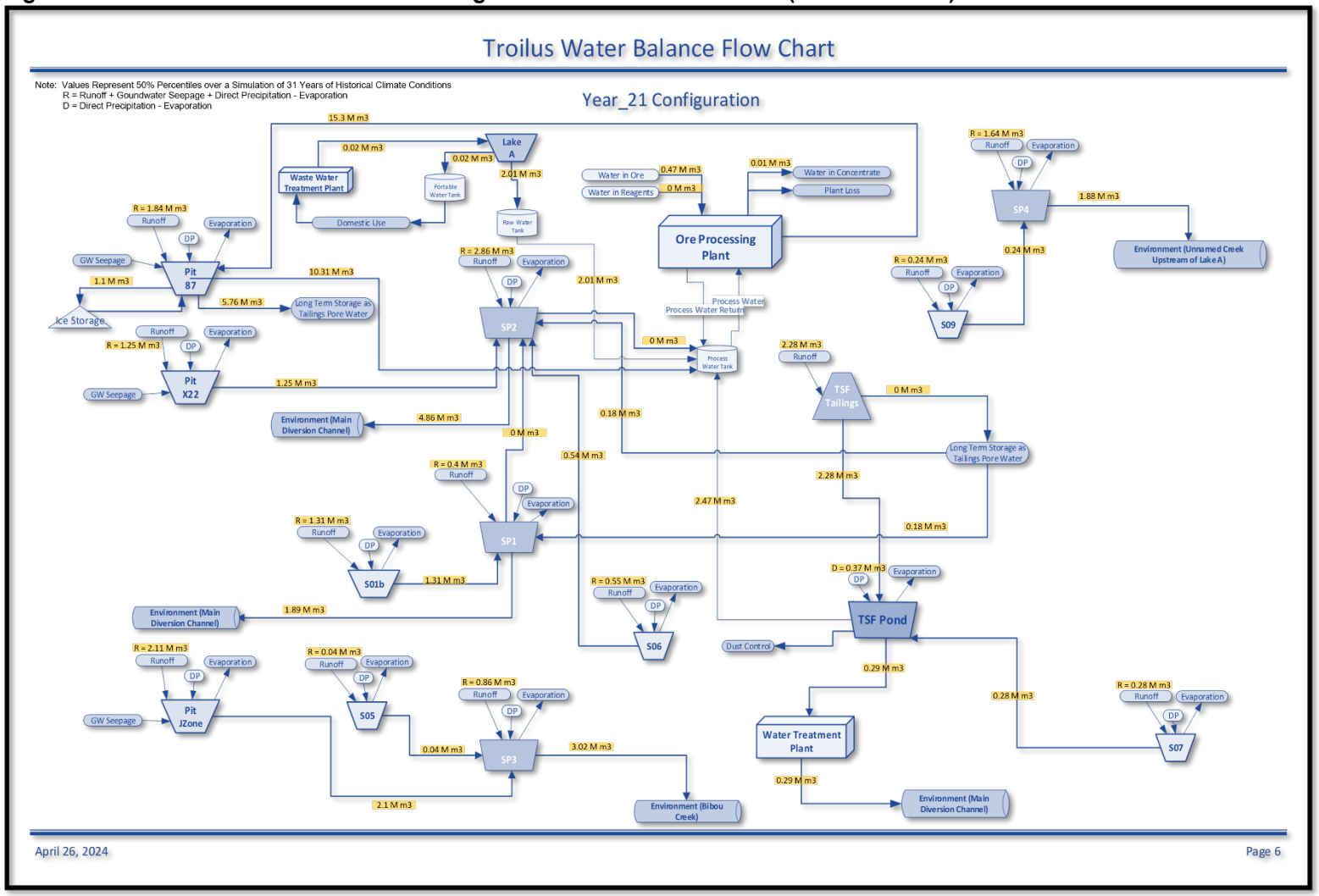


Figure C3.1 - 11: Estimated Annual Flow Diagram for Year 21 and Median (50th Percentile) Historical Climate Condition



3.2 Year 21 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP1 - 2.6

Figure C3.2 - 1: Estimated TSF Pond Water Levels for Year 21 and Climate Change Projection Scenario SSP1 - 2.6

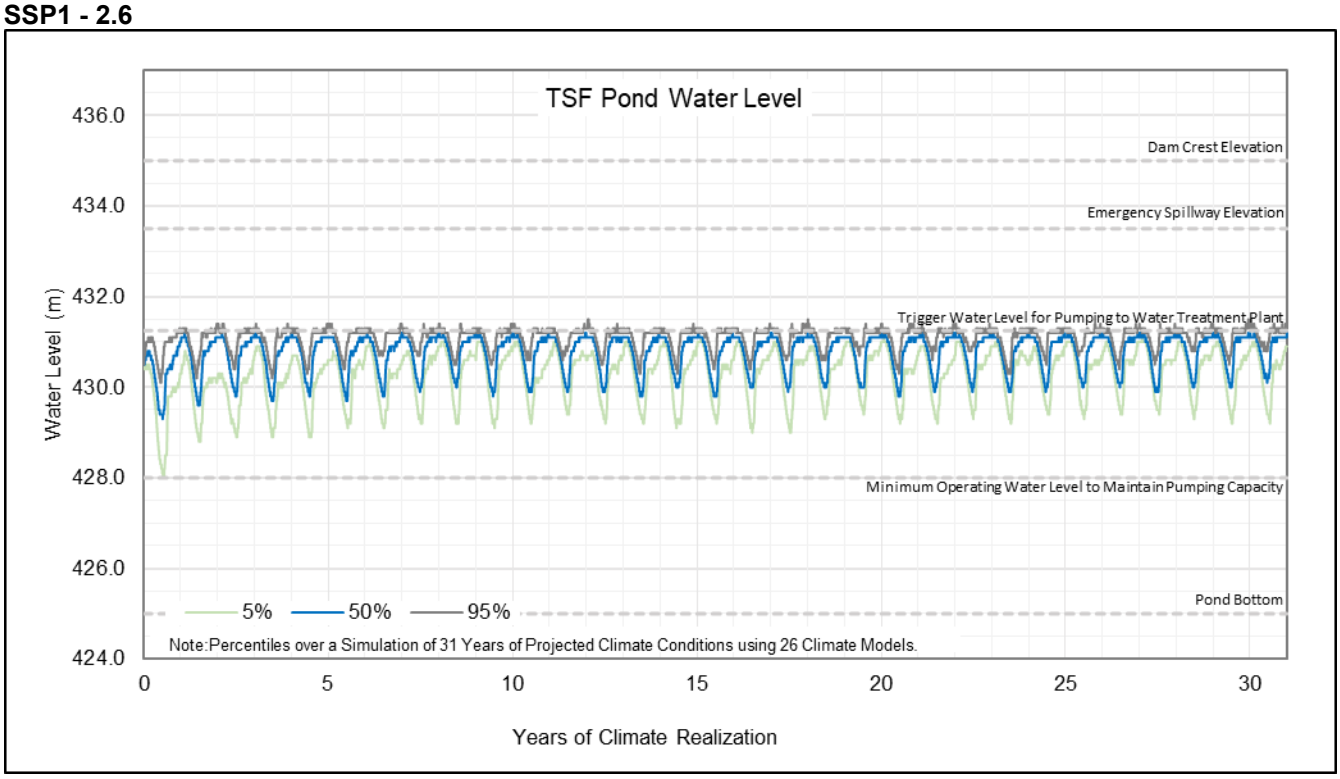


Figure C3.2 - 2: Estimated TSF Pond Water Volumes for Year 21 and Climate Change Projection Scenario SSP1 - 2.6

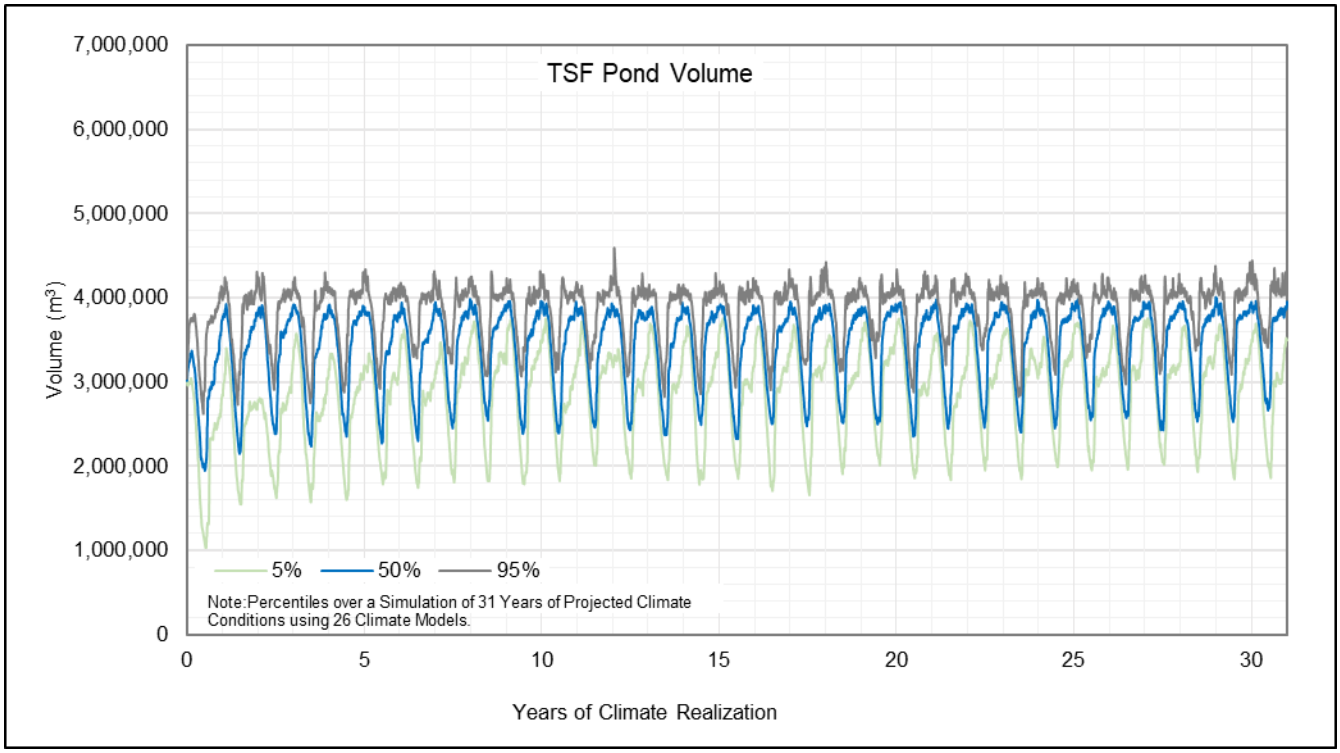


Figure C3.2 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 21 and Climate Change Projection Scenario SSP1 - 2.6

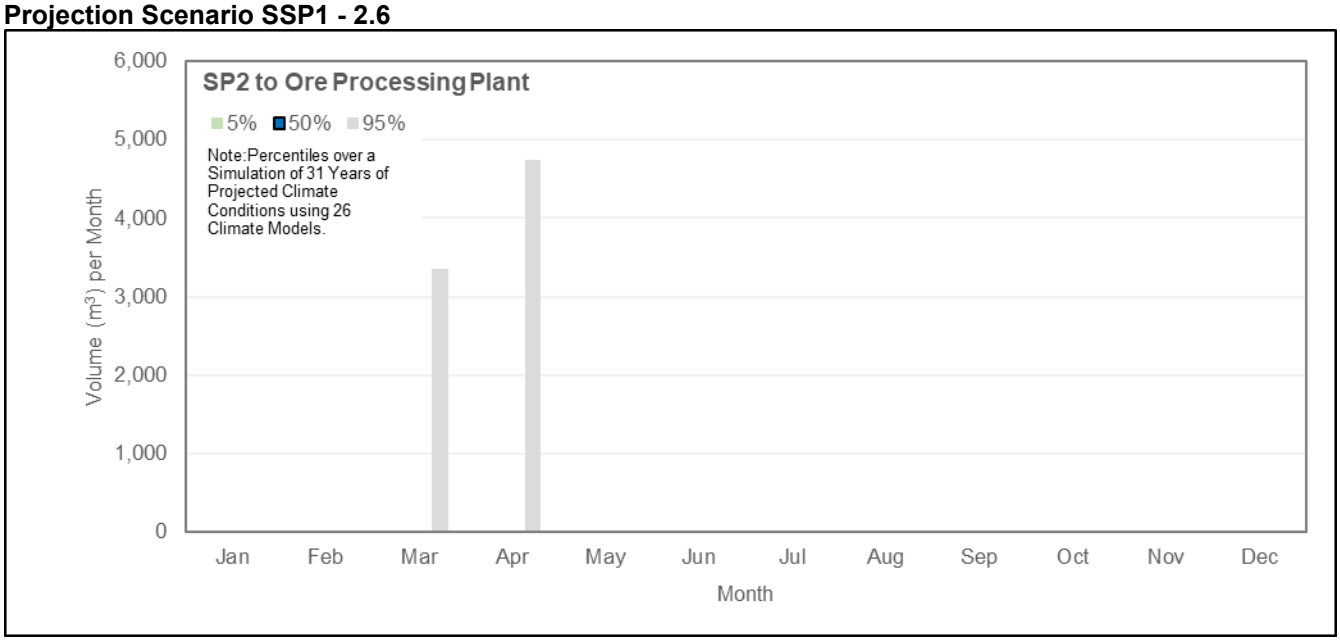


Figure C3.2 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 21 and Climate Change Projection Scenario SSP1 - 2.6

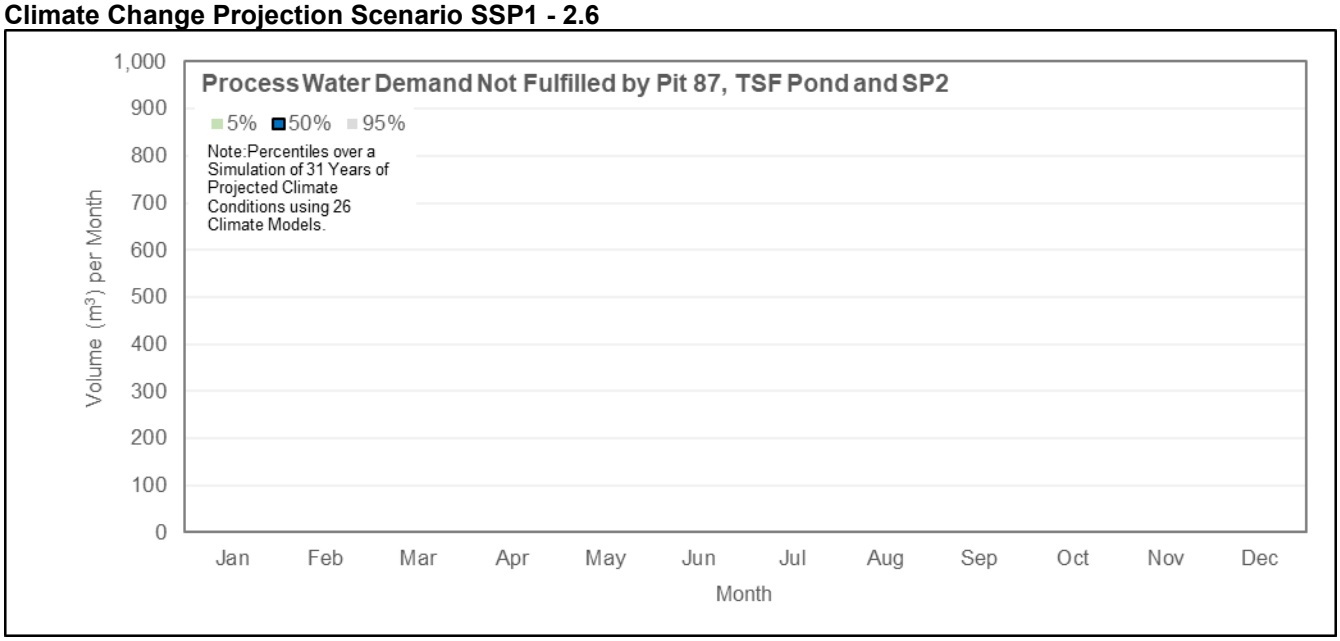


Figure C3.2 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP1 - 2.6

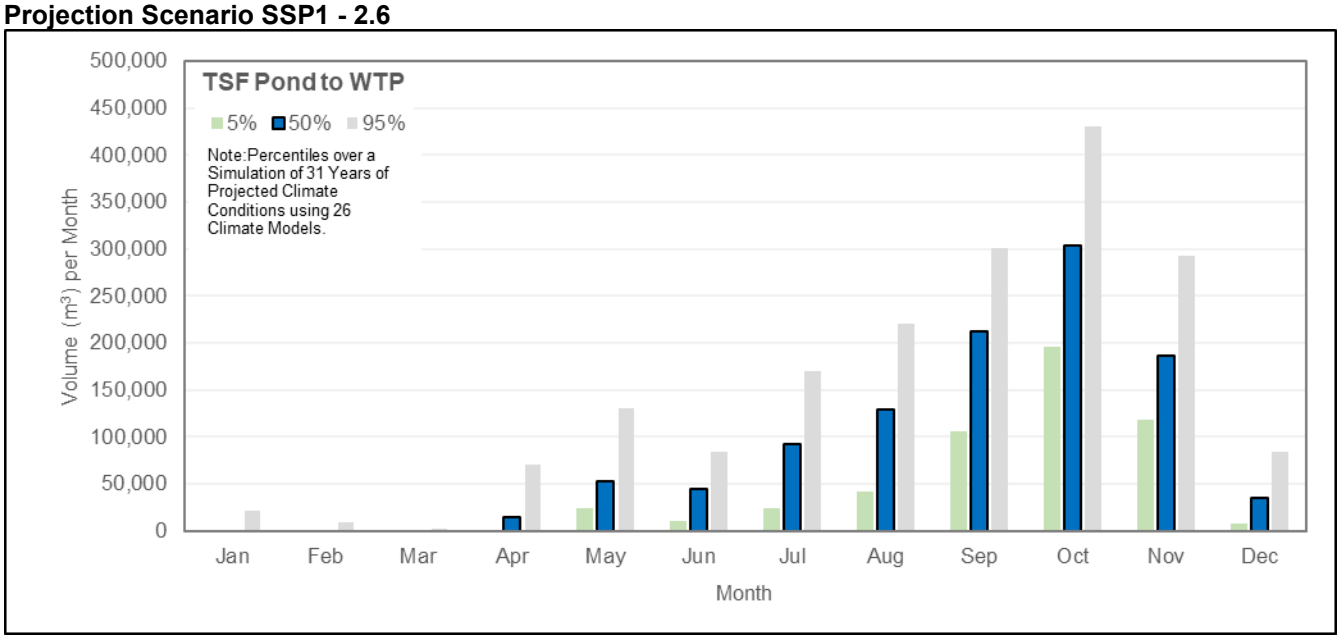


Figure C3.2 - 6: Estimated SP1 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP1 - 2.6

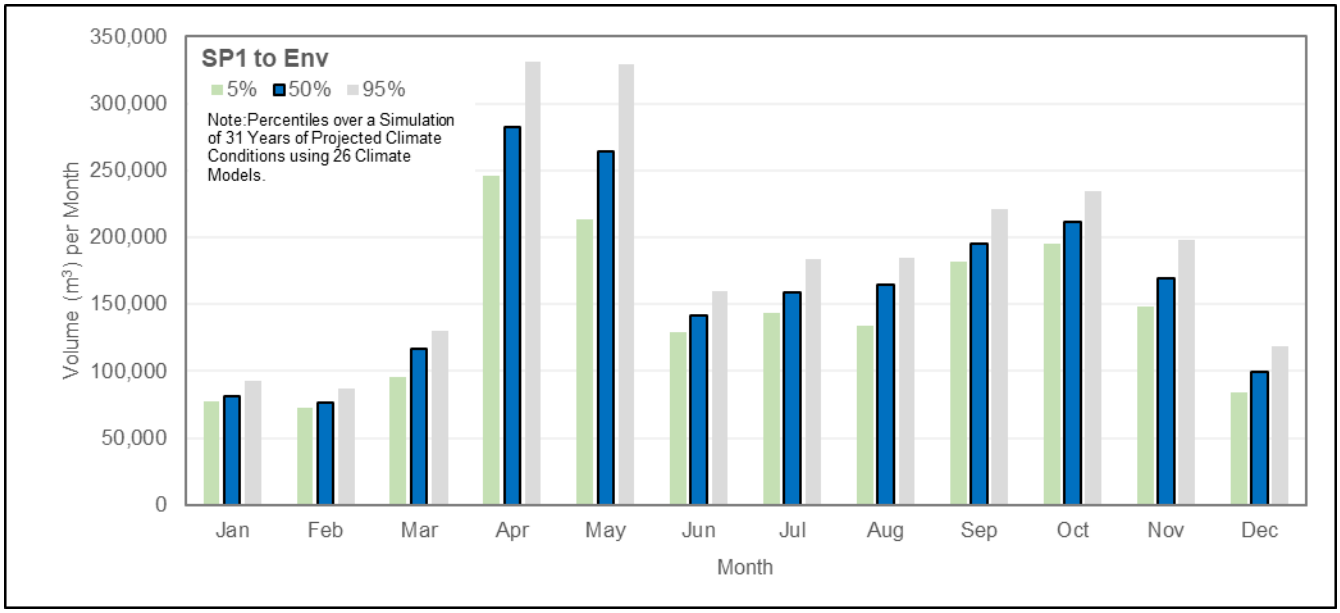


Figure C3.2 - 7: Estimated SP2 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP1 - 2.6

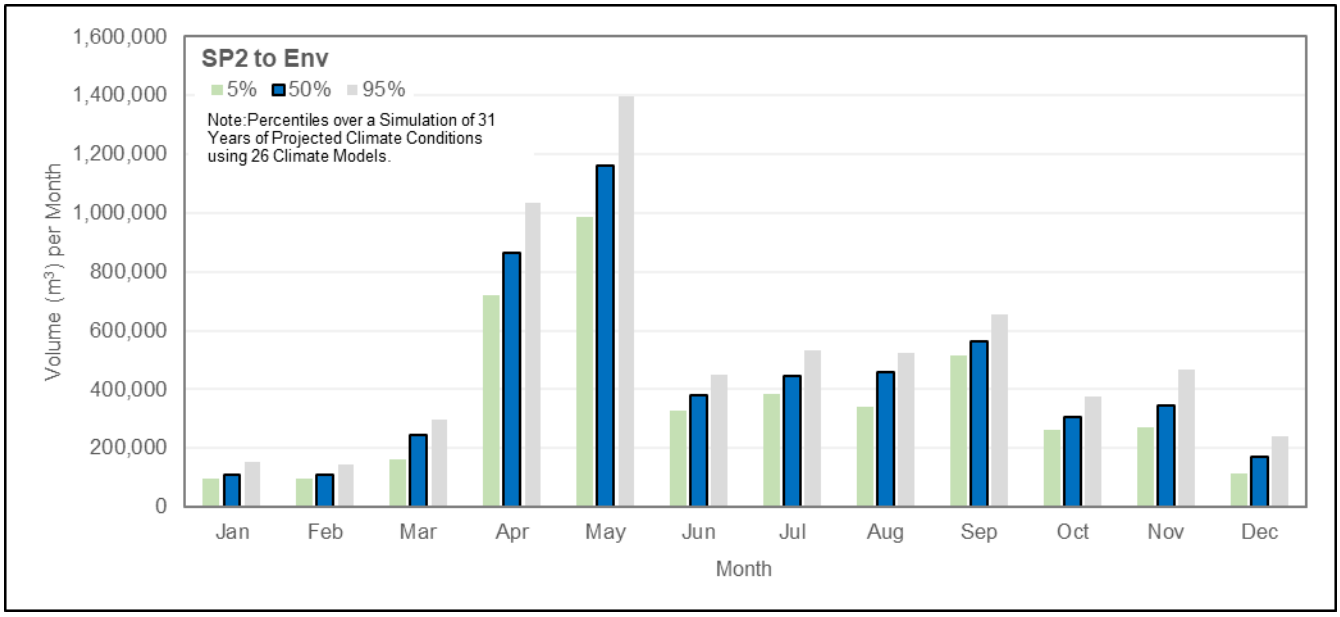


Figure C3.2 - 8: Estimated SP3 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP1 - 2.6

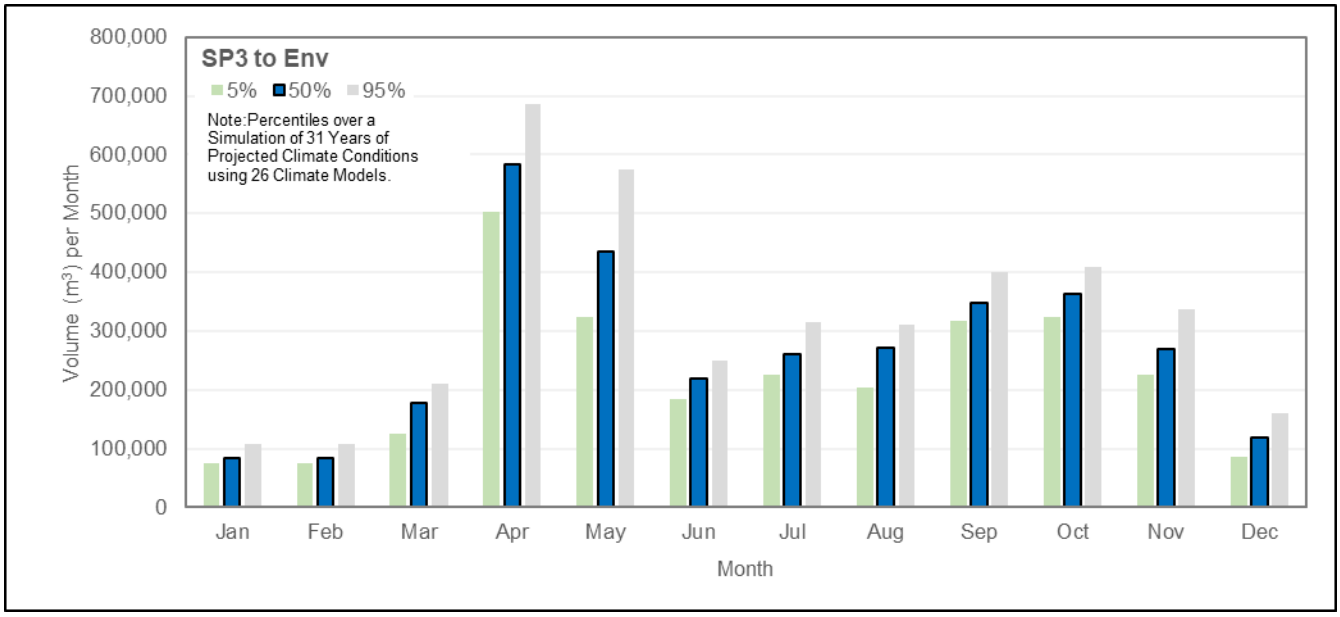


Figure C3.2 - 9: Estimated SP4 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP1 - 2.6

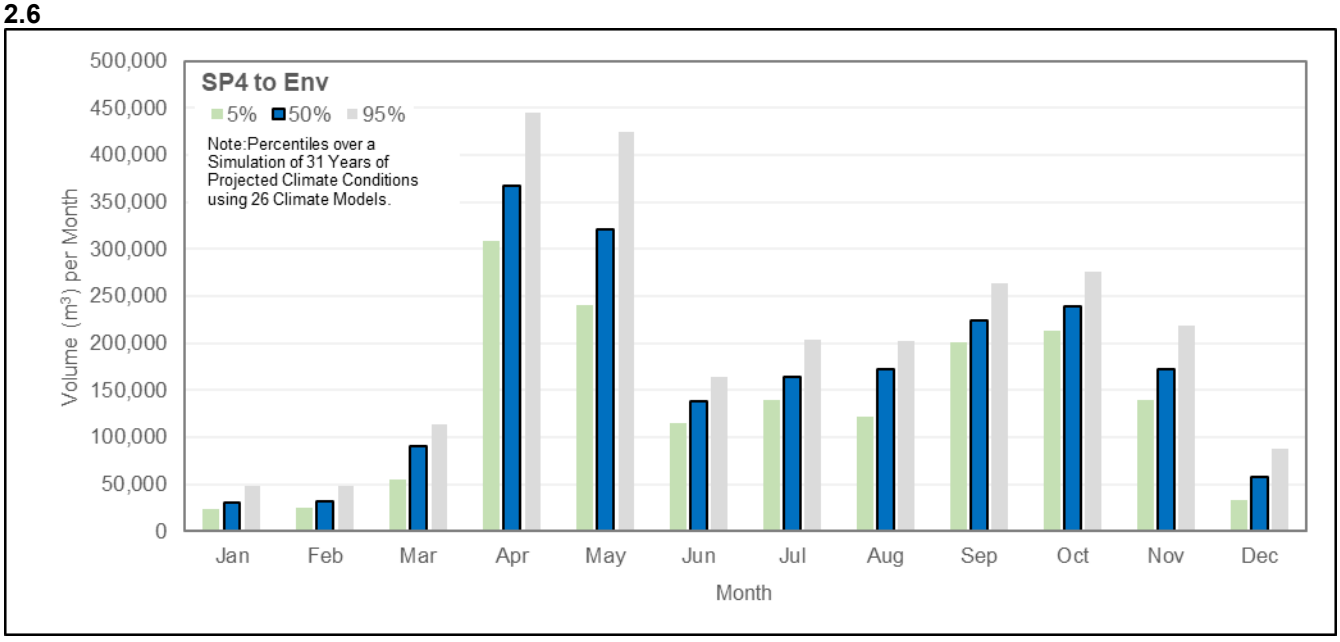
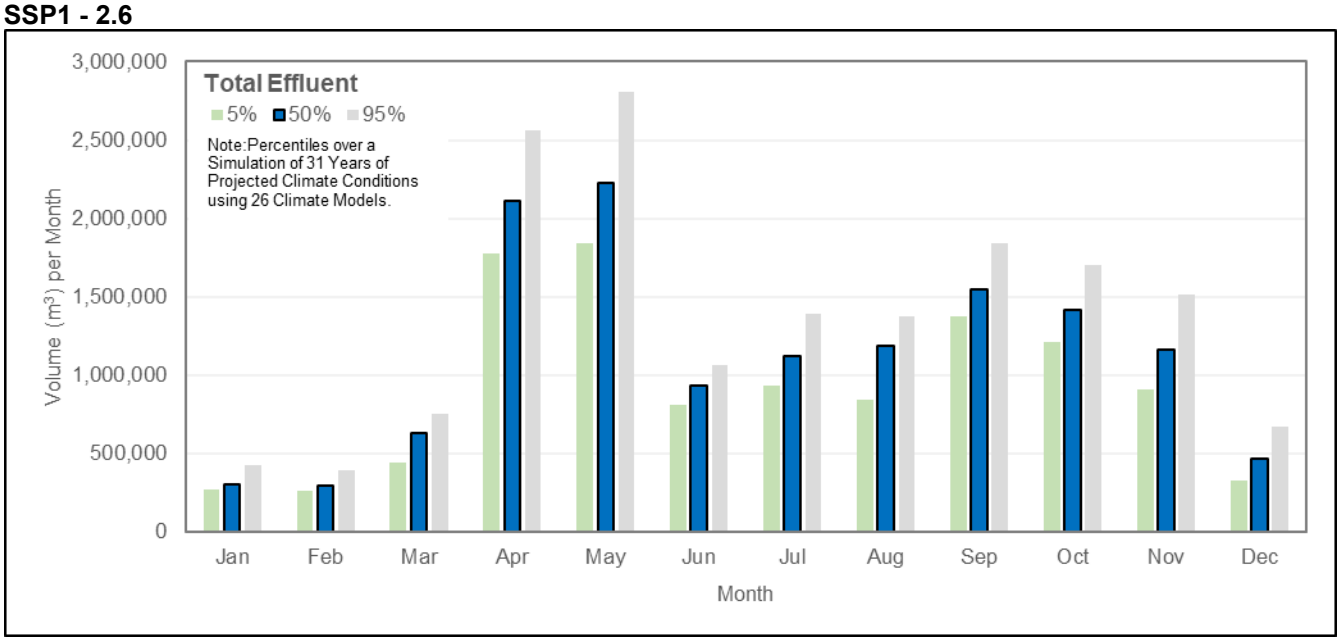


Figure C3.2 - 10: Estimated Total Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP1 - 2.6



3.3 Year 21 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP2 - 4.5

Figure C3.3 - 1: Estimated TSF Pond Water Levels for Year 21 and Climate Change Projection Scenario SSP2 - 4.5

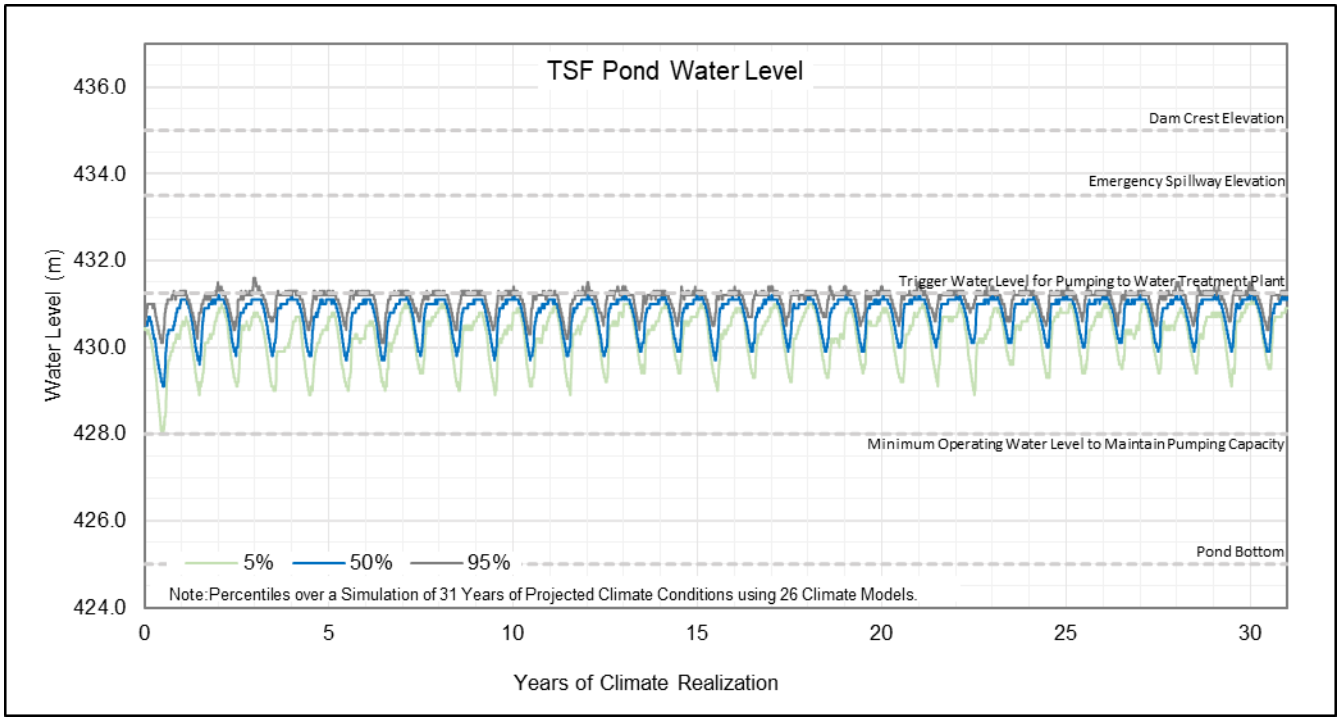


Figure C3.3 - 2: Estimated TSF Pond Water Volumes for Year 21 and Climate Change Projection Scenario SSP2 - 4.5

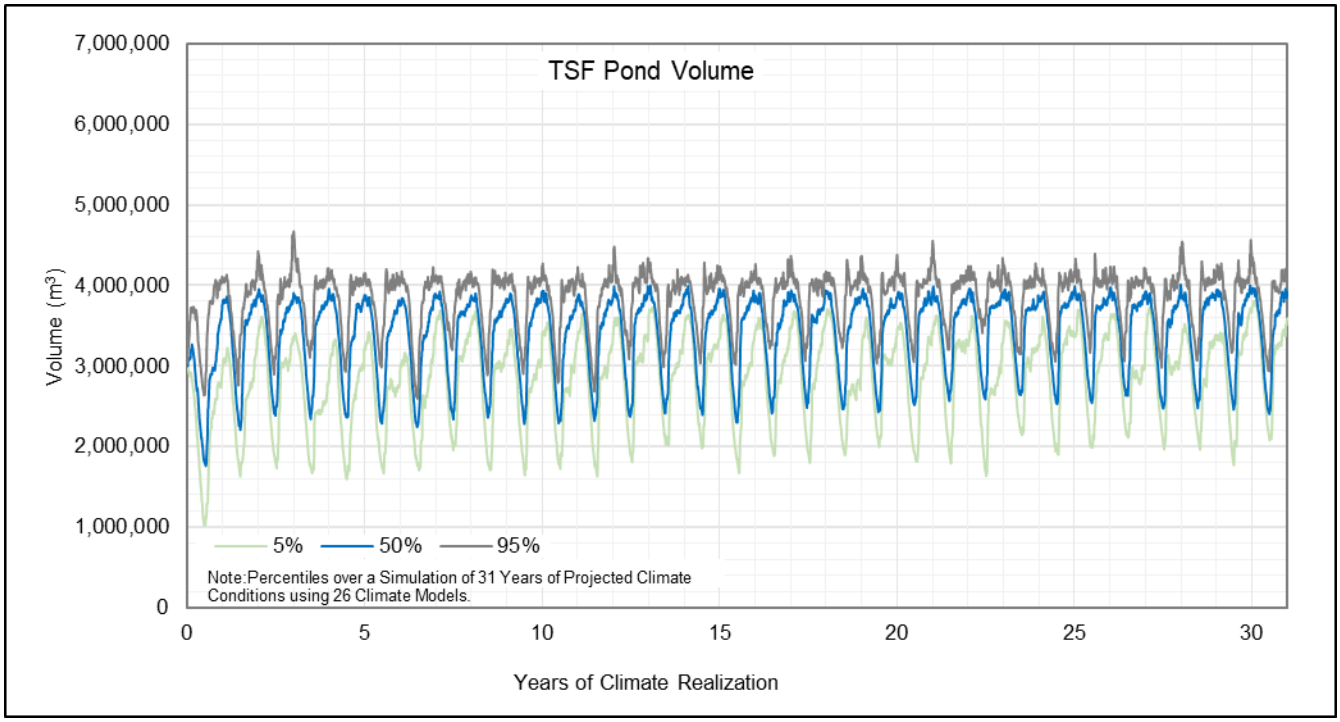


Figure C3.3 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 21 and Climate Change Projection Scenario SSP2 - 4.5

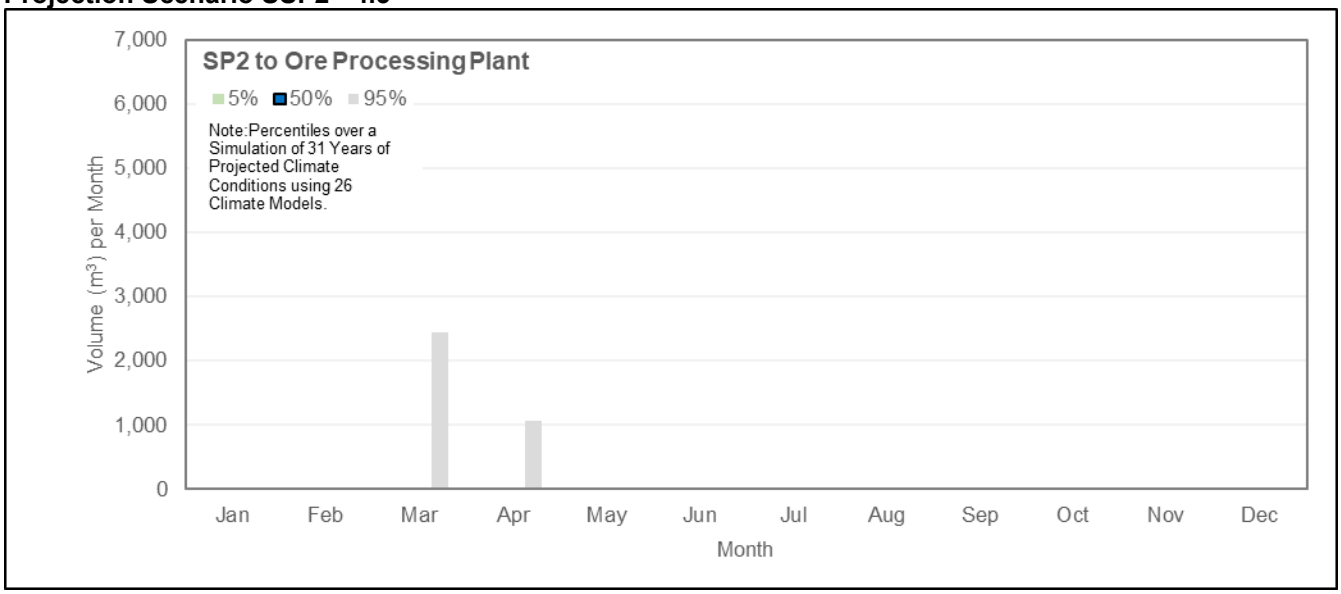


Figure C3.3 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 21 and Climate Change Projection Scenario SSP2 - 4.5

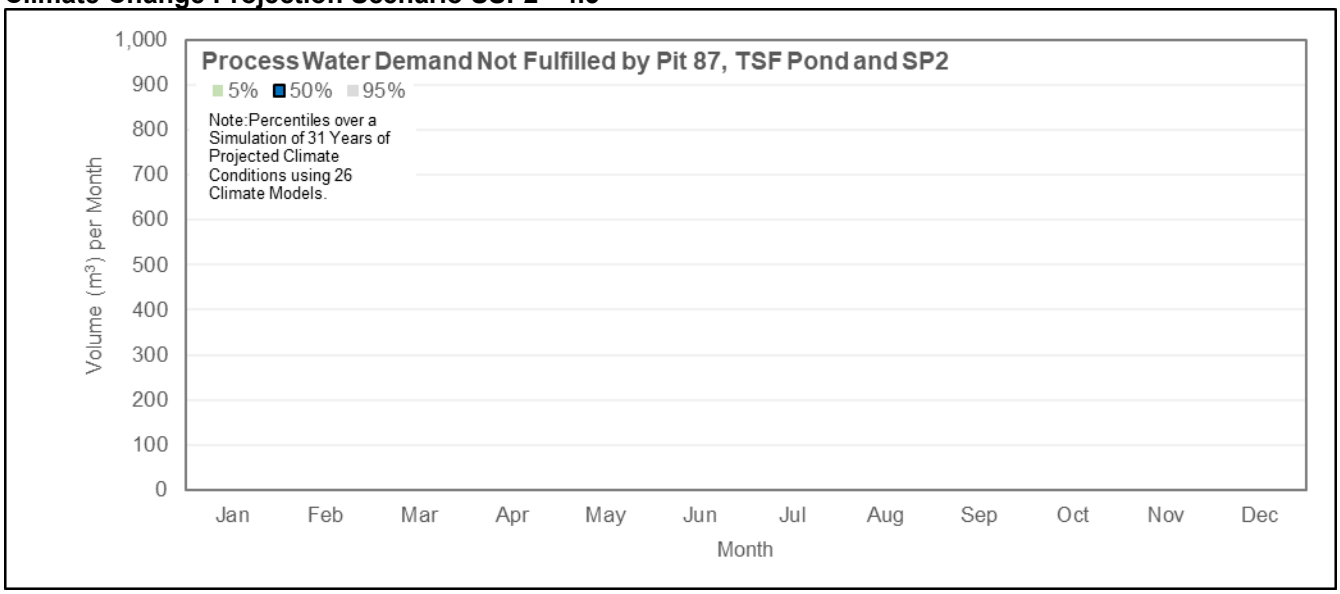


Figure C3.3 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP2 - 4.5

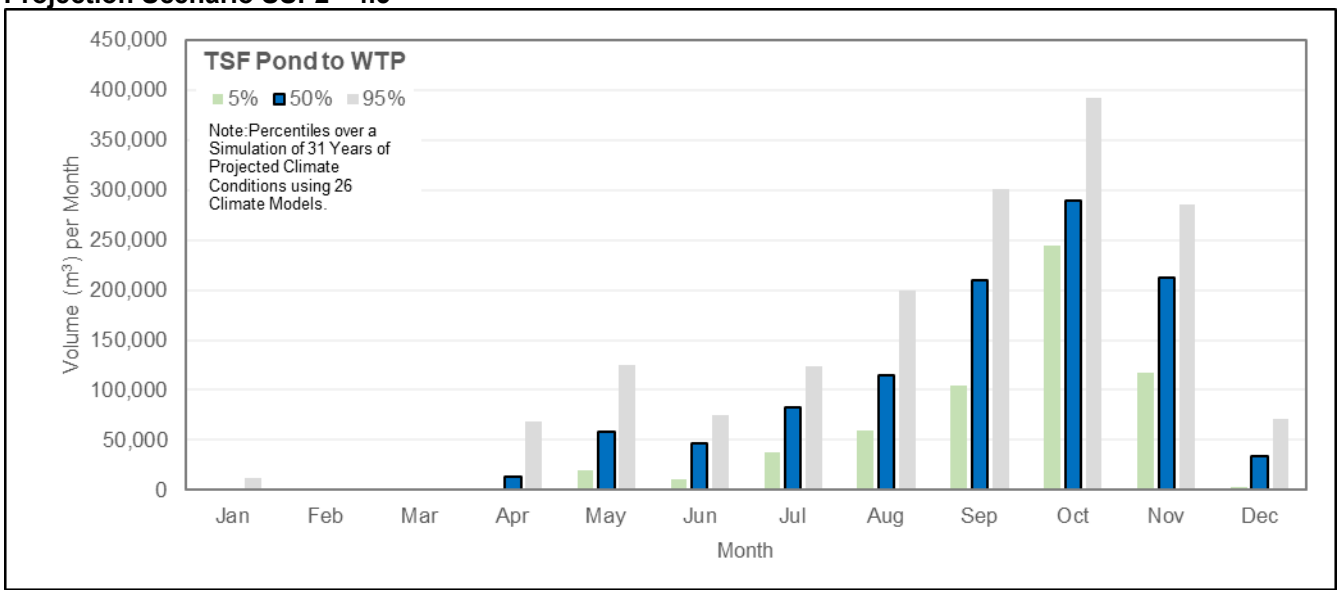


Figure C3.3 - 6: Estimated SP1 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP2 - 4.5

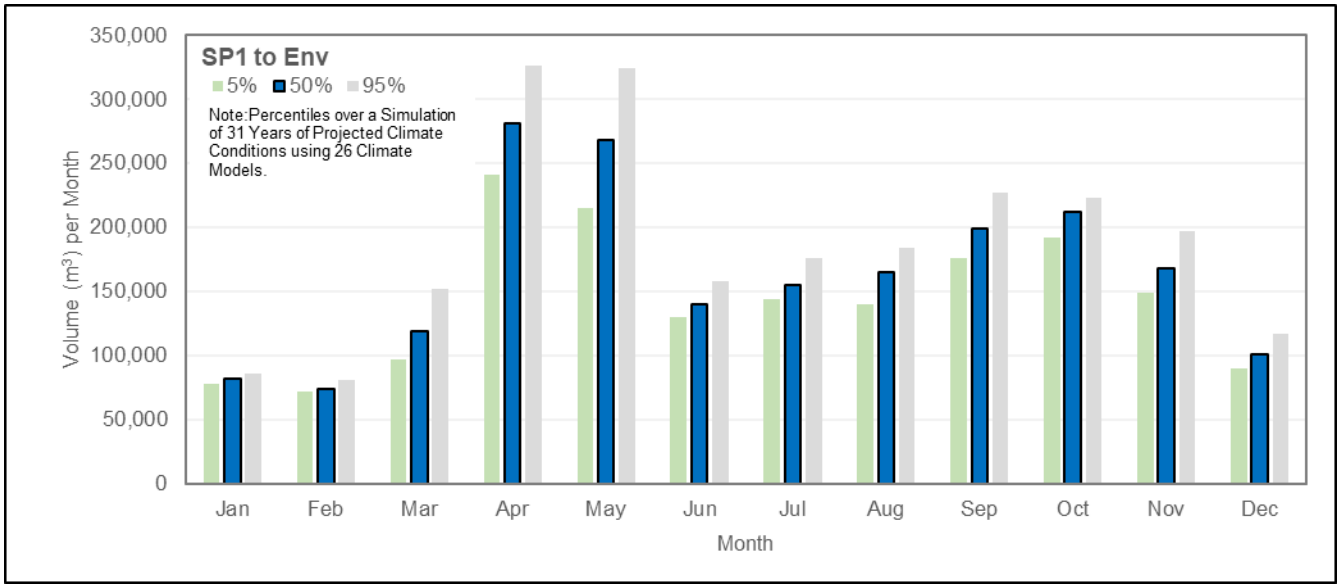


Figure C3.3 - 7: Estimated SP2 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP2 - 4.5

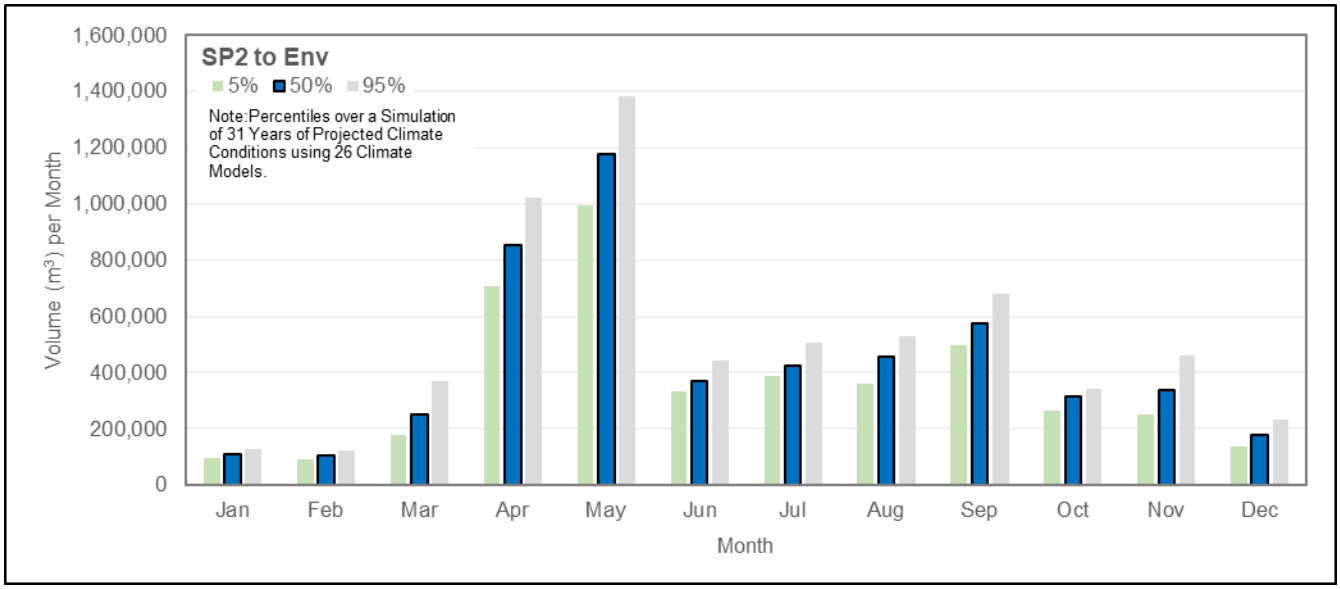


Figure C3.3 - 8: Estimated SP3 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP2 - 4.5

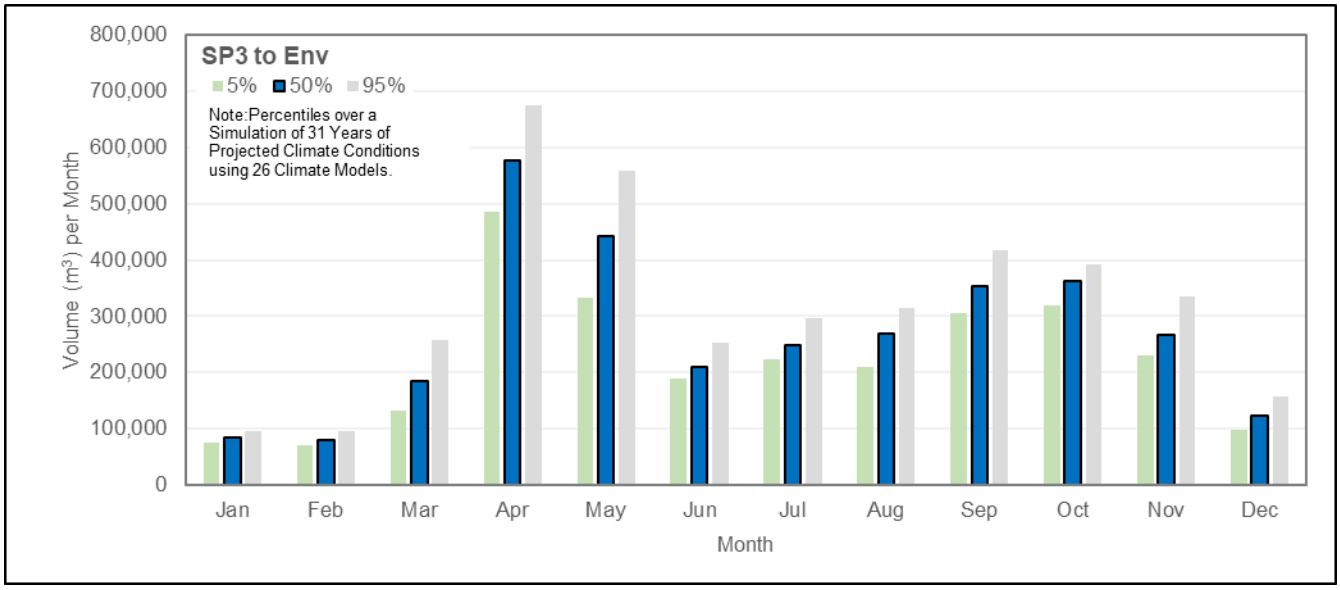


Figure C3.3 - 9: Estimated SP4 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP2 - 4.5

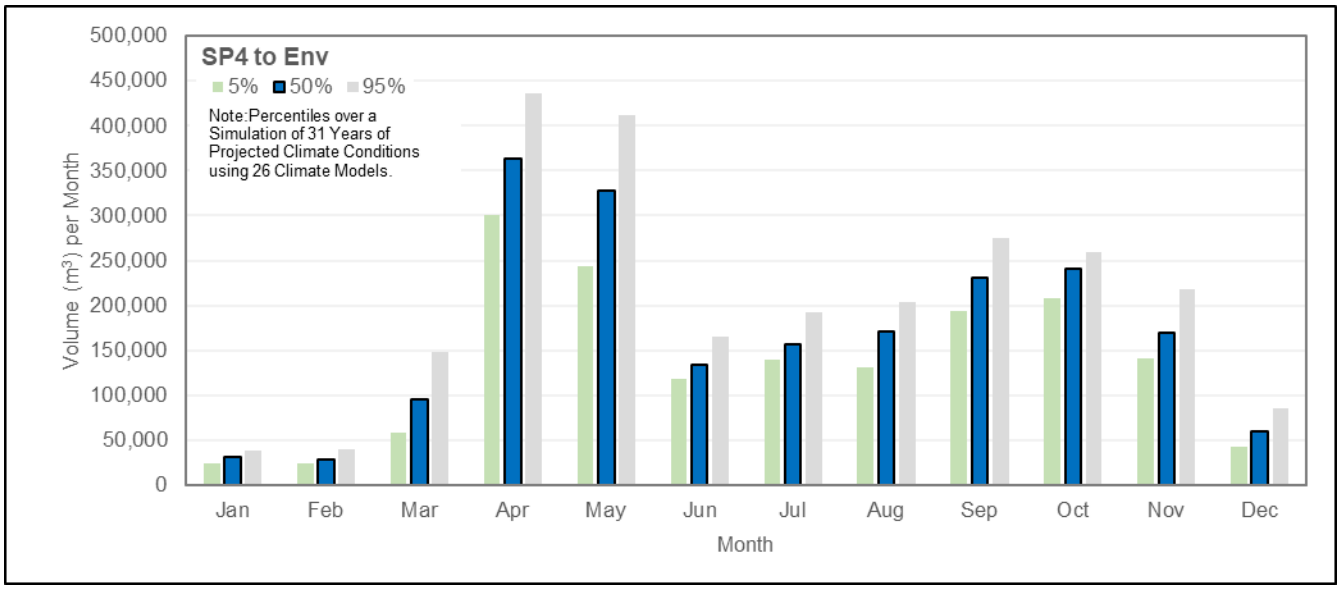
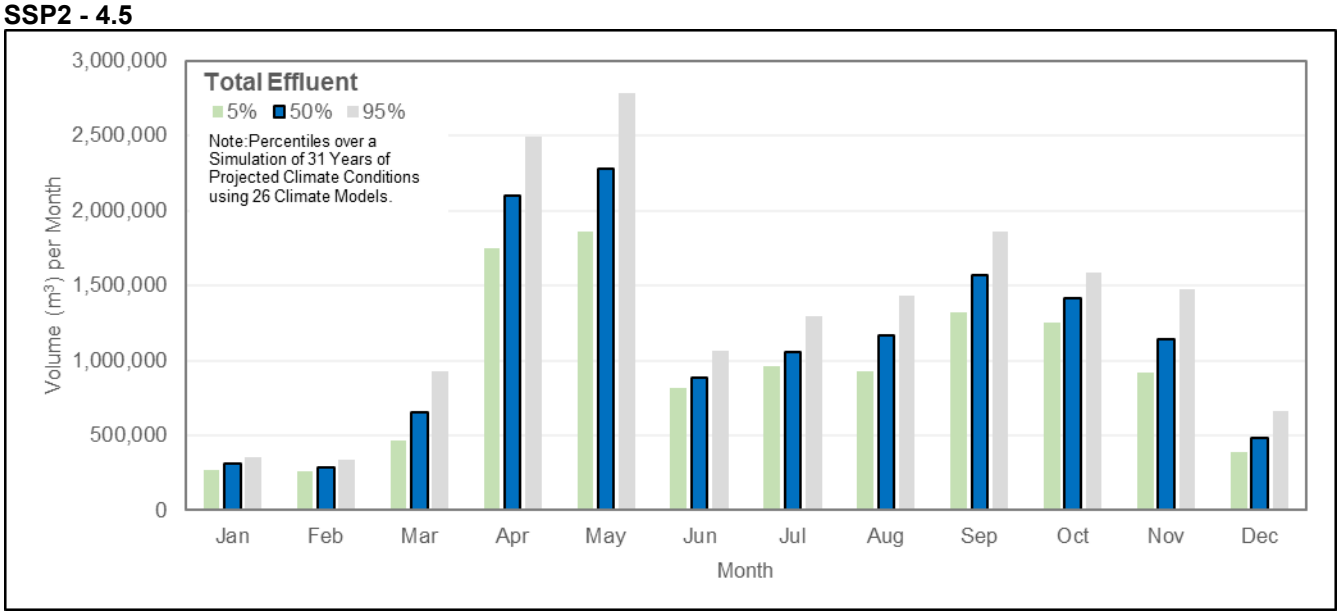


Figure C3.3 - 10: Estimated Total Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP2 - 4.5



3.4 Year 21 – Simulation of Climate Conditions Based on Climate Change Projection Scenario SSP5 - 8.5

Figure C3.4 - 1: Estimated TSF Pond Water Levels for Year 21 and Climate Change Projection Scenario SSP5 - 8.5

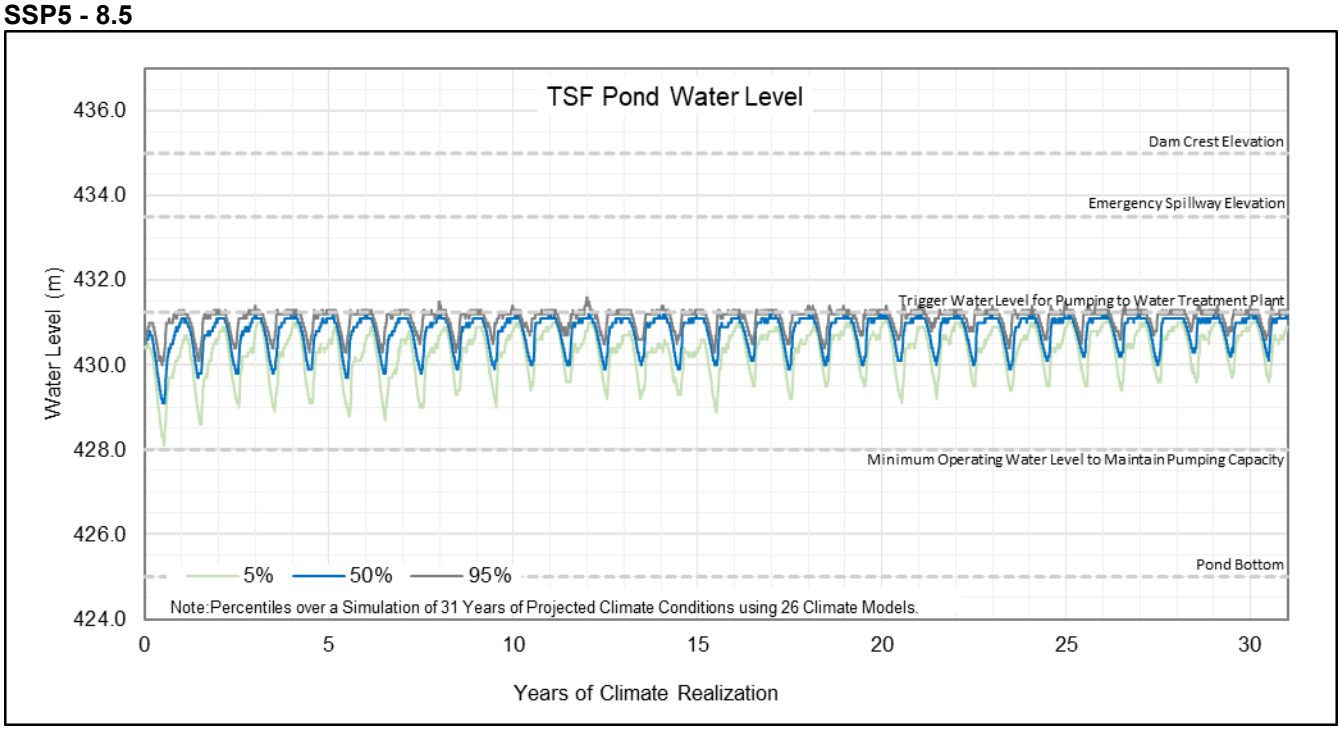


Figure C3.4 - 2: Estimated TSF Pond Water Volumes for Year 21 and Climate Change Projection Scenario SSP5 - 8.5

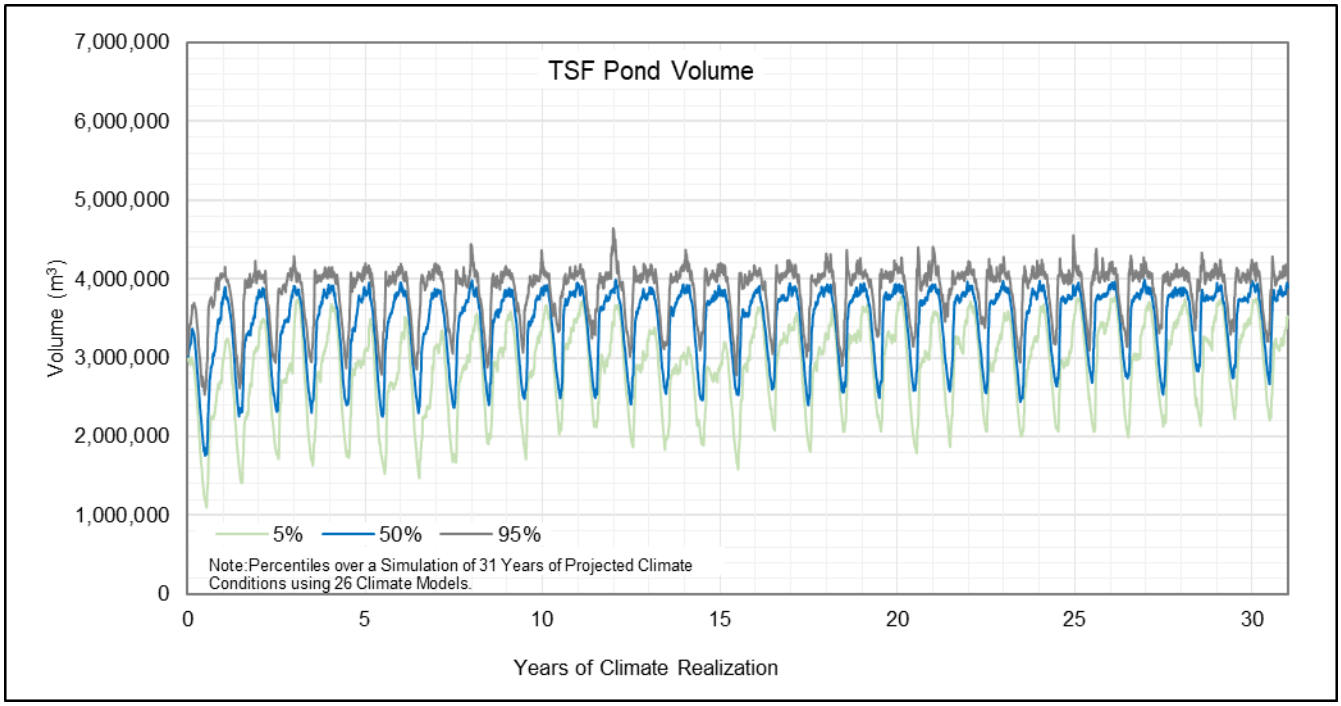


Figure C3.4 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 21 and Climate Change Projection Scenario SSP5 - 8.5

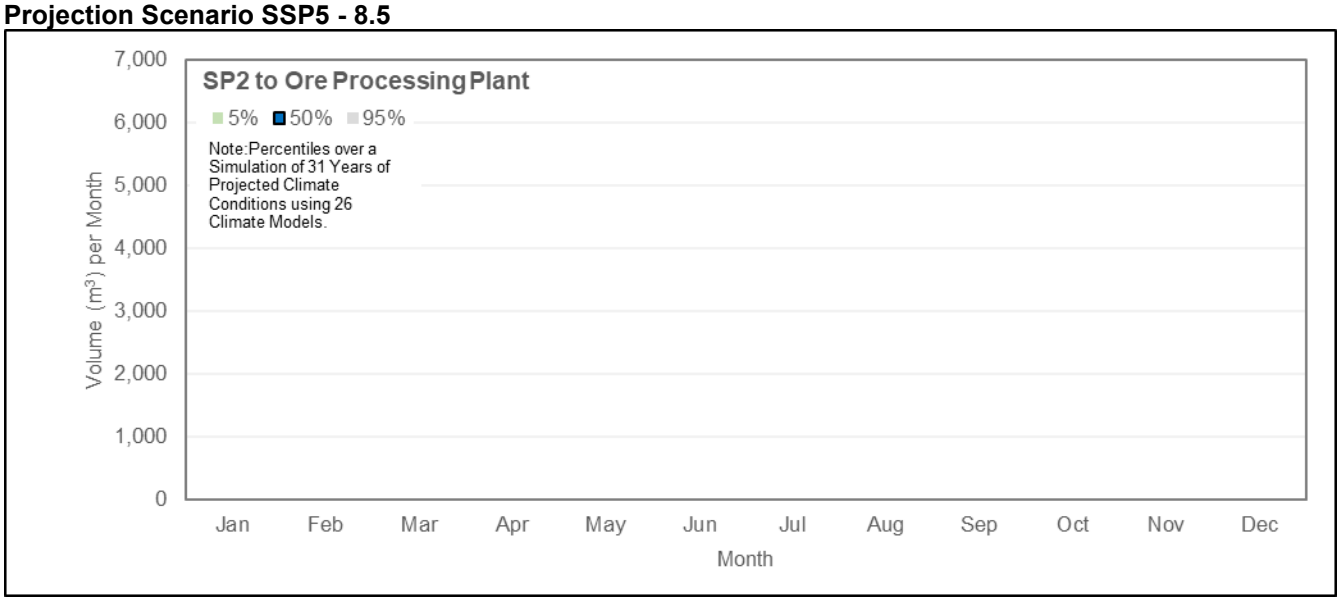


Figure C3.4 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 21 and Climate Change Projection Scenario SSP5 - 8.5

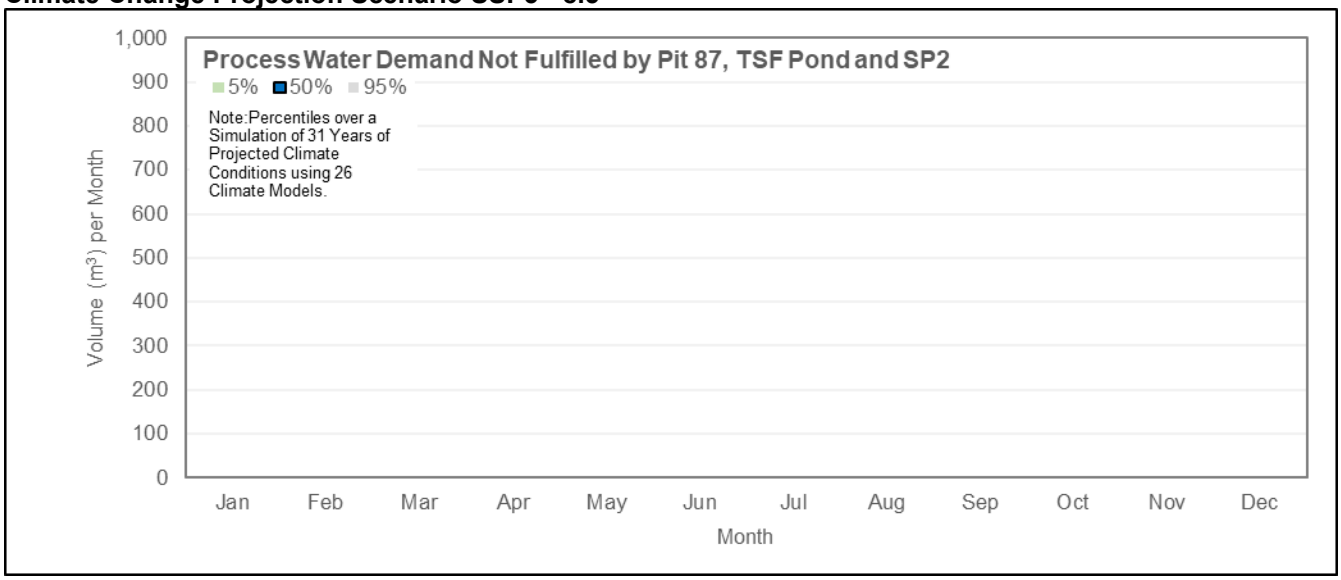


Figure C3.4 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP5 - 8.5

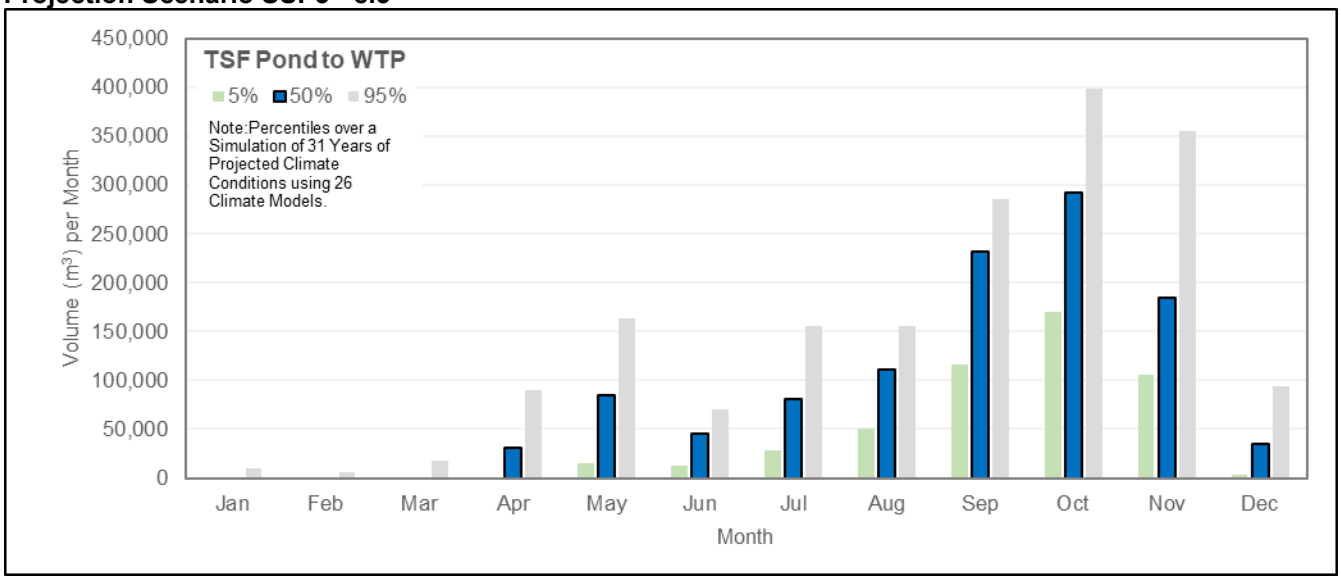


Figure C3.4 - 6: Estimated SP1 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP5 - 8.5

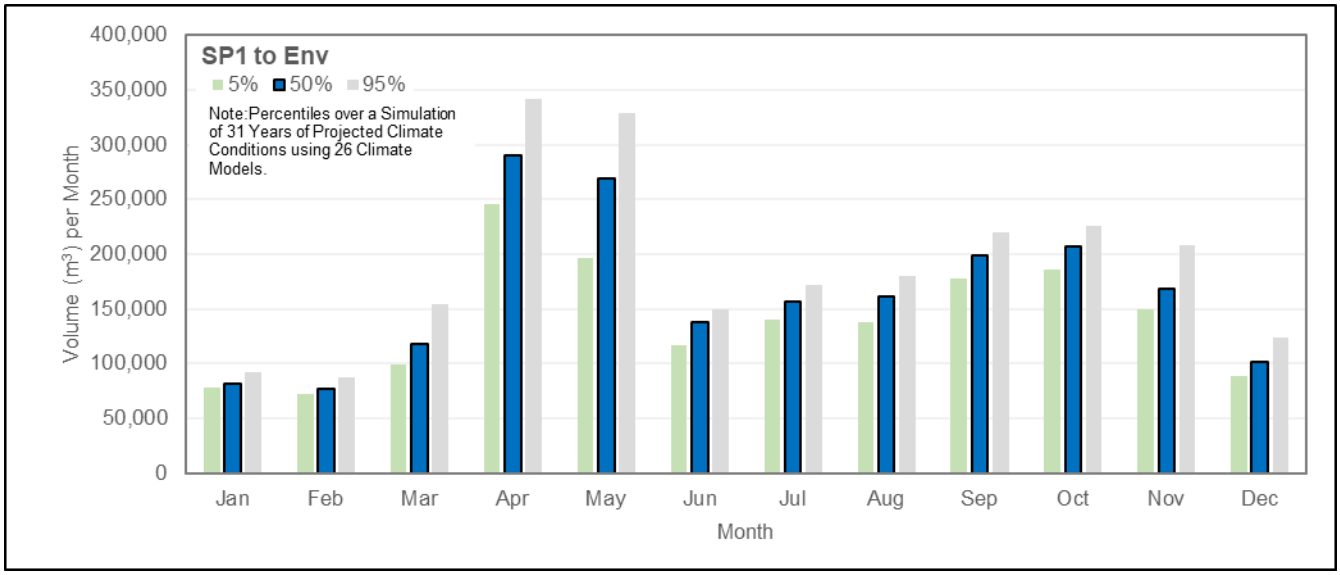


Figure C3.4 - 7: Estimated SP2 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP5 - 8.5

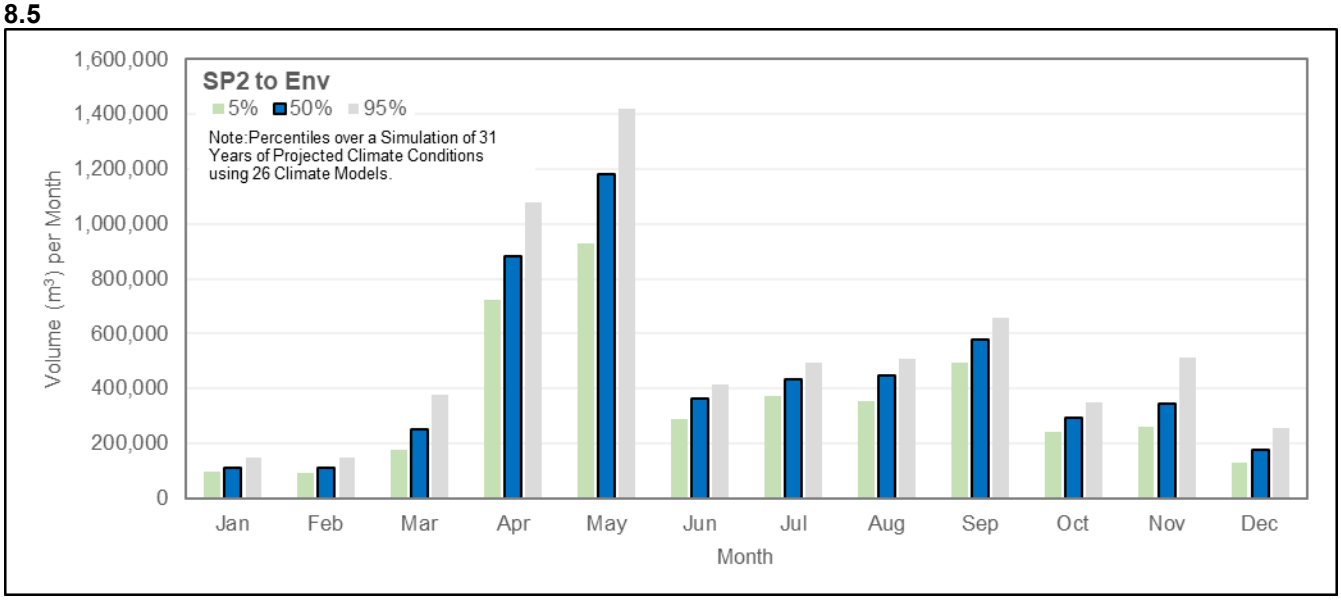


Figure C3.4 - 8: Estimated SP3 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP5 - 8.5

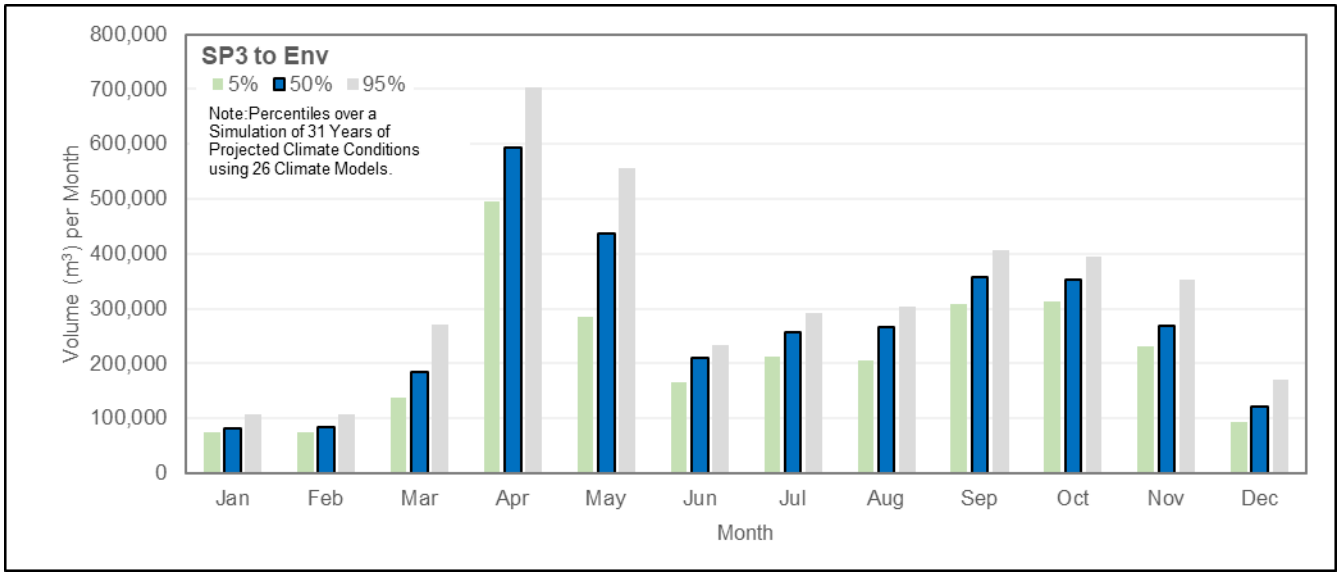


Figure C3.4 - 9: Estimated SP4 Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP5 - 8.5

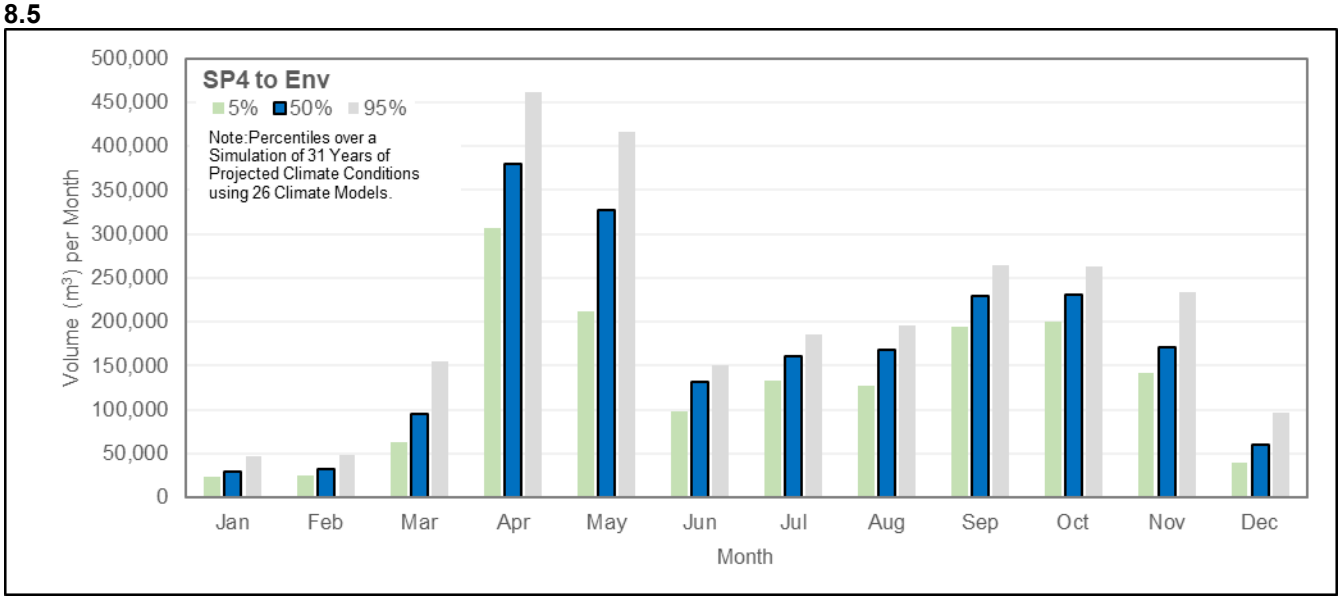
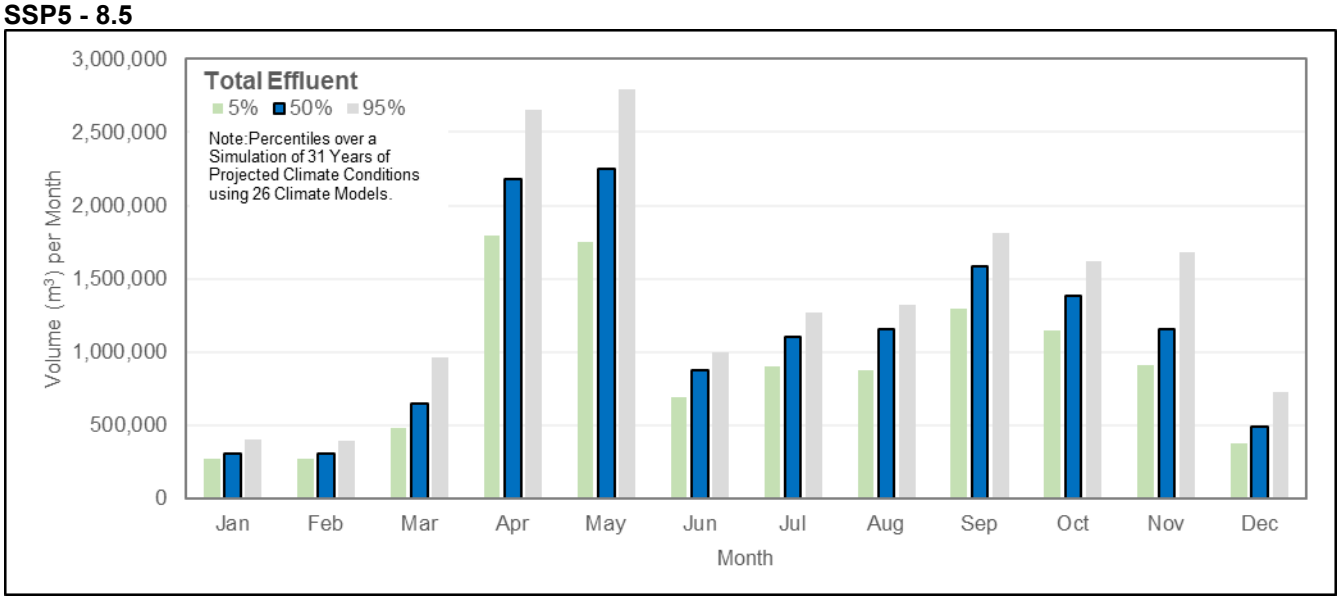


Figure C3.4 - 10: Estimated Total Effluent Fluxes for Year 21 and Climate Change Projection Scenario SSP5 - 8.5



3.5 Year 21 – Simulation of Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

Figure C3.5 - 1: Estimated TSF Pond Water Levels for Year 21 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

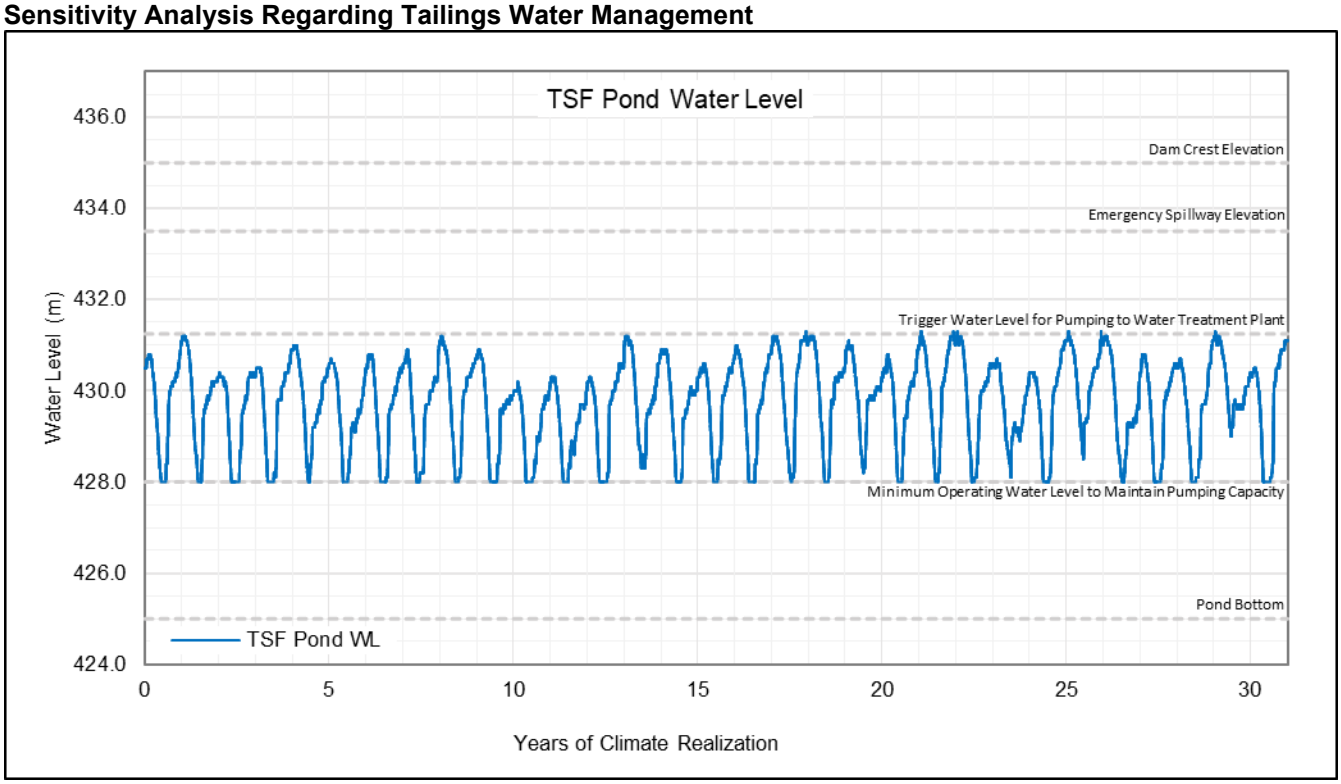


Figure C3.5 - 2: Estimated TSF Pond Water Volumes for Year 21 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

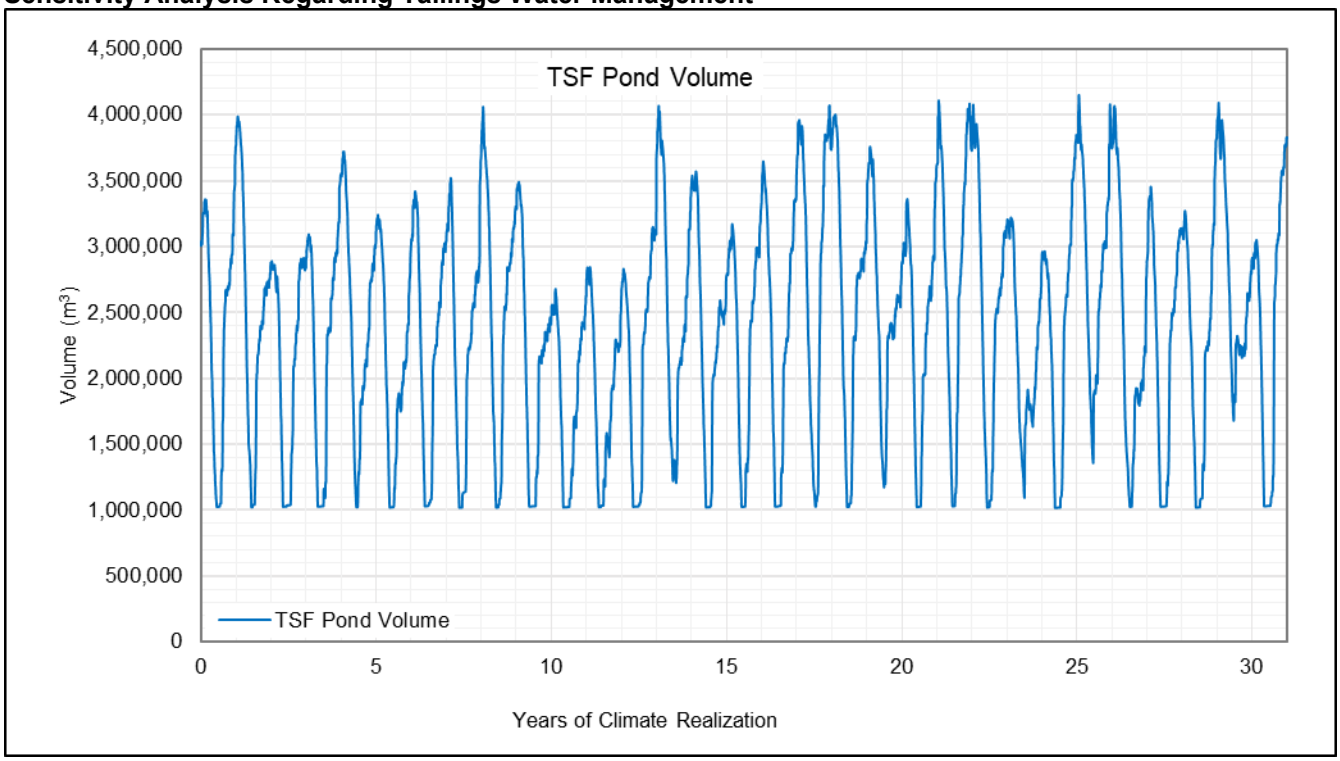


Figure C3.5 - 3: Estimated SP2 to Ore Processing Plant Pumped Fluxes for Year 21 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

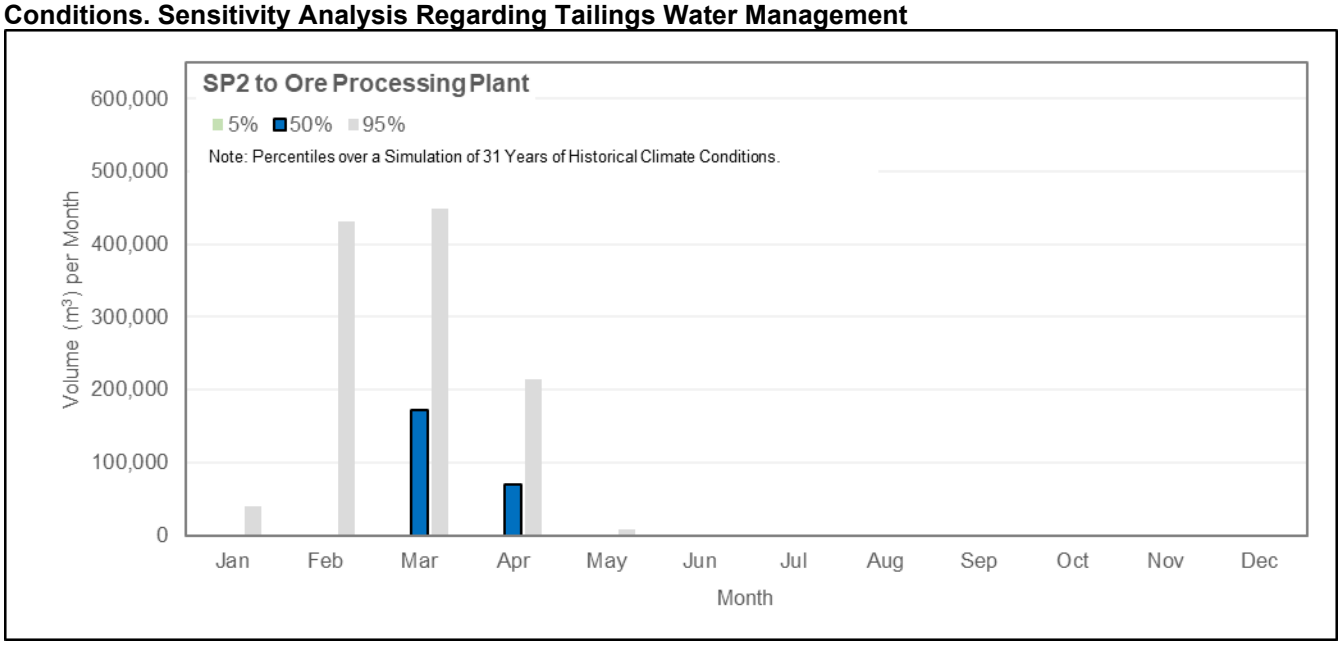


Figure C3.5 - 4: Estimated Process Water Demand Not Fulfilled by TSF Pond and SP2 for Year 21 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

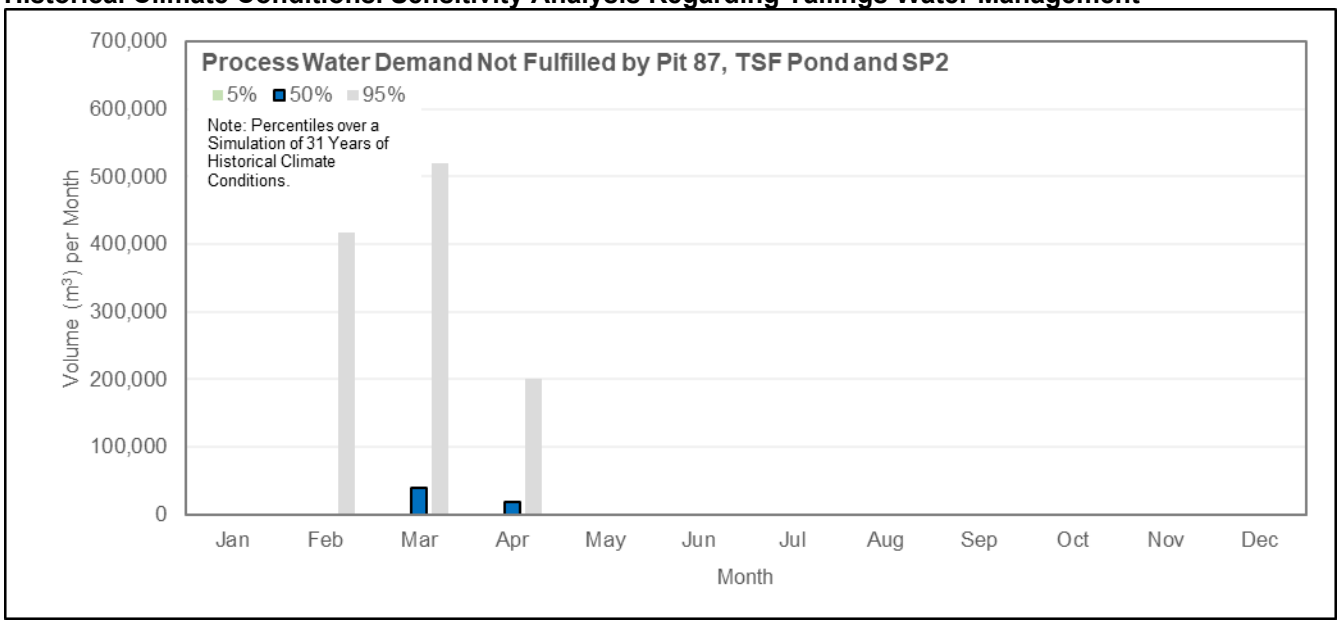


Figure C3.5 - 5: Estimated TSF Water Treatment Plant Effluent Fluxes for Year 21 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

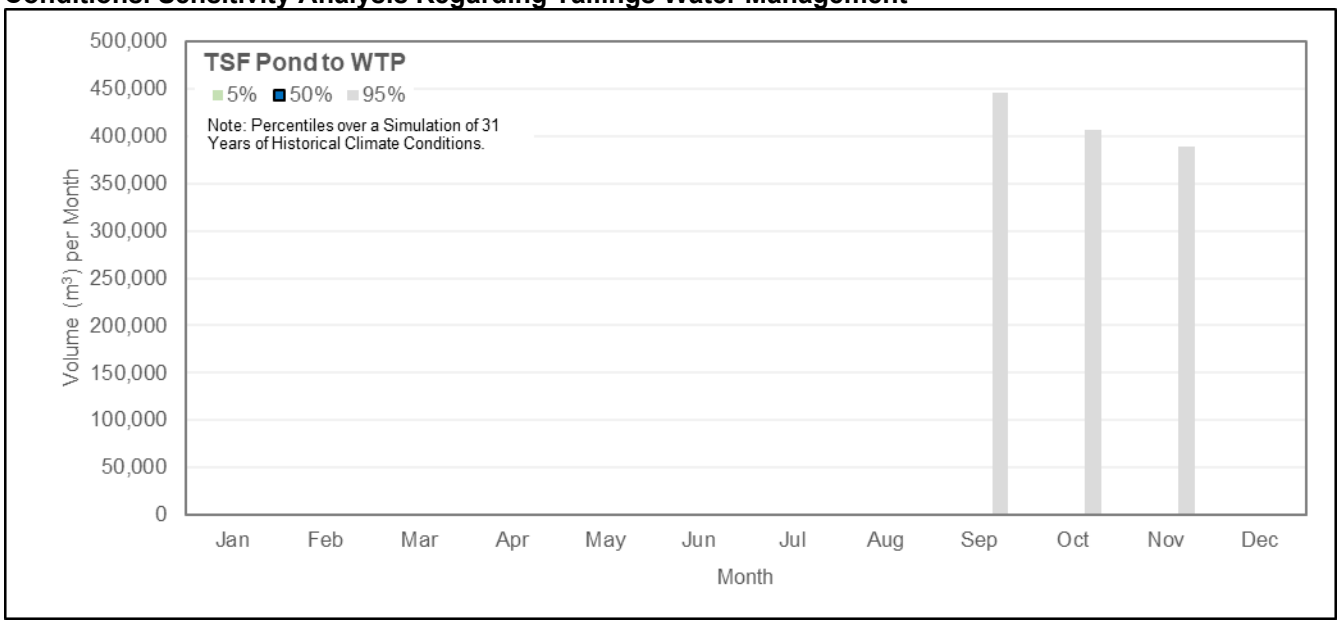


Figure C3.5 - 6: Estimated SP1 Effluent Fluxes for Year 21 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

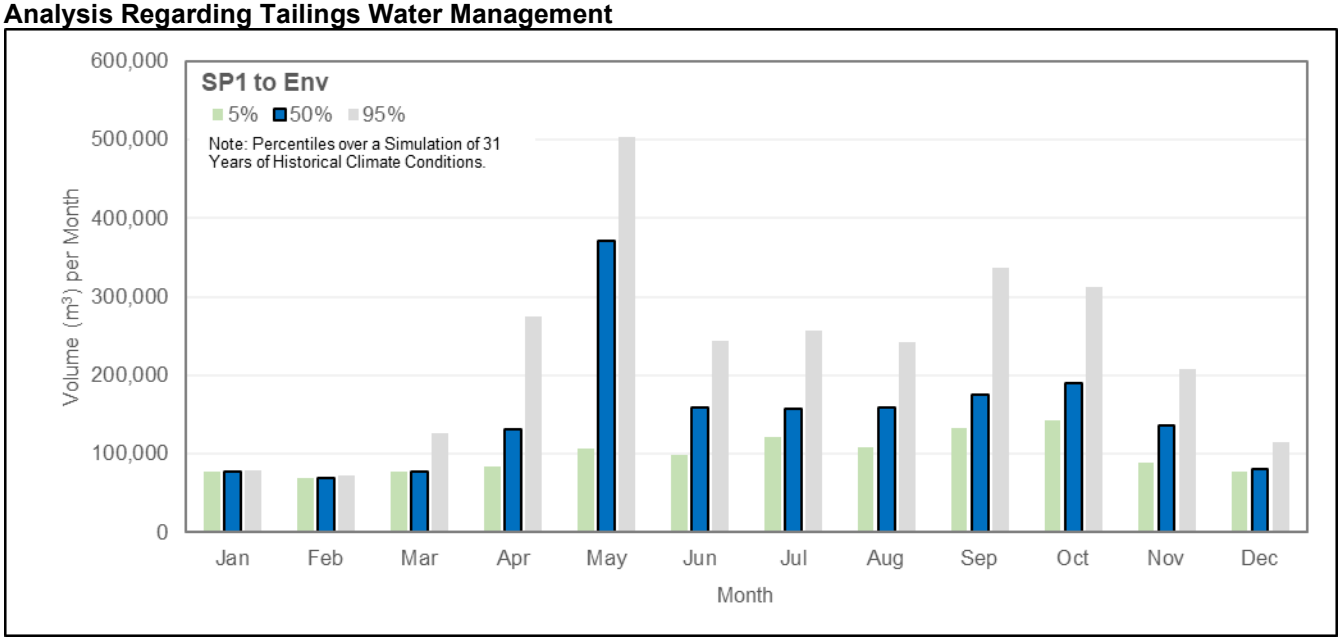


Figure C3.5 - 7: Estimated SP2 Effluent Fluxes for Year 21 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

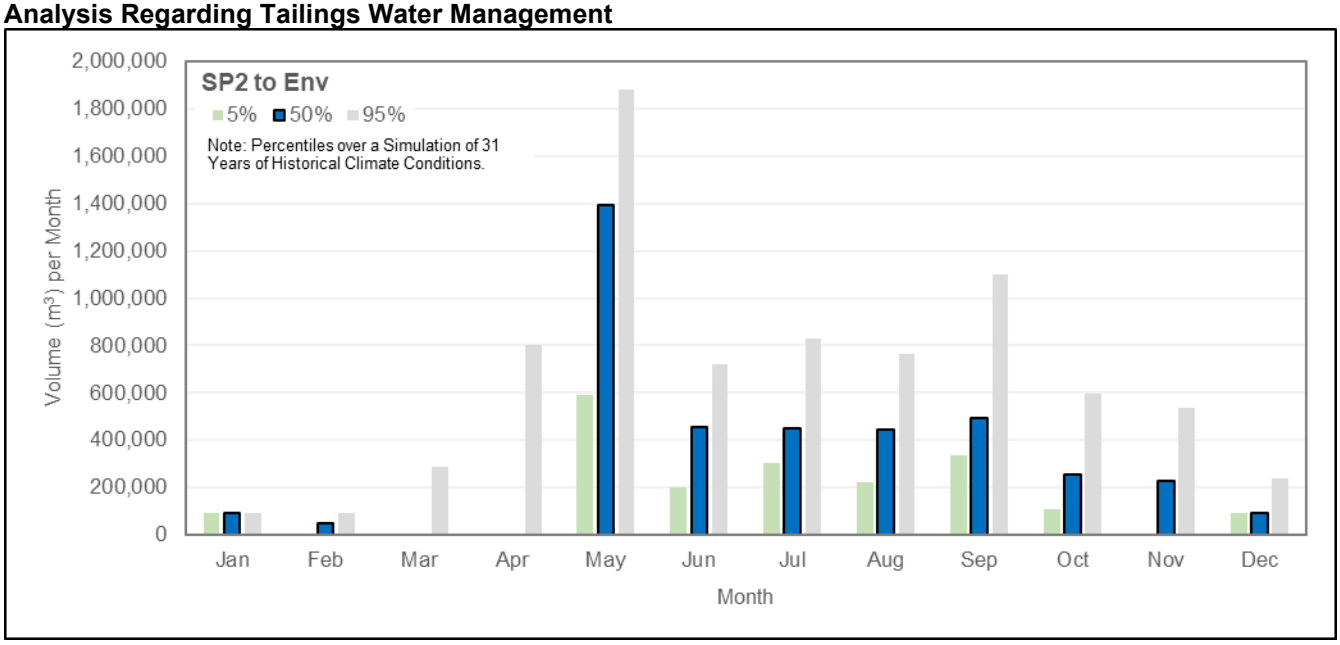


Figure C3.5 - 8: Estimated SP3 Effluent Fluxes for Year 21 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

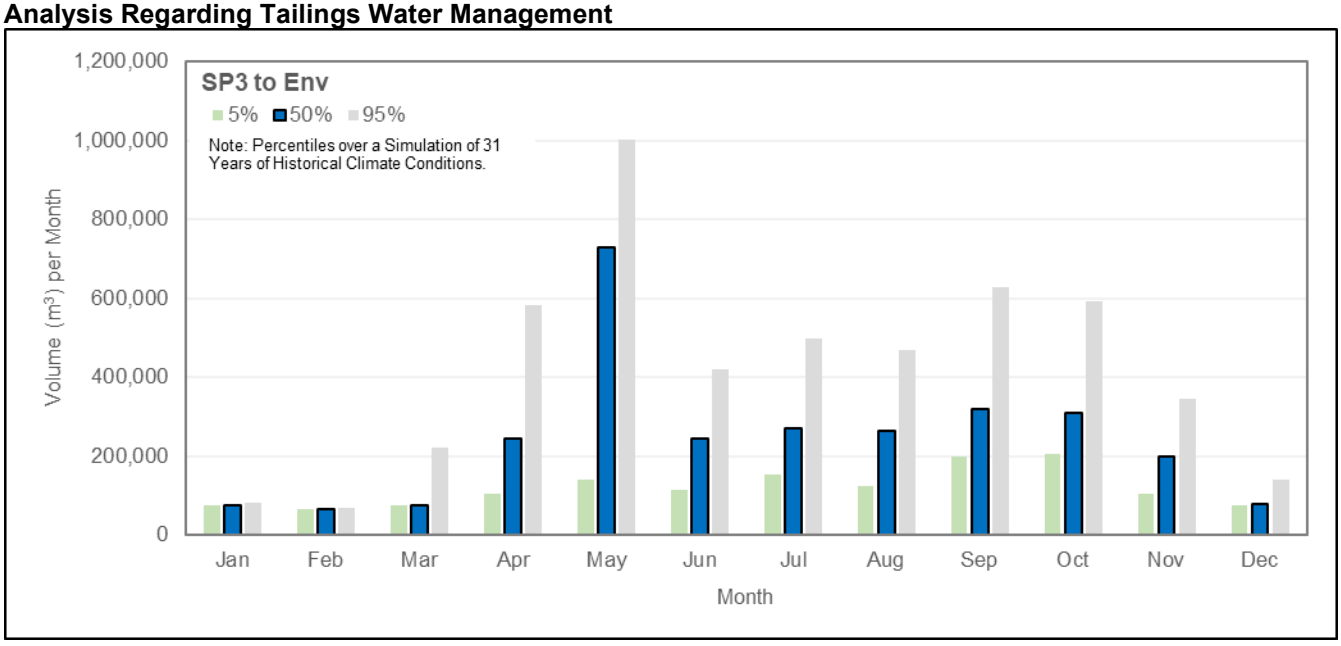


Figure C3.5 - 9: Estimated SP4 Effluent Fluxes for Year 21 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management

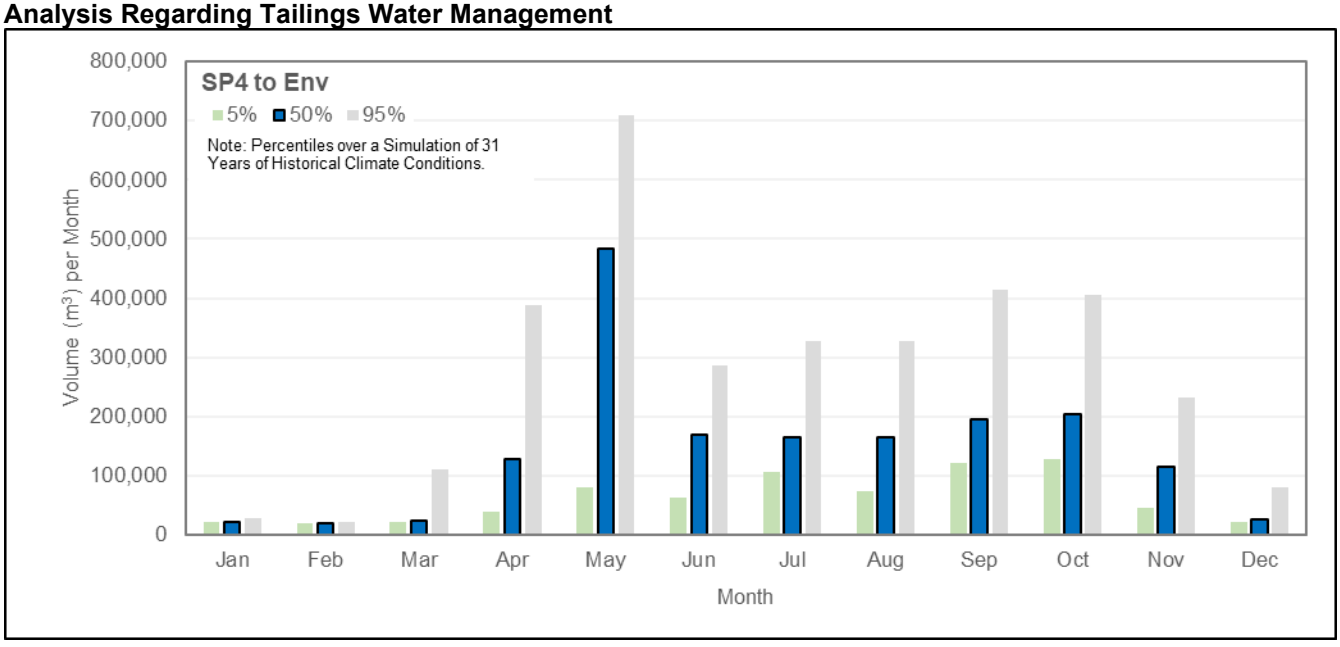
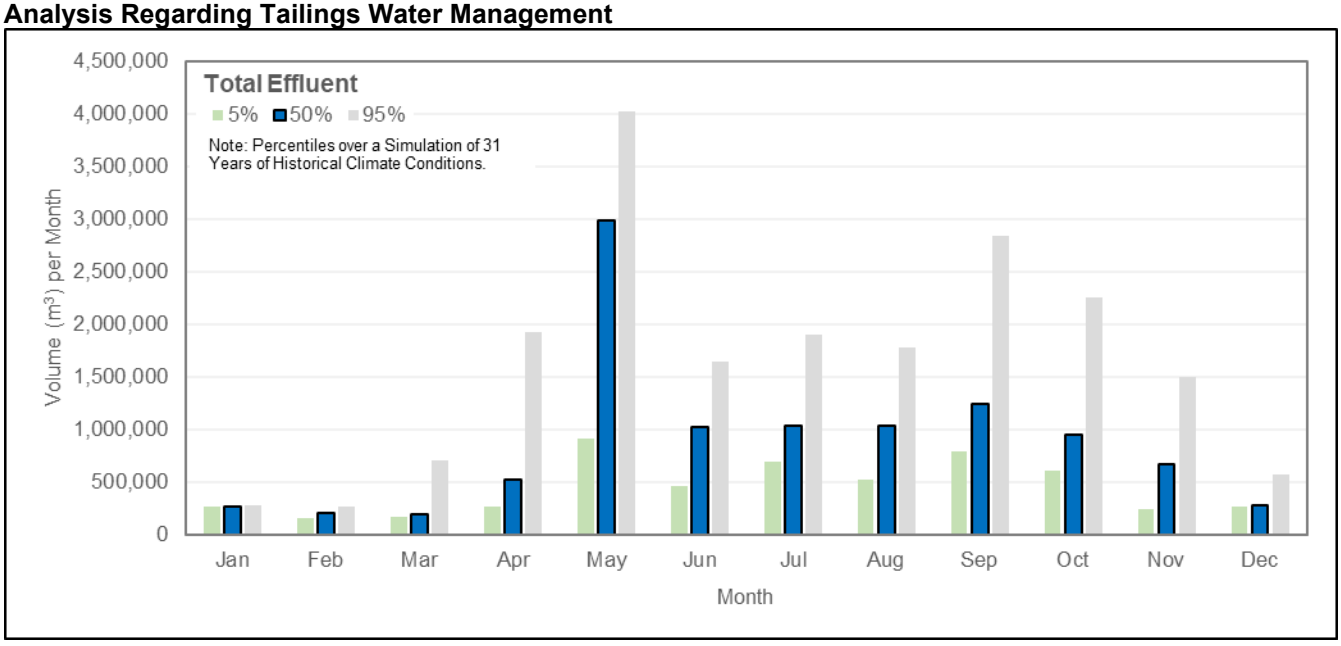


Figure C3.5 - 10: Estimated Total Effluent Fluxes for Year 21 and Historical Climate Conditions. Sensitivity Analysis Regarding Tailings Water Management



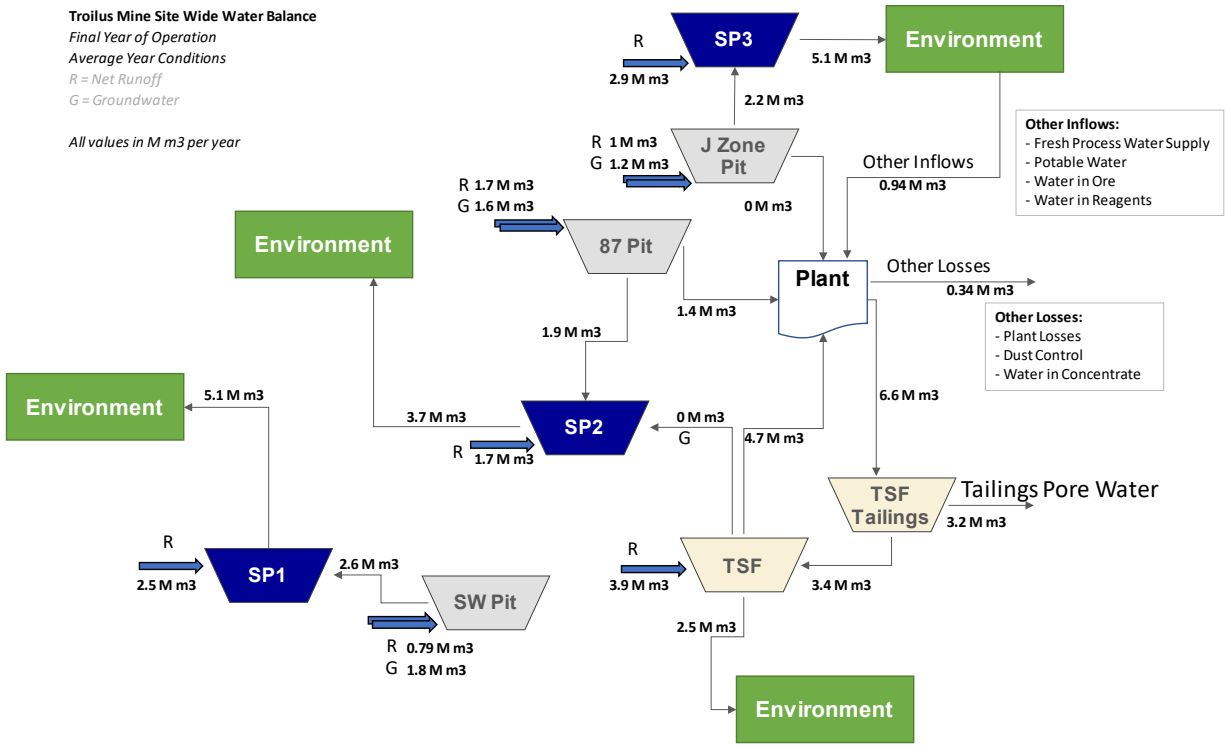


Figure 24: Site-Wide, Annual Water Balance for Average, Historic Climate Conditions – Last Year of Operation

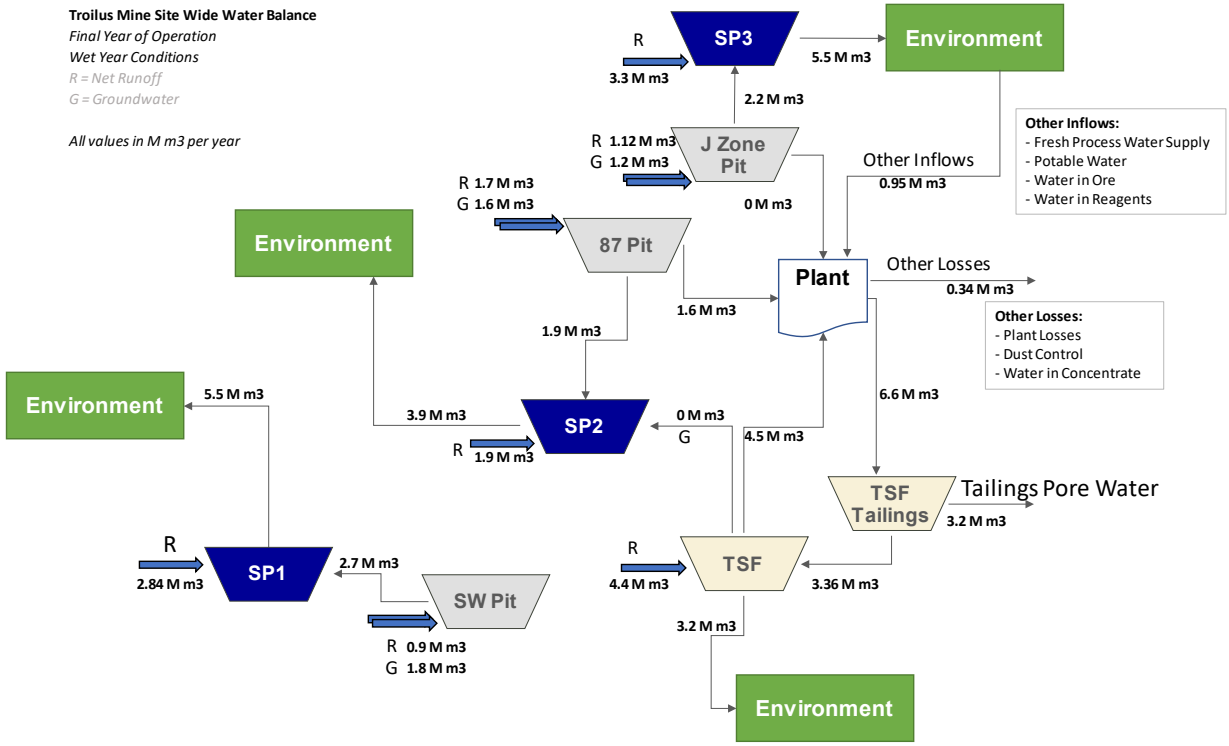


Figure 25: Site-Wide, Annual Water Balance for 1:10 Year Wet, Historic Climate Conditions – Last Year of Operation

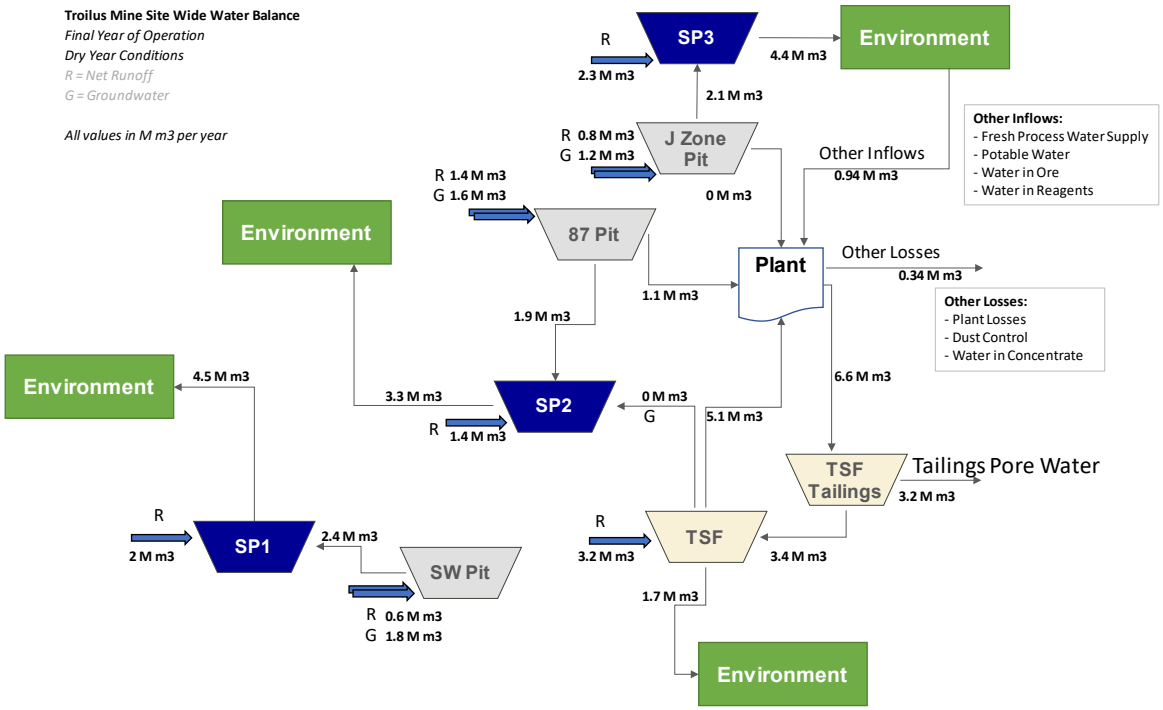


Figure 26: Site-Wide, Annual Water Balance for 1:10 Year Dry, Historic Climate Conditions – Last Year of Operation

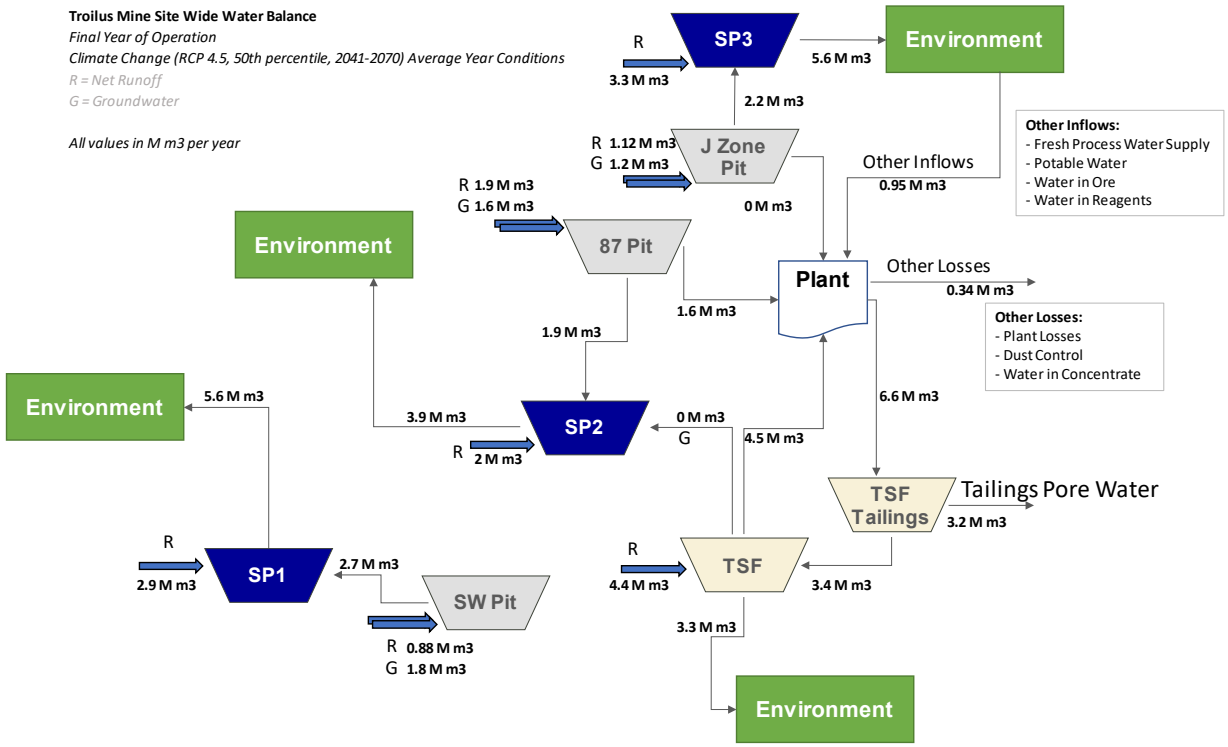


Figure 27: Site-Wide, Annual Water Balance for Average, Climate Change Adjusted Climate Conditions – Last Year of Operation

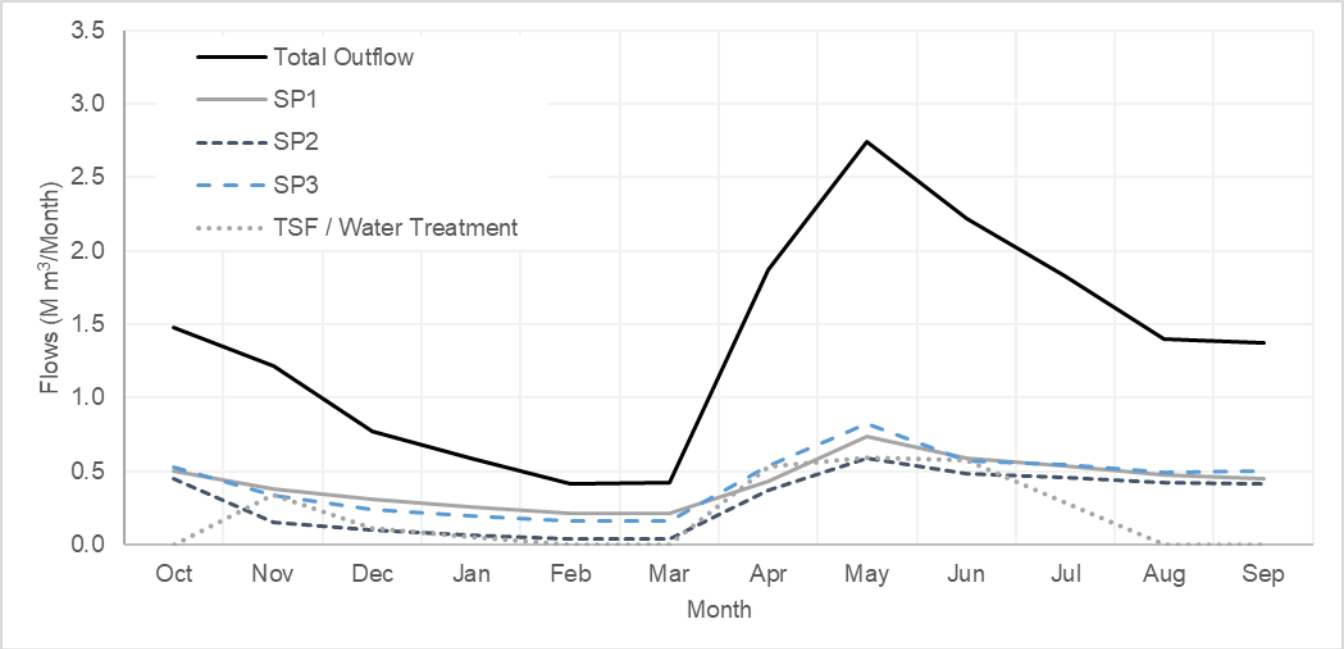


Figure 28: Effluent to the Environment for Average, Historic Climate Conditions – Last Year of Operation

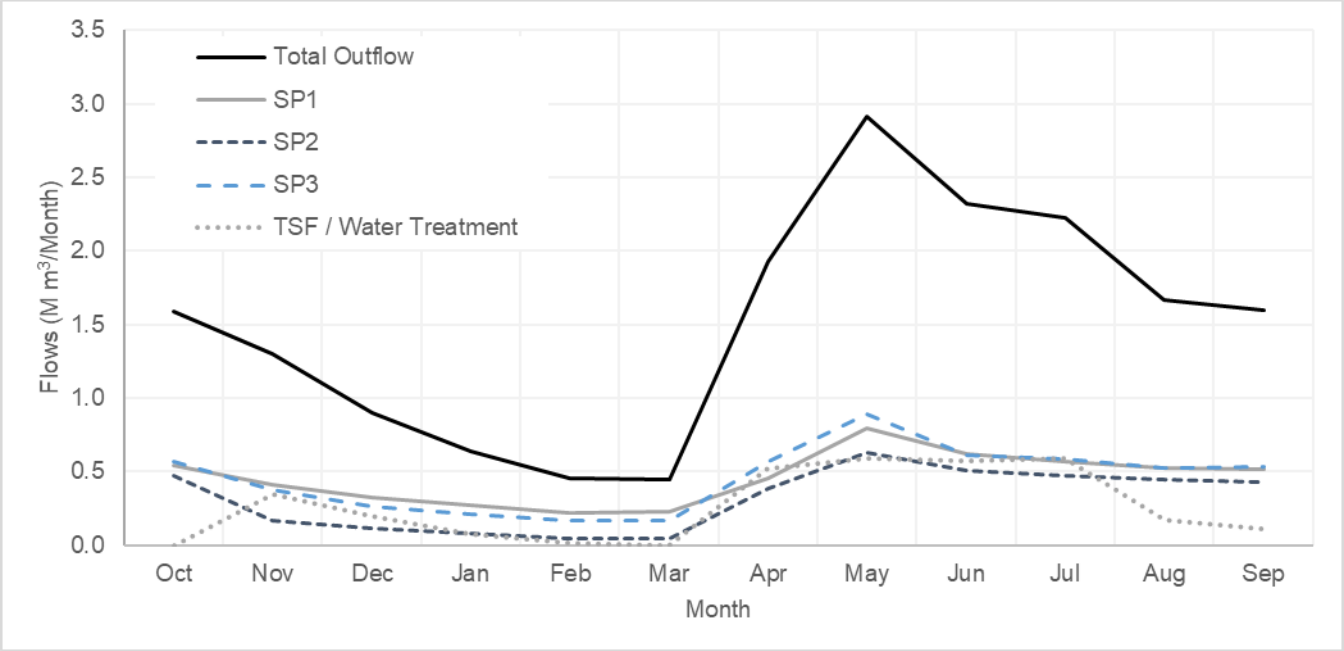


Figure 29: Effluent to the Environment for Wet, Historic Climate Conditions – Last Year of Operation

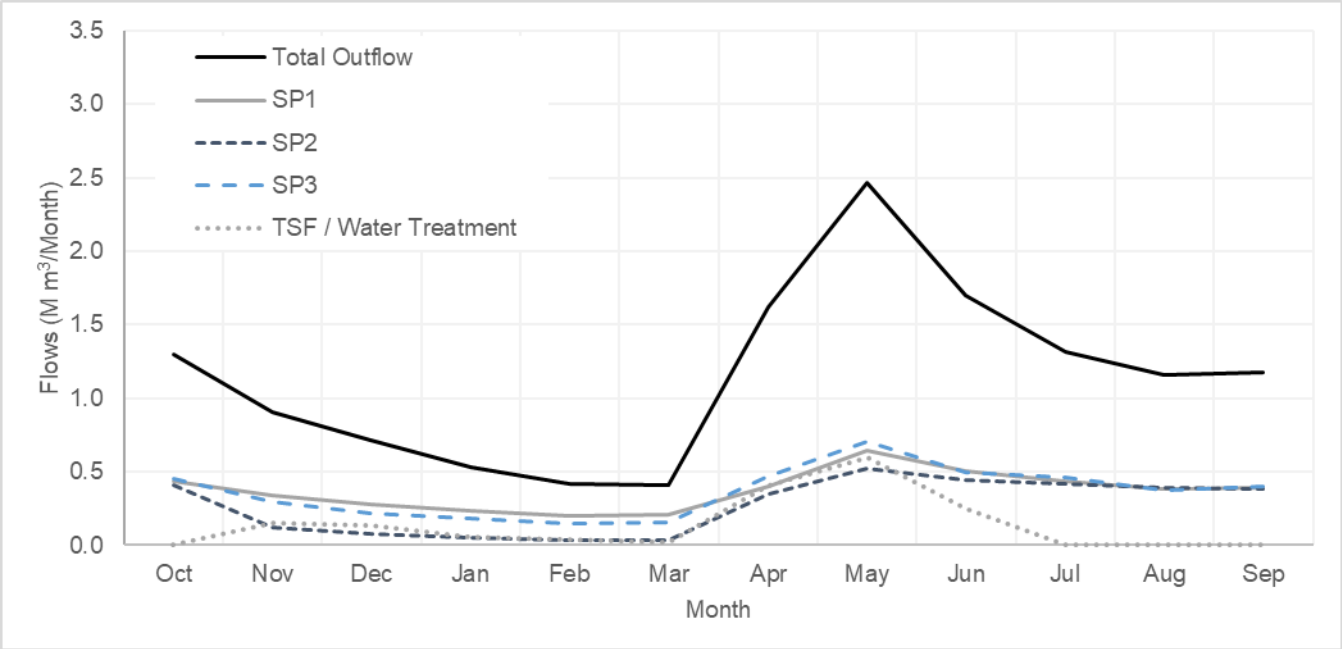


Figure 30: Effluent to the Environment for Dry, Historic Climate Conditions – Last Year of Operation

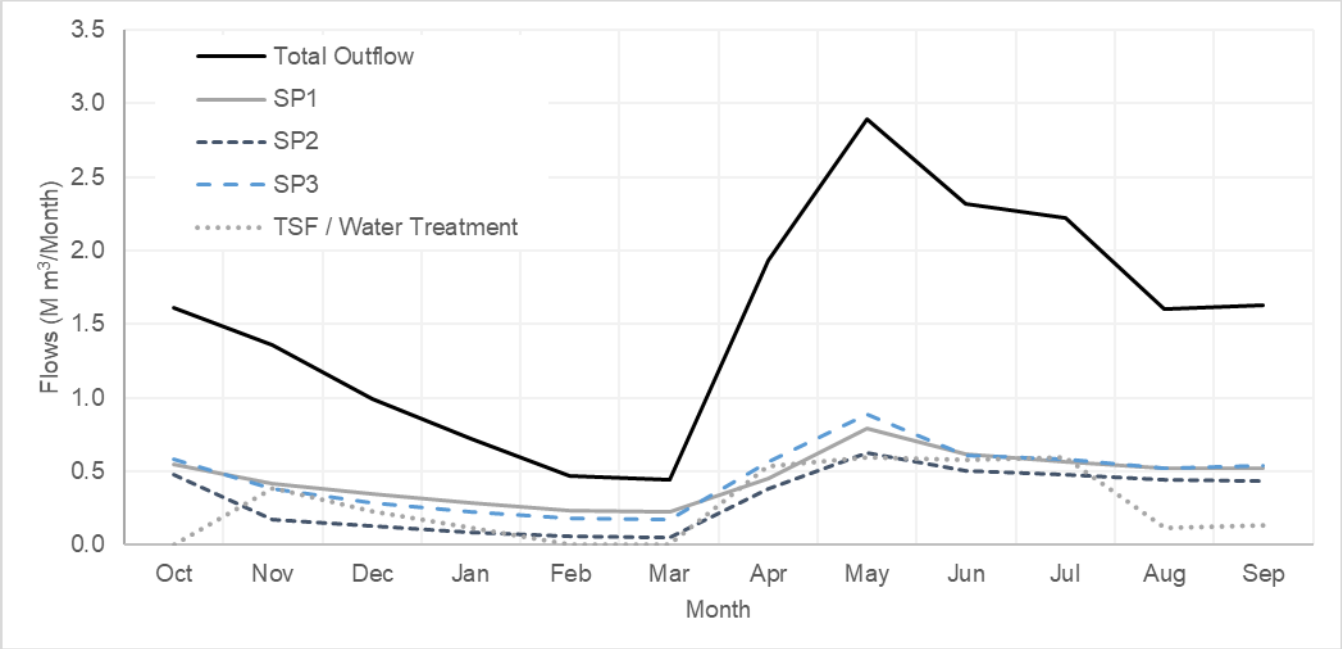


Figure 31: Effluent to the Environment for Average, Climate Change Adjusted Climate Conditions – Last Year of Operation

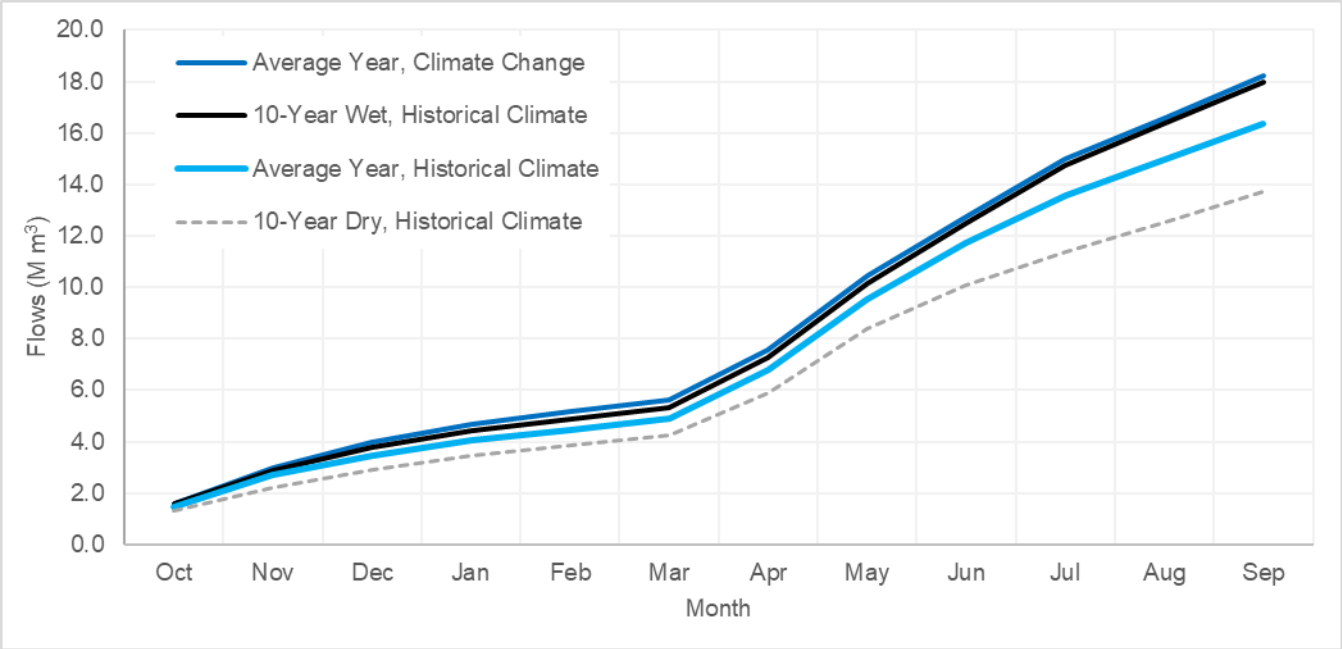


Figure 32: Cumulative Effluent Volumes to the Environment – Last Year of Operation

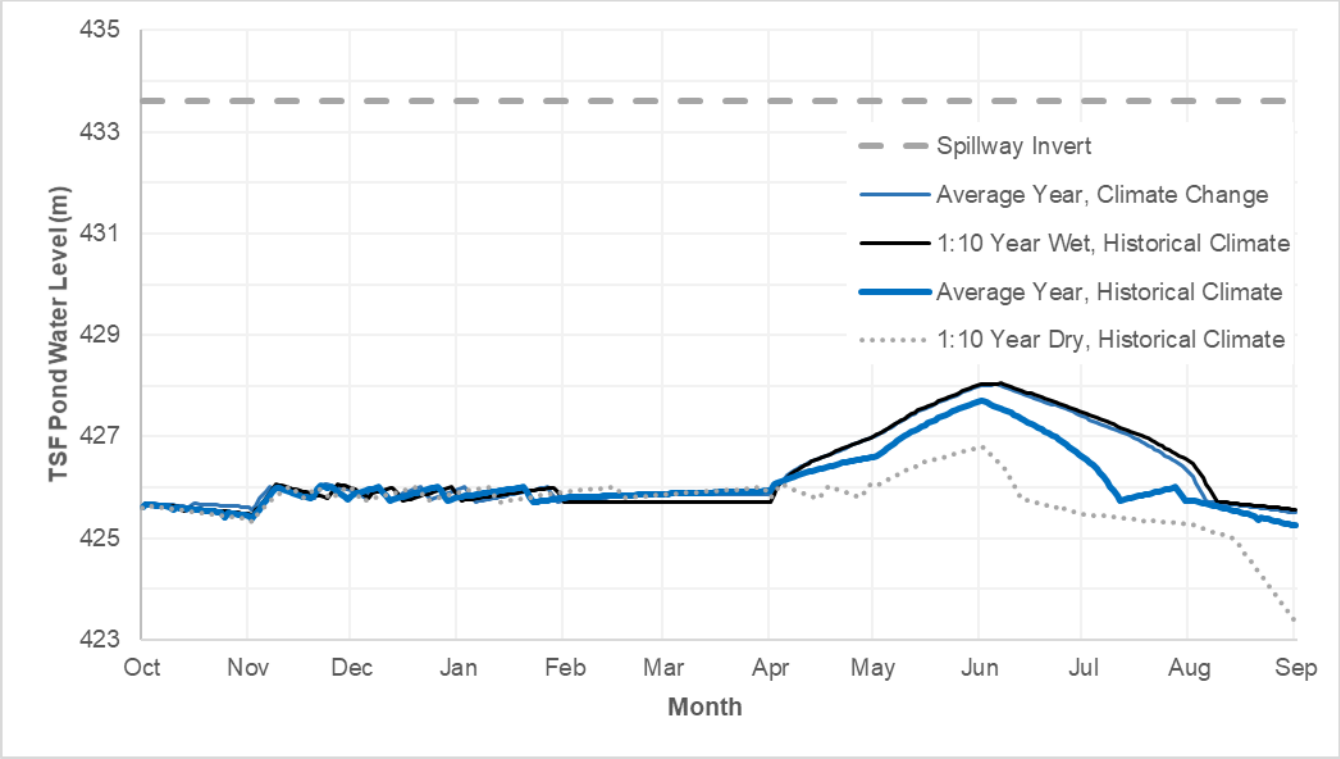


Figure 33: TSF Pond Simulated Water Level – Last Year of Operation

APPENDIX N

Limitations

IMPORTANT LIMITATIONS OF THIS REPORT

This report has been prepared by WSP Canada Inc. (WSP) for Troilus Gold Corp. This report is provided for the exclusive use by Client and is confidential.
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WSP has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

This findings and conclusions documented in this report have been prepared for the specific site, design objective, development and purpose described to WSP by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of or variation in the site conditions, purpose or development plans, or if the project is not initiated within a reasonable time frame after the date of this report (but no later than 24 months of the date of the report), may alter the validity of the report. Accordingly, WSP cannot be responsible for use of this report, or portions thereof, unless WSP is requested to review and, if necessary, revise the report.

The scope and the period of WSP's services are as described in WSP's proposal, and are subject to restrictions and limitations. WSP did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the report. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by WSP in regards to it.

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