



October 8, 2025

Project No. 19126620

Melanie Teitler, Aggregate Specialist

Ministry of Natural Resources and Forestry
Divisional Delivery Branch
Aggregates Section
300 Water Street
Peterborough, ON K9J 3C7

RESPONSE TO MINISTRY OF NATURAL RESOURCES REVIEW COMMENTS ON PROPOSED HIGHLAND LINE PIT TECHNICAL REPORTS, TOWNSHIP OF LANARK HIGHLANDS, ONTARIO (AGGREGATE RESOURCES ACT APPLICATION #626599)

Dear Ms. Teitler,

In a letter dated June 5, 2023, the Ministry of Natural Resources (MNR) provided review comments on the license application for the Thomas Cavanagh Construction Limited (Cavanagh) proposed Highland Line Pit (Aggregate Resources Act Application #626599). These review comments related to the MNR review of the Golder Associates Ltd. (now WSP Canada Inc.) reports entitled:

- Natural Environment Report (NER), Proposed Highland Line Pit, Lanark County, Ontario
- Level 1 and Level 2 Water Report, Proposed Highland Line Pit, Township of Lanark Highlands, Ontario
- Maximum Predicted Water Table Report, Proposed Highland Line Pit, Township of Lanark Highlands, Ontario
- Site Plans

WSP Canada Inc. (WSP) provided a response to the comments provided by the MNR on Site Plans and the hydrogeology comments related to the Water Report and Maximum Predicted Water Table Report in a letter dated January 13, 2025 (refer to **Attachment 1**). Responses to comments 1 to 11 and 29 to 32 provided by MNR regarding the Natural Environment Report and the rehabilitation plan, were provided in the Cambium Inc. letter dated January 10, 2025 (refer to **Attachment 1**).

Upon review of the responses prepared by WSP and Cambium, MNR provided further comments dated March 11, 2025 as part of their objection form (refer to **Attachment 2**). The March 11, 2025 comments provided by MNR are presented below in *italics* followed by the responses by WSP.

Natural Environment

Comment #6

Partially resolved – MNR staff appreciate the updates to the site plan, regarding the delineation of wetland boundaries in the field by an OWES evaluator prior to operations. However, the NER appears to identify an additional wetland, where staff gauge SG2 is located (Water Report, Section 3.2.1.1), that is not shown on the site plan. NER Figure 3 describes this wetland as a mixed mineral shallow marsh (MAS1), and this feature appears to be identified as general habitat for Blanding's Turtle on the site plan. It is recommended that this wetland boundary be included on the site plan so appropriate setbacks from the feature can be established in the field.

The Site Plan has been updated to include the wetland in the northern corner of the site.

Comment #7

Please note that our review of this comment is deferred, until our outstanding hydrogeological comments (43, 44, 46 and 48) are addressed.

Noted.

Comment #9

Please note that this comment is resolved, pending verification that any recommendations from DFO have been incorporated on the site plan, as required.

All recommendations from DFO have been added to Page 4 of 5 of the Site Plan. Please refer to Technical Report Recommendations under Natural Environment.

Site Plans

Comment #18

Partially resolved – To improve the clarity of the site plan, please include the area to be excavated in the setback in the legend on page 3 of 5.

The area to be excavated along Highland Line Road to provide a clearer line of sight is shown on the Operations Plan (page 3 of 5) and the symbol has been included in the legend on the Operations Plan (page 3 of 5).

Comment #24

Partially resolved – To support the progressive rehabilitation of the site, MNR staff support, in-principle, incorporating a 50% maximum disturbed area on the site plan. However, it is recommended for clarity that the revision to note 60 on the Rehabilitation Plan describe what the 'disturbed area' is intended to represent (e.g., in processing and storage areas, stripped areas, extraction areas, and unrehabilitated side slopes etc.).

The second sentence in the revision to note 60 also indicates that progressive rehabilitation will be initiated once the 50% maximum disturbed area is reached. This would appear to contradict the first sentence in this note, which suggests that progressive rehabilitation will be ongoing when there is available space in each phase (e.g., in Extraction Area 1 and 2). To ensure clear direction is provided on the site plan, it is recommended that the second sentence in the revised note be removed.

Site Plan Note 60 has been altered as follows to address this comment:

Progressive rehabilitation will be completed in direct correlation to the development of the pit as the extraction limits are reached and enough area is available to ensure that the production, stockpiling and processing of aggregate materials will not interfere with rehabilitation activities.

The maximum disturbed area (i.e., processing and storage areas, extraction areas and unrehabilitated side slopes) for the site shall not exceed 50% of the total extraction area, which includes both extraction area 1 and extraction area 2.

During operations, rehabilitated side slopes will be established in areas where the pit has reached the final depth and has extended to the excavation limit.

Hydrogeology

Comment #43

Partially resolved – MNR staff appreciate the response to this comment. However, the response only addresses potential impacts to Barbers Lake, resulting from the anticipated water table rise, and does not evaluate potential impacts on the wetlands and coldwater watercourses adjacent to the proposed pit. Based on the results of the drawdown analysis (as requested in comment #44), please evaluate the potential impacts on the adjacent wetlands and watercourses within the calculated cone of drawdown. This evaluation may require that additional mitigation measures be considered to address any potential adverse impacts to these features.

Please refer to the response for Comment #44.

Comment #44

Partially resolved - It is important to evaluate potential impacts on the adjacent wetlands and watercourses within the radius of influence of the anticipated groundwater drawdown. MNR staff appreciate that the response has evaluated the maximum radius of influence based on a 1 m water table change (e.g., revised Figure 2). However, to assess the extent of potential impacts on these features, please provide an estimate of the cone of drawdown with a 0.1 m cutoff. This assessment is important, as even a slight groundwater decline could lead to potential impacts on these features (e.g., coldwater watercourses no longer receiving sufficient groundwater, potentially negatively impacting spawning and incubation areas).

We also recognize that the presence of shallow bedrock may impede the propagation of the cone of drawdown in certain parts of the site by acting as a no-flow boundary. However, the extent of shallow bedrock in the study area requires further confirmation, as provincial scale mapping (e.g., OGS Surficial Geology) may not be accurate to evaluate site specific conditions. For example, Figure 2 (Attachment 2) shows that an existing pit, northwest of the site, is within a mapped bedrock area.

To address the MNR request, the predicted radius of influence, based on a 0.1 metre of drawdown, was estimated using the empirical formula developed by Marinelli and Niccoli (2000) using the hydraulic conductivity value from the geometric average of on-site testing of 4×10^{-5} m/s and of 1×10^{-4} m/s which was the highest value recorded at the site. Also, the average of the absolute value of maximum predicted drawdown at monitoring wells MW20-1 to MW20-5 based on the April 14, 2021 groundwater elevations (2.8 metres) was used in the

calculations. Results of the analysis are presented in Table 1 (rounded to the nearest 5 metres) and in **Attachment 3**.

Table 1: Predicted Radius of Influence

	Hydraulic Conductivity (m/s)	
	4×10^{-5} (Geomean)	1×10^{-4} (Maximum)
Marinelli and Niccoli (2000)	410 metres	605 metres

Based on the increase in the hydraulic conductivity, the maximum radius of influence based on 0.1 metres of water table change (increase or decrease) was estimated to be 605 metres. This radius of influence can be considered conservative as it incorporates the maximum predicted drawdown and the maximum measured hydraulic conductivity.

The impact assessment based on the estimated 605 metre radius of influence does not change from the original impact assessment due to a combination of factors.

In the south corner of the proposed site, the updated predicted radius of influence continues to intersect with the wetland associated with Long Sault Creek. The proposed licensed area (and limit of extraction) west of Anderson Lane (i.e., Extraction Area 2), has been reduced in size from what was originally proposed. This change has increased the separation distance between the limit of extraction and Long Sault Creek from 200 metres (i.e., the originally proposed limit of extraction) to approximately 300 metres or more for the reduced/revised limit of extraction, thus limiting the propagation of the updated predicted radius of influence in the direction of Long Sault Creek. In addition, shallow bedrock as observed in the area between the proposed excavation and Long Sault Creek which further prevents the drawdown in the sand and gravel deposit from propagating to the southeast under Long Sault Creek (refer to Figure 1 below). As well, the direction of groundwater flow within the proposed limits of extraction on the property is to the northeast towards Barbers Lake and not from the site towards Long Sault Creek to the south/southeast.



Figure 1: Interpreted Area of Exposed and/or Shallow Bedrock Observed August 2025. (Orange polygons represent areas of exposed and/or shallow bedrock)

In the area adjacent to Barbers Lake, the predicted radius of influence intersects with the wetlands. It is predicted that as a result of pit development and the associated levelling of the water level associated with the rehabilitated pit lake, the groundwater levels will experience an increase in this area leading to increased groundwater flow to the wetlands.

The revised radius of influence extends as far as the mapped limits of the wetlands north of Highland Line. In this area, based on the maximum groundwater levels recorded at MW20-2, the maximum drawdown would be 2 metres (at the edge of the pit lake) and the radius of influence would not extend as far as the maximum that is illustrated on Figure 1 in **Attachment 4**.

Two water supply wells (3500651 and 7106890) are identified within the revised radius of influence. Well 3500651 is identified in the MECP water well records as a bedrock well and is constructed with casing extending into the bedrock and, as such, would not be influenced by drawdown (<3 metres) in the overburden. Well 7106890 indicates gravel underneath 4.8 metres of granite. This well is also likely a bedrock well and, as such should not be influenced by drawdown in the overburden. However, as gravel is indicated on the well record at depth, a consideration of the available drawdown can be developed. The available drawdown in the well is 13.8 metres based on the water found depth and the static groundwater level recorded in the well record. The predicted percent reduction in available drawdown, based on the maximum drawdown predicted on the north side

of the site, at the extraction limit (2 metres at MW20-2), is 15%. In all likelihood, the well owner would not perceive the reduction in available drawdown in the well.

A thermal assessment of Barbers Lake and Long Sault Creek was completed to assess the thermal conditions around the site, and potential impacts to Brook Trout due to the development of the site (refer to **Attachment 5**). Results of the thermal assessment indicate that the existing thermal conditions around the site (i.e., Long Sault Creek and Barbers Lake) are not ideal for Brook Trout.

The water temperature recorded at Mississippi Valley Conservation Authority (MVCA) and WSP data logger stations in Long Sault Creek show that the water temperature frequently exceeds the physiological tolerances of Brook Trout. At both MVCA sites, temperatures consistently surpassed the species' optimal range and often exceeded the upper thermal threshold, suggesting that Brook Trout are likely experiencing thermal stress in Long Sault Creek during warmer periods. Further, the highest temperature extremes also frequently exceeded the upper threshold, particularly during summer months, indicating a lower likelihood of thermal refuge even under peak conditions. At MVCA's upstream logger station (MVCLS-15LS003), minimum daily temperatures frequently exceeded the optimal range, with some months surpassing the upper threshold entirely. In contrast, MVCA's downstream logger station (MVCLS-15LS004) was generally cooler (minimum temperatures), often remaining below the optimal range, potentially offering limited thermal relief.

The temperature and dissolved oxygen profiles collected in Barbers Lake show that there is no summer refugia habitat available for Brook Trout to escape thermal stress in Long Sault Creek. Barbers Lake had a surface temperature of 24°C which stayed consistent until a depth of 4.5 metres, at which point temperature began to quickly decrease with depth until it reached 10-11°C from 7 metres deep to the maximum depth. While these temperatures at depth are suitable for Brook Trout growth and survival, the dissolved oxygen profile shows that the conditions become anoxic below 4.5 m deep. As such, the conditions in Barber Lake as sampled in August 2025, indicate that during the warmer summer months, the lake would be inhospitable for Brook Trout.

Based on the results of the thermal transport model, during an average year, the presence of the pit lake would result in an increase in the temperature of the groundwater discharging in the area of the proposed Highland Line Pit to Barbers Lake in comparison to the current site conditions. On average, the magnitude of this increase ranges from 0.3°C in the Spring to 1.2°C in the Fall. Given that the Highland Line property contributes only a small portion of the total groundwater contribution to Barbers Lake - approximately 10% to 15% of the lake's shoreline - and considering the larger volumes of water entering the lake from the unaffected southern tributary of Long Sault Creek and from precipitation and overland runoff, the overall thermal impact of the slightly warmer groundwater is expected to be negligible. Therefore, it is unlikely that these localized thermal changes, which are considered small, will have any measurable impact on fish species dependent on Barbers Lake or the downstream Long Sault Creek.

Comment #46

Partially resolved - To address this comment, please provide delineated catchment areas for the adjacent wetlands and watercourses. This mapping should be used to estimate the potential loss of surface water runoff to these features, by comparing water balances within each catchment area (pre- and post-extraction).

As requested, the delineated catchment areas for the wetlands and watercourses adjacent to the proposed Highland Line Pit are provided in Figure 2 below. The catchment areas were delineated using the Ontario Watershed Information Tool (OWIT). Two catchment areas were identified that intersect the site. The catchment to the north (9.6 km²) is associated with the unevaluated wetland to the north as well as the northern branch of Long Sault Creek. The catchment to the south (8.5 km²) is associated with Barbers Lake and the southern branch of Long Sault Creek.

A water balance for the site was completed and presented in the Water Report.

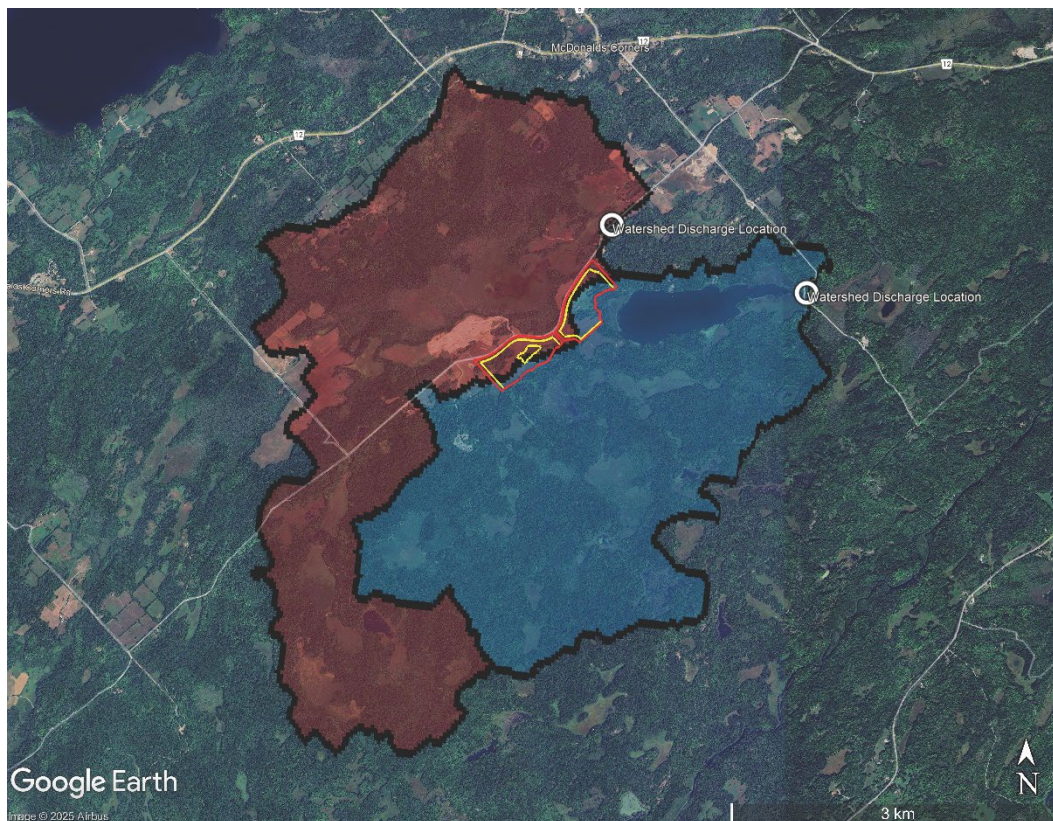


Figure 2: Catchment Areas

The water balance in the Water Report estimated that the pit excavation will convert approximately 0.20 km² and 0.16 km² of the southern and northern catchments, respectively (approximately 2.4% and 1.7%, respectively) to a depression (pit lake) with a surface outlet to Barbers Lake at 186 metres asl, along the east part of the site, that will both internally drain to shallow groundwater and outflow as surface runoff during different seasons. Although direct runoff from the pit area to either of the catchments will be reduced, the water surplus collecting in the pit will also infiltrate and continue downgradient to Barber's Lake and Long Sault Creek as shallow groundwater flow.

The water balance assessment in Section 3.0 in the water report suggests that overall, there is a decrease in water surplus of 10% from 168,755 to 151,180 m³ per year for the site under operational conditions. Rehabilitated conditions are expected to have a similar decrease in surplus compared to existing conditions. Runoff volumes to the southern and northern catchments are expected to decline, however baseflow to Barbers Lake and Long Sault

Creek is expected to slightly increase as a result of the increase in infiltration at the pit. This change from site runoff to infiltration is expected to decrease peak flow contributed from the site and slightly increase a steadier base flow from the site.

Overall, the surface water impacts, associated with the proposed pit, that are discussed in the Water Report are marginal. Changes in contributing catchment to the locations discussed are on the order of 2%, while infiltration is still estimated to report to two of the three adjacent waterbodies as baseflow.

Based on the results presented in the Water Report, the Natural Environment Report indicated that no further study was required for fish habitat or for the wetlands.

Comment #48

Partially resolved - To confirm the impact assessment for the adjacent wetlands and watercourses, including monitoring the performance of any mitigation measures (e.g., setbacks etc.), it is recommended that the groundwater and surface water monitoring program on the site plan be enhanced to include:

- *Installing additional monitoring wells.*
- *Establishing additional surface water monitoring stations.*
- *Incorporating SG2 into the monitoring program.*
- *Increasing the frequency of water level readings.*
- *Establishing trigger thresholds at the monitoring locations and developing an adaptive management plan/response plan.*

To address recommendations by MNR, the following additions to the monitoring program are proposed:

- In order to provide additional information regarding potential changes to water levels in the wetland located to the north of the site, an additional monitoring well is proposed in the area between Anderson Lane and the existing MW20-2. Similarly, to monitor groundwater levels to the south of the site, an additional monitoring well is proposed between MW20-6 and Anderson Lane, adjacent to the extraction area. Proposed monitoring well locations are presented on the Site Plans (Page 3 of 5) in **Attachment 6**.
- Additional surface water locations SG-2, SG-4 and SG-5, can be included in the monitoring program in order to monitor water levels and temperature at the north of the site and in both reaches of Long Sault Creek. Surface water monitoring locations SG-2, SG-4 and SG-5 will be instrumented with dataloggers to monitor water levels and water temperatures on a daily basis during ice free conditions. It should be noted that a datalogger at surface water monitoring location SG-1 is already part of the proposed monitoring program.
- Water level readings at surface water locations and monitoring wells will be increased from quarterly to monthly. In addition, a datalogger will be deployed in MW20-2 to measure water levels and water temperatures on a daily basis. It should be noted that dataloggers in MW20-3 and MW20-6 are already a part of the proposed monitoring program.
- Water level readings in all monitoring wells will be increased from a quarterly to a monthly frequency.

- The monitoring program will include a condition that requires the development of trigger thresholds at appropriate monitoring locations and the development of an adaptive management plan/response prior to extraction proceeding below the water table. This would permit the acquisition of additional baseline data during the pre-development period and during extractive operations above the water table.

The above additions to the monitoring program have been included in the *Technical Report Recommendations and/or Monitoring - Water Report and Agency Comments* on the Operations Plan Notes (Page 4 of 5) of the Site Plans in **Attachment 6**.

Closure

A revised site plan incorporating these changes is enclosed as **Attachment 6**. The changes which are identified in redline include changes made in response to public and agency comments on the application.

If you have any questions on this submission, please contact the undersigned.

Yours truly,

WSP Canada Inc.



Brian Henderson, M.A.Sc., P.Eng.
Environmental Engineer



Kris Marentette, M.Sc., P.Geo.
Senior Hydrogeologist

BJH/KAM/rk

CC: Phil White, Thomas Cavanagh Construction Limited
Neal DeRuyter, MHBC Planning
Dave Mariott, Ministry of Natural Resources

Attachments: Attachment 1: WSP and Cambium Responses to MNR Comments (January 2025)
Attachment 2: MNR Objection Form Response (March 11, 2025)
Attachment 3: Empirical Formulae Analytical Results
Attachment 4: Figures
Attachment 5: Thermal Assessment of Barbers Lake and Long Sault Creek
Attachment 6: Revised Site Plan (October 8, 2025)

[https://wsponline.sharepoint.com/sites/gld-112126/project files/6 deliverables/response to comments/14 mnr objection letter \(march 11, 2025\)/final/19126620-4-rev0-response to mnr_8oct2025.docx](https://wsponline.sharepoint.com/sites/gld-112126/project%20files/6%20deliverables/response%20to%20comments/14%20mnr%20objection%20letter%20(march%2011,%202025)/final/19126620-4-rev0-response%20to%20mnr_8oct2025.docx)

ATTACHMENT 1

**WSP and Cambium Responses to
MNR Comments (January 2025)**



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January 10, 2025

Thomas Cavanagh Construction Ltd.
9094 Cavanagh Road
Ashton, Ontario
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Attn: Phil White, Quality Control Manager

Re: Response to MNR Review Comments on the Proposed Highland Line Pit Technical Reports, Township of Lanark Highlands, Ontario (Aggregate Resources Act Application #626599)
Cambium Reference: 19681-001

Dear Mr. White:

In a letter dated June 5, 2023, the Ministry of Natural Resources (MNR) provided review comments on the license application for the Thomas Cavanagh Construction Limited (Cavanagh) proposed Highland Line Pit (*Aggregate Resources Act Application #626599*). The review comments relate to the MNR review of the technical reports and plans submitted along with the application, including the Natural Environment Report (NER), Proposed Highland Line Pit, Lanark County, Ontario (WSP/Golder 2022a). The authors of the NER are now employed at Cambium Inc. (Cambium) and have been retained by Cavanagh to continue to provide services related to this application.

The purpose of this letter report is to respond to the comments provided by the MNR as they relate to the NER and certain comments on the rehabilitation plan. The comments provided by the MNR are presented below in italics followed by the responses by Cambium.

NATURAL ENVIRONMENT

MNR COMMENT #1

Processes and conclusions regarding the presence or absence of some Significant Wildlife Habitats (SWH) within 120 m of the site is unclear and/or insufficient to prove absence. In general, the report should provide sufficient information on the methods and findings to substantiate conclusions with respect



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to significant wildlife habitat. Please include a complete assessment of the SWH as per the appropriate Significant Wildlife Habitat Technical Guide and applicable Ecoregion Criteria (i.e., Ecoregion 5E). The ecosites identified and mapped for the proposed licence area suggest the following candidate Significant Wildlife Habitats may be present (at minimum): Bat Maternity Colonies, Turtle Wintering Areas, Specialized Habitat for Wildlife (Seeps and Springs, Amphibian Breeding Habitat (Woodland)) and Habitat for Special Concern and Rare Wildlife Species.

The Level 1 report should provide a conclusion (and rationale) regarding the presence or absence of each wildlife habitat described in the ecoregional criteria. Further, it is unclear if targeted surveys or reconnaissance for addressed significant wildlife habitats were conducted in support of the application. MNRF would appreciate additional information on any survey methodologies, observations and conclusions related to any occurrences of significant wildlife habitat.

Response:

A complete description of all methods for all surveys performed for the NER, and the data which feed into the assessment of SWH in accordance with the criteria set out in the Significant Wildlife Habitat Criteria Schedules (SWHCS), is provided in the NER (Section 4.0). As the MNR is aware, the SWHCS identifies various types of surveys to be conducted *only when* habitat criteria (i.e., candidate SWH) are present. Where habitat criteria was present, based on WSP's expert review of habitats in the field and supplemental desktop spatial analysis, targeted surveys were performed in accordance with the SWHCS recommendations (e.g., amphibian call-counts, breeding bird surveys, turtle basking surveys, etc.) as outlined in the NER. If the MNR feels insufficient information has been provided, please identify where the deficiencies are perceived so that we can accurately respond and provide the additional information.

It should be noted that the WSP report is an NER, and not a Level 1 Report, which is no longer a reporting requirement under the ARA.



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MNR COMMENT #2

As noted in the NER, “the wetland area on the Site north of Barbers Lake extending down to the lakeshore contained numerous seeps...The small pond feature is also associated with groundwater seepage. The small pond feature will be removed during operations. Additional seeps or springs may be present in the Study Area.” However, as noted in SWH Criteria Schedule for Ecoregion 5E, “presence of a site with 2 or more seeps/springs should be considered SWH.” The ARA recognizes the interim nature of mineral aggregate resource extraction, where progressive and final rehabilitation of sites are required to accommodate compatible land uses. It is the ministry’s understanding that the proposed licence area overlaps with SWH (Seeps and Springs). SWH is protected under the ARA Technical Reports and Information Standards, Section 2.2 (f), whereby negative impacts and any proposed preventative, mitigative or remedial measures must be identified. The ARA under Section 12.1 (a), also requires that mineral aggregate operations minimize impacts to the environment. In order to issue a licence under the ARA to extract from within SWH, any negative impacts to the natural feature or its ecological function must be addressed through preventative, mitigative or remedial measures. The ministry would be unable to support extraction within the portion of the SWH where no negative impact has been established. Please provide additional information on survey methodologies, locations and number of seeps identified on site and how proposed operations meet the test of no negative impact. See also Comment #10 below.

Response: A seep is not the same as a pond that intercepts the groundwater table, which is the case for the small pond feature at the Site. The wording of the NER was slightly misleading in that regard and should be revised to indicate that the pond intercepts the groundwater table and also receives surface water inputs. The seepage associated with the wetland adjacent to Barber’s Lake will not be impacted by the proposed extraction, as noted in the NER and the Water Report (WSP/Golder 2022b). Note that the license boundary has been moved to be coincident with the extraction area in the vicinity of the seeps, such that the seeps are no longer within the license boundary (see revised Site Plan).



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MNR COMMENT #3

As noted in the NER, measures to protect the area identified as maternity roost habitat for tri-coloured bat include the area being removed from extraction and delineated as a “Natural Environment Exclusion Area” and demarcated with a fence. As noted above, any negative impacts to the natural feature or its ecological function must be addressed through preventative, mitigative or remedial measures to meet the test of no negative impacts. We are concerned a fence may be insufficient at preventing negative impacts to the maternity roost habitat during operations and rehabilitation. Please provide an analysis on how the ecological function will be maintained and how all impacts will be mitigated (e.g., dust, noise, vibrations, etc.).

Response: The roost identified in the NER for tri-colored bat is not bat maternity roost SWH, per the definition provided in the SHWCS. The impacts of the proposed project on SAR were considered by the MECP, who determined in an email dated April 26, 2024 that the proposed mitigations are likely sufficient and no permits under the ESA are required.

MNR COMMENT #4

We agree a timing restriction on vegetation removal is necessary to protect migratory birds, but it is also necessary to avoid impacts to Significant Wildlife Habitats like Bat Maternity Colonies. Environment Canada has established the migratory bird nesting period for this region to be from early to mid April to late August for forest and wetland habitats. We recommend that tree removal only occurs between October 1st and March 30th to avoid the breeding bird nesting and the active season for bats.

Response: Noted. Although the NER did not identify any SWH Bat Maternity Colonies or any habitats meeting the criteria for that type of SWH, vegetation removal will be scheduled to occur between October 1 – March 30.



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MNR COMMENT #5

Unevaluated wetlands are identified on LIO within the site and adjacent lands (within 120 m information boundary) and have the potential to be impacted from operations. In accordance with the Aggregate Resources Act policy (Policy A.R. 2.01.07), unevaluated wetlands cannot be assumed to be non-significant, unless agreed to by the Ministry. As part of the application, an Ontario Wetland Evaluation System (OWES) evaluation to determine wetland significance by a certified evaluator was not completed. Instead, the ministry understands that the wetlands were assumed significant for planning purposes and the applicant has proposed a 30 m buffer to protect the wetlands. To implement this recommendation, the wetland boundary should be flagged by a qualified professional and a 30 m undisturbed setback established. The setbacks must be applied to the wetland boundary and the boundary must be established following OWES and marked in the field under the direction of a qualified ecologist prior to site development and operations.

Response: Noted. The wetland boundary was established following the rules of OWES. Wetland boundaries will be marked and surveyed in the field under the direction of a qualified and certified OWES wetland evaluator, using OWES protocols.

MNR COMMENT #6

A minimum 30 m, vegetated buffer is standard for mitigating potential impacts and provide enhancement opportunities by maintaining the wetland form and function, protecting wetland water quality and the vegetation and tree root zone; thereby, regulating associated surface and groundwater regimes and the hydrological and hydrogeological conditions upon which they depend. Buffer recommendations have been developed through the analysis of existing natural heritage features and functions and in consideration of guidance from relevant scientific literature (i.e., Natural Heritage Reference Manual). Further, a minimum buffer is integral for the protection or enhancement of aquatic habitat quality and function and for reducing potential for physical edge effects through the establishment of a more robust dense edge vegetation community. As such,



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please provide a minimum 30 m buffer along the southern border of the site where it is adjacent to the wetland and indicate on site plans. Please also move any berms outside of the 30 m setback along all wetlands to provide an undisturbed buffer along these sections. Further preventative, mitigative or remedial measures may be required pending Hydrogeological requirements.

Response: Based on the revised site plan proposed by Cavanagh, Extraction Area 2 has been pulled north beyond 30 m from the wetlands along the southern edge of that portion of the Site, and berms are no longer proposed along the southern edge of Extraction Area 2. Extraction Area 2 is now greater than 100 m from the wetlands to the south. The license boundary has been revised to be coincident with the southern edge of Extraction Area 1, and consequently no berms are proposed within 30 m of the wetlands along the southern edge of Extraction Area 1 (adjacent to Barber's Lake). Acoustic berms are required along the northeastern edge of the Site within the 30 m wetland buffer to meet ARA requirements. This berm will be placed as close to the inner edge (extraction side) of the buffer as feasible, and will be removed post-extraction as part of rehabilitation.

MNR COMMENT #7

Please confirm the 30 m setbacks are adequate to ensure no impacts to the water budget/balance, water levels, thermal regime and hydroperiod of wetlands and associated water features.

Response: The NER and the Water Report confirm that 30 m setbacks are adequate to ensure no impacts to the water budget/balance, water levels, thermal regime and hydroperiod and associated water features being retained on the Site and those in the Study Area. In addition, as noted in the response to Comment #6, the revised Extraction Area 2 has resulted in a buffer of greater than 100 m from the wetlands to the south of Extraction Area 2.

MNR COMMENT #8

There is some discrepancy between the surface water features identified in the NER that must be addressed. The small intermittent watercourse and pond



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January 10, 2025

feature in the FOM2-2 forest appear to be more consistent with the information available in Land Information Ontario and what can be observed from satellite imagery than the mapping provided in Figure 1 of the NER. Please clarify the discrepancy and provide additional information to substantiate conclusions regarding presence/absence. We recommend that additional background information review and/or site investigations are completed to verify the presence/absence of these waterbodies and their extent.

Response: The LIO mapping of the small intermittent watercourse has been overlaid (in orange) with the NER mapping (blue dashed lines) in the image below for illustrative purposes. Multiple site visits were conducted from spring through fall and did not observe any surface water or indication of past surface water in the location of the yellow line except where it overlaps the surface water features mapped in the NER. There is a large sand ridge that runs between the small pond feature and the seepage area mapped in the NER, making surface flow between the pond and the seepage area physically impossible. No ground-truthing was completed as part of the LIO mapping.





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MNR COMMENT #9

As noted in the NER, there will be no substantial impacts to fish habitat during operations and rehabilitation that is present in Long Sault Creek (a sensitive, coldwater fishery dependant on groundwater to support life cycle functions of coldwater species) and Barbers lake (a fishery that contains pike spawning habitat). However, the NER states that there will be a decrease in water balance by 10% and a decrease in the runoff volume to Barbers Lake and Long Sault Creek as a result in catchment loss. Also discussed in the NER, “an outlet to Barbers Lake will be placed at the east edge of the pit to offset the loss in runoff.” The NER then goes on to state that “although the pit will no longer be directing a substantial amount of runoff to either waterbody, the water surplus collected in the pit will also infiltrate and continue downgradient to these two waterbodies as shallow groundwater flow.” Please provide a rationale how these changes in runoff pattern meet the test of no negative impact to fish habitat as well as wetlands. Please also provide analysis on how these changes in runoff pattern may change the temperature regime or groundwater seepage to these two waterbodies. If impacts to fish habitat are expected, we recommend that the applicant circulate the Department of Fisheries and Oceans Canada (DFO), confirming that Fisheries Act obligations, if any, have been met.

Response: Although no impacts to fish habitat are expected, WSP Canada Inc. sent a formal request for a project review to Fisheries and Oceans Canada (DFO) for this application to confirm that assessment. In a letter dated March 12, 2024 (Attachment A), DFO confirmed that no authorization under the *Fisheries Act* is required for this project, and that the applicant’s obligations under the *Fisheries Act* have been met. With respect to the impact to wetlands, please see the response to Comment #2.

MNR COMMENT #10

As noted in the NER, a small intermittent watercourse is present in the northeastern portion of the site. The watercourse appears to “originate from two seepage/spring areas then flows through a cedar swamp into a small inlet of Barbers Lake.” Further, within the FOM2-2 Forest, there is a “small wetland



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inclusion/pond” that had “shallow water throughout most of the spring and summer and was vegetated with emergent and floating plants.” Processes and conclusions regarding the absence of fish habitat in this area is unclear and/or has not been well substantiated. Please provide additional information on any survey methodologies, observations and conclusions related to any occurrences of fish habitat. Please also provide a rationale why these features are not considered headwater drainage features.

Response: The intermittent watercourse was stated in Section 5.6 of the NER as having potential fish habitat in the lower reaches, but underground flow in several sections were a barrier to fish moving further up in the feature. Although no fishing was conducted at the small pond feature, additional study in June 2023 indicated that the oxygen levels present were 0.5 mg/L, which is anoxic and not conducive to the survival of fish, if present. All matters relating to fish and fish habitat were directed to DFO, as noted in the response to Comment #9.

The small pond feature is not considered a headwater drainage feature (HDF) because it has no surface inflow or outflow, and therefore does not meet the definition of an HDF. The small intermittent stream meets the definition of a headwater drainage feature; however, headwater drainage features are not one of the features that need to be addressed under the requirements of Section 2.2 of the Aggregate Resources of Ontario: Technical Reports and Information Standards (Ontario August 2020). Therefore, it was not noted as such in the NER.

MNR COMMENT #11

As per ARA Technical Reports and Information Standards, Section 2.2 (e), endangered and threatened species and their habitat need to be assessed for negative impacts, including inventory, habitat assessments and any proposed preventative, mitigative or remedial measures must be identified. As endangered and threatened species and their habitat are regulated by the Ministry of Environment, Conservation and Parks (MECP), we recommend that the applicant circulate the MECP so that the proposed development, including the proposed rehabilitation, is in accordance with the Endangered Species Act.



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Response: The application, NER and an Information Gathering Form (IGF) were reviewed by the MECP. MECP indicated in an email dated April 26, 2024 that the proposed mitigations outlined in the NER and the IGF are likely sufficient and that no permitting under the ESA is required.

PROGRESSIVE AND FINAL REHABILITATION

MNR COMMENT #29

As Eastern Wood Pewee habitat was identified during targeted surveys as “territory singing in Southern edge forest”, the woodland may be candidate habitat for this species. By including a diverse wildflower and shrub mix to the rehabilitation planting plan, it promotes insect diversity and better foraging habitat for Eastern Wood Pewee to further mitigate impacts of the proposed forest removal on this species.

Response: Eastern wood-pewee is a forest species that forages within the forest strata. It is reliant on a forest-based insect community and will not likely utilize the rehabilitation area for foraging (which will be rehabilitated as lake, wetland, and meadow). However, as noted in the site plan notes, flowering forbs, shrubs, and graminoids are included in the rehabilitation plan species mix (shrubs are currently limited to the littoral zone). This will provide a food source and habitat for many insect species that can be foraged on by many species of birds and other wildlife.

MNR COMMENT #30

Please provide a minimum planting density for trees, shrubs, and clumps of plants.

Response: The final rehabilitation area will be two ponds with shallow littoral zones to promote wetland habitat, and meadows on upland slopes. While it is expected trees and shrubs will move on to the upland slopes naturally, there is no current plan for planting woody species on the upland slopes as part of the rehabilitation plan. Slopes will be seeded with a mix of bunch and spreading grasses and forbs consisting of native and non-native, non-invasive species to



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prevent erosion. In the littoral zones, approximately 100 nodes of herbaceous and/or woody wetland species will be planted with a targeted density of 75% cover at establishment, and a target diversity of at least 10 species.

MNR COMMENT #31

Please include criteria for successful establishment of self-sustaining vegetation and requirements for monitoring, tending, and re-planting (as needed) to ensure success and healthy functionality following final rehabilitation.

Response: Criteria will be added to the site plan notes as follows: Monitoring will consist of plots within the littoral zones. A target of 60% cover by native species, and 60% survival of woody plantings will be implemented. Percent coverage and diversity will be noted and monitored each summer for three years after planting. Should any woody species consistently underperform, that species shall be replaced with a different species. A general assessment of the upland seeded slopes will also be conducted at the same time, using a systematic meander approach to cover the entire area. If bare soils are widespread (e.g., >25%) overseeding with the same seed mix will be completed. After the initial three years of the monitoring program, the need for additional remedial action and additional monitoring will be assessed.

MNR COMMENT #32

Mitigation - We recommend all setbacks from natural heritage features be clearly marked under the direction of a qualified Ecologist and prior to the start of operations.

Response: Noted. All setbacks from natural heritage features will be clearly marked under the direction of a qualified ecologist prior to the start of operations.



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Closing

If you have any questions on this letter report, please contact the undersigned.

Best regards,

Cambium Inc.

DocuSigned by:

Fergus Nicoll

AC17126AFF204FA...

Fergus Nicoll, Dip.T.

Ecological Specialist

DocuSigned by:

G. Weeks

B52DA9433CDD43E...

Gwendolyn Weeks, H.B.Sc.Env.

Senior Ecologist / Senior Project
Manager

FIN/GAW

Encl. *Cambium Qualifications & Limitations*

Attachment A DFO Letter of Advice, Proposed Highland Line Pit

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CAMBIUM QUALIFICATIONS AND LIMITATIONS

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Site Assessments

A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the extent that Cambium's work or report considers any locations or times other than those from which information, sample results and data was specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those extrapolations.

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The client expressly agrees that Cambium employees shall have no personal liability to the client with respect to a claim, whether in contract, tort and/or other cause of action in law. Furthermore, the client agrees that it will bring no proceedings nor take any action in any court of law against Cambium employees in their personal capacity.





Fisheries and Oceans
Canada

Pêches et Océans
Canada

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Fisheries and Oceans Canada
Ontario and Prairie Region
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Programme de Protection du poisson et de son habitat
Pêches et Océans Canada
Région de l'Ontario et des Prairies
1028 rue Parsons Sud-Ouest
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March 12, 2024

Your file *Votre référence*

N/A

Our file

Notre référence

23-HCAA-02078

Thomas Cavanagh Construction Ltd.
Attn: Phil White
9094 Cavanagh Road
Ashton, ON
K0A 1B0

Subject: Aggregate Pit, Barber's Lake, Long Sault Creek, Township of Lanark Highlands – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat

Dear Phil White:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on October 3, 2023. We understand that you propose to:

- Construct an aggregate extraction pit (Highland Line Pit) covering 35.1 hectares located 170m northwest of Long Sault Creek and 125m west of Barber's Lake in the Township of Lanark Highlands, Lanark County, Ontario.
- Upon closure, rehabilitate the pit by converting the extraction areas into permanent pond features which will include graded banks (slope: 3:1) seeded with native vegetation, the creation of littoral habitat (slope: 5:1) planted with emergent aquatic vegetation and the installation of habitat enhancement features including boulder clusters and roots wads.

Our review considered the following information:

- Request for Review and additional supporting documents dated October 3, 2023;
- "Natural Environment Report, Proposed Highland Line Pit, Lanark County, Ontario" technical report prepared by Golder Associates Ltd., dated December 12, 2022

- “Level 1 and Level 2 Water Report, Proposed Highland Line Pit, Township of Lanark Highlands, Ontario” technical report prepared by Golder Associates Ltd., dated December, 2022; and,
- Meeting between DFO, Thomas Cavanagh Construction Ltd. and WSP discussing project details on February 14, 2024.

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

- the death of fish by means other than fishing and the harmful alteration, disruption or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*; and,
- effects to listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*;

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

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

- Limit impacts on riparian vegetation to those approved for the work, undertaking or activity:
 - Limit access to banks or areas adjacent to waterbodies
 - Prune or top the vegetation instead of grubbing/uprooting
 - Limit grubbing on watercourse banks to the area required for the footprint of works, undertaking or activity
 - Construct access points and approaches perpendicular to the watercourse or waterbody
 - Remove vegetation selectively and in phases
 - Re-vegetate the disturbed area with native species suitable for the site
- Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks.
- Develop and implement a Sediment Control Plan to minimize sedimentation of the waterbody during all phases of the work, undertaking or activity:
 - Schedule work to avoid wet, windy and rainy periods (and heed weather advisories)
 - Regularly inspect and maintain the erosion and sediment control measures and structures during all phases of the project
 - Use biodegradable sediment control materials whenever possible
 - Remove all exposed non-biodegradable sediment control materials once site has been stabilized
 - Operate machinery on land, or from barges or on ice
 - Use methods to prevent substrate compaction (e.g., swamp mats, pads)
 - Monitor the waterbody to observe signs of sedimentation during all phases of the work, undertaking or activity and take corrective action

- Dispose and stabilize all dredged material above the high water mark of nearby waterbodies to prevent entry in the water
- Develop and immediately implement a response plan to prevent deleterious substances from entering a water body:
 - Stop works, undertakings and activities in the event of a spill of a deleterious substance;
 - Immediately report any spills (e.g., sewage, oil, fuel or other deleterious material), whether near or directly into a water body;
 - Keep an emergency spill kit on site during the works, undertakings and activities;
 - Contain any water with deleterious substances;
 - Ensure clean-up measures are suitably applied so as not to result in further alteration of the bed and/or banks of the waterbody;
 - Clean-up and appropriately dispose of the sediment-laden water and water contaminated with deleterious substances;
 - Maintain all machinery on site in a clean condition and free of fluid leaks;
 - Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water;
 - Dispose of all waste materials (e.g., construction, demolition, commercial logging) above the ordinary high water mark to prevent entry into the waterbody; and,
 - Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, poured concrete or other chemicals do not enter the waterbody.
- Aquatic invasive species are introduced and spread through transporting sands and sediments and using contaminated construction equipment. To prevent the spread of aquatic invasive species during construction in aquatic environments:
 - Clean, drain and dry any equipment used in the water; and,
 - Never move organisms or water from one body of water to another.

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal will not require an authorization under the *Fisheries Act*.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to remain in compliance with the *Fisheries Act*, avoid prohibited effects on listed aquatic species at risk, any part of their critical habitat or the residences of their individuals, and prevent the introduction of non-indigenous species.

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

23-HCAA-02078

- 4 -

The Proponent shall notify DFO at least 10 days prior to starting any in-water works by sending an email to the DFO 10 day notification inbox at DFO.OP.10DayNotification-Notification10Jours.OP.MPO@dfo-mpo.gc.ca. We recommend that a copy of this letter be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

If you have any questions with the content of this letter, please contact Brett Ellis at (587) 357-5802, or by email at Brett.Ellis@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Amelia', followed by a long horizontal flourish.

Amelia Corrigan
A/Senior Biologist – Mining, Oil & Gas – South
Fish and Fish Habitat Protection Program
Ontario & Prairies Region
Fisheries and Oceans Canada

Cc: Brett Ellis, Fisheries and Oceans Canada
Andrew Rou, WSP
Warren Aken, WSP



January 13, 2025

Project No. 19126620

Melanie Teitler, Aggregate Specialist

Ministry of Natural Resources and Forestry
Divisional Delivery Branch
Aggregates Section
300 Water Street
Peterborough, ON K9J 3C7

**RESPONSE TO MINISTRY OF NATURAL RESOURCES AND FORESTRY REVIEW COMMENTS ON
PROPOSED HIGHLAND LINE PIT TECHNICAL REPORTS, TOWNSHIP OF LANARK HIGHLANDS, ONTARIO
(AGGREGATE RESOURCES ACT APPLICATION #626599)**

Dear Ms. Teitler,

In a letter dated June 5, 2023, the Ministry of Natural Resources and Forestry (MNRF) provided review comments on the license application for the Thomas Cavanagh Construction Limited (Cavanagh) proposed Highland Line Pit (Aggregate Resources Act Application #626599). These review comments relate to the MNRF review of the Golder Associates Ltd. (now WSP Canada Inc.) reports entitled:

- Natural Environment Report (NER), Proposed Highland Line Pit, Lanark County, Ontario
- Level 1 and Level 2 Water Report, Proposed Highland Line Pit, Township of Lanark Highlands, Ontario
- Maximum Predicted Water Table Report, Proposed Highland Line Pit, Township of Lanark Highlands, Ontario
- Site Plans

The purpose of this submission is to respond to the comments provided by the MNRF on Site Plans and the hydrogeology comments related to the Water Report and Maximum Predicted Water Table Report. Responses to comments 1 to 11 and 29 to 32 provided by MNRF regarding the Natural Environment Report and the rehabilitation plan, are provided in the Cambium Inc. letter dated January 10, 2025 which has been provided under separate cover. The remaining comments provided by MNRF are presented below in *italics* followed by the responses by WSP Canada Inc. (WSP).

Site Plans

General

Comment #12

Licence conditions must be concise and free from ambiguity. Licence conditions and site plan notes must apply exclusively to the licensee and must be practical and legally enforceable by MNRF.

The Site Plan has been updated to remove ambiguity.

Comment #13

SPS 2: Please include Geographic Township of Dalhousie on the drawing.

'Geographic Township of Dalhousie' has been added to all site plans.

Comment #14

'Archeological Exclusion Zone' – A Stage 2 archaeological assessment report is outstanding for the area identified on page 3 of the site plan as the 'archeological exclusion zone'. This is necessary before the site plan is finalized to ensure appropriate setbacks have been applied to archaeological resources until further investigation, as needed, has been completed. Based on the results of the Stage 2 assessment a letter from Ministry of Citizenship and Multiculturalism (MCM) must be obtained and if applicable, confirm temporary avoidance and protection for this site. If MCM supports the temporary avoidance and protection as it is proposed, we have provided comments on the draft site plan intended to address our interests under the ARA. We encourage the applicant to share these comments with MCM for their consideration.

A Stage 1-2 Archaeological Assessment (November 5, 2024) has been completed for the areas identified on the original site plan submission as the 'Archaeological Exclusion Zone'. The Archaeological Assessment did not recommend any additional studies and no archaeological sites were identified during the current Archaeological Assessment that require avoidance and protection.

It should be noted that the licensed boundary (and extraction area) of the site has been updated and, as such, an archaeological assessment will not be completed in areas outside of the proposed updated licensed boundary.

Existing Features

Comment #15

Land Use/Zoning Section - Once all municipal approvals have been completed, please update these notes and corresponding symbols on the drawing prior to issuance.

Noted. Land use and zoning symbols will be updated once municipal approvals have been obtained.

Comment #16

As per ARA Site Plan Standard #20, all significant natural features on and within 120 m of the site shall be depicted on the Existing Features page. Please include all significant natural features confirmed in the NER on the site plan.

All significant natural features on and within 120 metres of the site have been added to the Existing Features page of the site plans (Page 2 of 5). Site Plan Note 20 has been updated to read as follows:

Significant Natural Features on the site:

1. Habitat for Endangered and Threatened Species: tri-coloured bat; little brown myotis; northern myotis; Blanding's turtle.
2. Significant Wildlife Habitat – Species of Conservation Concern: barn swallow.

Significant Natural Features within 120 metres of the site:

1. Habitat for Endangered and Threatened Species: black ash; Blanding's turtle; eastern meadowlark.
2. Significant Wildlife Habitat – Species of Conservation Concern: barn swallow; eastern wood pewee; common nighthawk.
3. Significant Wildlife Habitat – Seeps

Comment #17

The Ministry recommends removing operational information from Existing Features page. If the need for an amendment arises in the future, this will reduce the changes necessary to the site plan. Operational information would include: extraction area, setbacks and monitoring buffers.

Extraction areas, setbacks and monitoring buffers have been removed from the Existing Features General (Page 1 of 5) and the Existing Features – Site (Page 2 of 5) site plans.

Operations

Comment #18

Variation to excavation of setbacks – The rationale for this variation states that the purpose is to provide a clearer line of sight of the highway at the entrances and exits. Please provide further details if the intention of this variation is to excavate along the entire length of Highland Line Road or only in the locations of the entrances/exits. Please include details on the distance from the entrances/exits to be excavated as well as a maximum depth of extraction in the disturbed areas of the setback.

The area to be excavated along Highland Line Road to provide a clearer line of sight is shown on the Operations Plan (page 3 of 5). The maximum depth of extraction in this area will be 11 metres.

Comment #19

SPS 37 – O. Reg. 244/97 'Control and Operation of a Pit or Quarry' rule s. 0.13(1)(13i) states that a building or structure will not be located within 30m of the licenced boundary. The drawing on page 3 indicates that the scale house, scales, and fuel storage will be located during the beginning of site operations within 30m of the licence boundary. Please revise for consistency with the site plan notes or add a site plan variance for the location of these structures.

The position of the scales, scalehouse and fuel storage area has been updated on Page 3 of 5 such that it is located 30 metres (minimum) from the licence boundary. Site Plan Note 37 has also been updated to read as follows:

"No buildings or permanent structures are proposed for the site. A scale house and scales will be established at the site however it will be portable and will move within the licensed area. The scale house and scales will initially be established near the entrance/exit at the northeast corner of the site greater than 30 metres from the licenced boundary."

Comment #20

SPS 37 – O. Reg. 244/97 'Control and Operation of a Pit or Quarry' rule s. 0.13(1)(25) states that scrap will not be stored within 30m of a water body, please revise to include this information. Please also provide additional details of how scrap will be managed once the area shown on the drawing is within below water extraction to satisfy this section of the regulation.

Site Plan Note 37 has been altered as follows to address this comment:

"Scrap from the site will be temporarily stored in designated areas. Scrap storage will initially be established within the areas designated on the operations site plan (page 3 of 5) however may move within the licensed area during operations. The scrap areas must remain greater than 30 metres from any water body and the licenced boundary at all times. Should there be no location(s) within the licensed boundary that satisfies the requirements of the site plan note, then scrap cannot be stored on site."

Comment #21

SPS 39 – As per Recycling Policy A.R. 5.00.15 once the aggregate on site has been depleted there will be no further importation of recyclable materials permitted. In addition to not being stored within 30m horizontally, recycled asphalt shall also not be stockpiled within 2m of the established water table. Please revise this note to include these additional requirements and details of how recycled materials will be managed or relocated once the area identified on the drawing is within the below water extraction area.

Site Plan Note 39 has been altered as follows to address this comment:

"Importation of recyclable materials will not be permitted on this site."

Comment #22

SPS 48 – The berms identified in the noise barrier table on page 3 only refer to noise attenuation berms. Please include the minimum height of all storage berms.

Site Plan Note 48 has been altered as follows to address this comment:

"Storage berms for topsoil and overburden will be located within the setbacks of the site where they exist, or along the edge of the extraction area, greater than 3 metres from the licence boundary, in areas where no setbacks exist. The minimum height for storage berms will be 2 metres. The minimum height for the berms that are required for noise attenuation will be constructed as per the recommended noise barriers table (Page 3 of 5). Material may be imported to complete the noise attenuation berms should there be insufficient on-site material. Imported material must meet the requirements of note 62 (Page 5 of 5)."

Comment #23

'Archeological Exclusion Zone' – If temporary avoidance and protection is confirmed by MCM, please revise the site plan drawing to clearly delineate the archaeological sites that will be avoided and protected, including protective buffers and monitoring zones, if required. Please include conditions that describe how the archaeological sites will be avoided and protected and details of the circumstances of when and how the protections may be lifted.

A Stage 1-2 Archaeological Assessment (November 5, 2024) has been completed for the areas identified on the original site plan submission as the 'Archaeological Exclusion Zone'. The Archaeological Assessment did not recommend any additional studies and no archaeological sites were identified during the current Archaeological Assessment that require avoidance and protection.

It should be noted that the licensed boundary (and extraction area) of the site has been updated and, as such, an archaeological assessment will not be completed in areas outside of the proposed updated licensed boundary.

Progressive and Final Rehabilitation

Comment #24

SPS 60 – Progressive Rehabilitation was enforceable. Please add progressive rehabilitation including clear and measurable triggers for progressive and final rehabilitation. For example, the use of a maximum disturbed area for this site or the use of operational phases which relate the progressive rehabilitation to the completion of operational sequences (for example, completion of 50% side sloping and planting of Extraction Area 1 before starting Extraction Area 2).

Site Plan Note 60 has been altered as follows to address this comment:

"Progressive rehabilitation will be completed in direct correlation to the development of the pit as the extraction limits are reached and enough area is available to ensure that the production, stockpiling and processing of aggregate materials will not interfere with rehabilitation activities.

The maximum disturbed area for the site shall not exceed 50% of the total extraction area, which includes both Extraction Area 1 and Extraction Area 2. Once 50% of the extraction area has been disturbed, progressive rehabilitation shall take place on final side slopes prior to the development of additional disturbed area.

During operations, rehabilitated side slopes will be established in areas where the pit has reached the final depth and has extended to the excavation limit."

Comment #25

SPS 62 – Please provide soil calculations or rationale to MNRF on how the 4.1M m3 of excess soil requirement was determined for rehabilitation.

The maximum volume of excess soil requirements to complete rehabilitation of the site was determined based on the amount of fill required to slope the edges of the excavation at either 5 horizontal:1 vertical or 3 horizontal:1 vertical slopes as indicated on the site plan. For conservatism, the calculation assumed a vertical excavated face

down to the depth of the pit before rehabilitation was completed and assumed no topsoil was available in the existing condition for eventual use in rehabilitation.

Comment #26

SPS 62 – Importation of Soil, Topsoil or Fill Material – The MNRF has 6 standard site plan conditions for the importation of excess soil. Please remove the conditions and replace with the following:

- 1) *Excess soil, as defined in Ontario Regulation 244/97 may be imported to this site to facilitate the following rehabilitation:*
 - a) *Creation of 3:1 slopes (or sloping ratio otherwise described on the final rehabilitation page)*
 - b) *Top dressing to establish vegetation*
- 2) *Liquid soil, as defined in Ontario Regulation 406/19 under the Environmental Protection Act, is not authorized for importation to the site.*
- 3) *The quality of excess soil imported to the site for final placement must be equivalent to or more stringent than the applicable excess soil quality standards as determined in accordance with Ontario Regulation 244/97 as amended from time to time and must be consistent with the site conditions and the end use identified in the approved rehabilitation plan.*
- 4) *Where a qualified person is retained or required to be retained in accordance with Ontario Regulation 244/97, the quality, storage, and final placement of excess soils shall be done according to the advice of the qualified person.*
- 5) *Excess soil imported to facilitate rehabilitation as described on this site plan shall be undertaken in accordance with Ontario Regulation 244/97 under the Aggregate Resources Act, as amended from time to time.*
- 6) *The cumulative total amount of excess soil that may be imported to this site for rehabilitation purposes is xx m³*

Site Plan Note 62 has been updated with the text provided.

Comment #27

Editorial – Page 5, note 63 – Please revise Ministry of Northern Development Natural Resources and Forestry to Ministry of Natural Resources and Forestry.

Noted and updated on Page 5 of 5 (Site Plan Note 63) of the site plans.

Comment #28

‘Archeological Exclusion Zone’ – Please revise to address aspects of the final rehabilitation plan that are contingent on future approvals from MCM. Areas subject to temporary and avoidance and protection need to be illustrated on the final rehab plan and indicate how rehab will proceed if, ultimately, approvals to excavate cannot be obtained.

A Stage 1-2 Archaeological Assessment (November 5, 2024) has been completed for the areas identified on the original site plan submission as the ‘Archaeological Exclusion Zone’. The Archaeological Assessment did not recommend any additional studies and no archaeological sites were identified during the current Archaeological Assessment that require avoidance and protection.

It should be noted that the licensed boundary (and extraction area) of the site has been updated and, as such, an archaeological assessment will not be completed in areas outside of the proposed updated licensed boundary.

Cross Sections

Comment #33

SPS 70: The site plan standard states that appropriate horizontal and vertical scales must be clearly marked on all cross sections. Please incorporate a horizontal scale into the cross-section schematic.

Both horizontal (1:4000) and vertical scales (1:1000) are marked on all cross sections on all pages of the site plans.

Comment #34

Editorial – Please remove the word “proposed” from the cross-section schematics.

The word ‘proposed’ has been deleted from all cross sections on all pages of the site plans.

Technical Recommendations

Comment #35

Editorial – Where bullets without numbering are used, please change them to be alphanumeric (a. b. c. or i, ii, iii, etc.) so they can be easily referenced.

The text on all pages of the site plan have been updated to reflect this comment.

Comment #36

Wash plant section, fourth bullet point – This condition indicates that there may be a requirement for an enclosure or additional noise mitigation to ensure the generator noise does not exceed 108.5 decibels. The current wording of this condition is not enforceable and contains ambiguous language such as “will likely need to be”. Please revise to include further details on how the noise limits will be identified and how mitigation will be managed for this location if required. If an enclosure is required, please indicate this on the site plan.

The note will be updated as follows: “The generator is to be housed inside a trailer and fitted with an exhaust silencer that meets the minimum insertion loss requirements listed in “the minimum insertion loss for generator exhaust silencer table (page 4 of 5)”. The silencer is to be located inside the trailer or as close as possible to the location where the exhaust exits the trailer with the duct material between the silencer and the generator constructed of 16-gauge weather resistant metal. The silencers shall have a high transmission loss casing. This item does not apply if hydro is used to provide power to the plant.”.

Comment #37

Editorial – Please revise to show portable construction equipment section as a new heading and not as a bullet point under the highway trucks section.

Noted and updated on Page 4 of 5 of the site plans.

Comment #38

New Process section – This condition contains ambiguous language making it difficult to enforce. Please revise so it is clear how and when it will be determined that the new processes will be implemented and will meet the guidelines (i.e. additional noise testing or assessments) and whether a site plan amendment or formal authorization from the Ministry will be required at a later date.

The condition states that a new process at the site will require assessment by a qualified acoustical consultant prior to commissioning. The note has been updated as follows:

“If a new process is introduced to the site that is not currently included in the site plan, then this process shall be assessed by a qualified acoustical consultant prior to commissioning. Noise mitigation measures shall be reviewed, and altered, if necessary, to ensure that MECP sound level limits are met at all points of reception and the site plan shall be amended as required by MNRF.”

Comment #39

Editorial – Symbol for wash plant and mobile crushing plant is missing from the legend. Please revise.

The symbol for the wash plant and mobile crushing plant has been added to the legend on Page 3 of 5 of the site plan.

Comment #40

Editorial – Page 3, Noise Barrier Table - For consistency and to avoid confusion please revise the barrier names so they are the same on the noise barrier table as they are on the drawing.

The names of the individual barriers in the noise barrier table have been updated to reflect those on the drawing.

Hydrogeology

Comment #41

Please update the water level map presented to accurately represent the maximum water table elevation. It is unlikely that there is a hydraulic sink present at the location of MW20-3. It is also unlikely that equipotential lines meet the drainage features such as wetlands and lake at the perpendicular angle.

With reference to Figure 1 in the Maximum Predicted Water Table Report, the maximum groundwater elevation recorded to date at each of the monitoring wells was used in developing the contours on Figure 1. These maximum groundwater elevations are presented in Table 1 of the Maximum Predicted Water Table Report. Figure 1 from the Maximum Predicted Water Table Report was prepared using groundwater elevation data from April 29, 2020, March 12, 2021 and April 14, 2021. As such, Figure 1 should be considered to represent the contouring of the maximum groundwater elevation data at each of the six monitoring well locations as opposed to being a representation of the elevation of the groundwater table or the groundwater flow direction at a single point in time. As requested, a revised version of Figure 1 from the Maximum Predicted Water Table Report was prepared and is provided in **Attachment 1**. In this figure, the groundwater contours from the water table within the sand and gravel deposit have been included in the figure. The contours have been truncated where bedrock has been

mapped close to surface. The surficial geology mapping (refer to Figure 3 in **Attachment 2**) coincides with where Cavanagh has determined the aggregate resource exists on the property. Areas that have not been developed for agriculture are also a good indication for the presence of bedrock near the surface. Conceptually, groundwater flows from west to east through a trough in the bedrock that has been filled by sand and gravel. The bedrock on either side of the trough serves as a barrier to groundwater flow from within the sand and gravel deposit.

To illustrate the groundwater flow direction across the site, the groundwater elevations from a single date were plotted and contoured on Figure 1A in **Attachment 1**.

The groundwater elevation data used to prepare Figure 1A were from April 14, 2021 and did not include the groundwater elevation data from MW20-6 since this monitoring well is not part of the shallow groundwater flow system across the lower parts of the property which are proposed for extraction. In addition, monitoring well MW20-6 falls outside of the updated licence boundary of the proposed pit. Based on the April 14, 2021 groundwater elevation data, the general groundwater flow direction is from southwest to east across the site, and towards the topographic low near Barbers Lake (where MW20-3 is located).

Based on agency review comments and a determination that there is a lack of extractable unconsolidated aggregate resource (due to the shallow depth to bedrock) along the extraction area west of Anderson Lane (i.e., Extraction Area 2), the limit of extraction for Extraction Area 2 has been reduced in size (as shown in **Attachment 1**). The original size of Extraction Area 2 was 20.8 hectares. The size of Extraction Area 2 has been revised to exclude the archaeological setback along the south/southeast property line. Based on this revision, the revised size of Extraction Area 2 is 14.0 hectares. Based on the reduction in size of the extraction area on the Highland Line property, Figure 2 (Water Supply Wells) from the Water Report has been updated and a revised version of Figure 2 is presented in **Attachment 2**.

Comment #42

Please update the analysis of the water levelling effect. Because of the overall groundwater gradient of approximately 10 meters, it is possible that the creation of the ponds may result in drawdown in groundwater level by approximately 5 meters at the southwestern part of the pit and water table rise of approximately 5 meters at the northeastern part.

Based on Figure 1A (**Attachment 1**), the overall groundwater gradient across the proposed extraction area is approximately 6 m with the estimated flooded lake level at rehabilitation predicted to be approximately 186 m ASL. As such, this could result in a lowering of the groundwater table on the southwest part of the site and a rise in the groundwater level in the northeastern part of the site adjacent to Barbers Lake. Based on the revised size of Extraction Area 2, the limit of extraction has been setback from the southeast property line of the lands owned by Cavanagh by at least 100 metres thereby increasing the separation distance between the limit of extraction and Long Sault Creek. Based on the reduction in size of the extraction area on the Highland Line property, Figure 2 (Water Supply Wells) from the Water Report has been updated and a revised version of Figure 2 is presented in **Attachment 2**.

Comment #43

Please provide impact analysis as to how the groundwater decline of approximately 5 meters upstream and water level rise of approximately 5 m downstream will impact the near-by wetlands, water levels in the cold streams, and seeps. Please consider both hydraulic and temperature change effect with potential change in chemistry.

Based on the reduction in size of Extraction Area 2 on the Highland Line property, the estimated average radius of influence [based on the one metre of water level change (increase or decrease) related to pit development] does not propagate beneath the Long Sault Creek along the south part of the site (northeast of MW20-6). This is illustrated on the updated version of Figure 2 from the Water Report which is presented in **Attachment 2**.

The ground surface elevations along the limit of extraction adjacent to Barbers Lake range from 186 m ASL near MW20-3 to 190 – 192 m ASL along the northeast boundary of the site adjacent to Barbers Lake. The estimated flooded lake level at rehabilitation is predicted to be approximately 186 m ASL. As such, the potential does exist for there to be seasonal outflow from the pit lake along the limit of extraction near MW20-3 under high water level conditions. Along the majority of the limit of extraction adjacent to Barbers Lake, the existing ground surface is above the predicted lake level of 186 m ASL. It is expected that the pit lake with a water level of approximately 186 m ASL would increase the hydraulic gradient between the pit lake and the adjacent Barbers Lake wetland which could result in the increased flow at groundwater seeps adjacent to Barbers Lake.

The issue of temperature change and potential change in chemistry is addressed in the response to Comment #48 below.

Comment #44

Because the monitoring wells are not completed to the depth of the anticipated depth of extraction, please use the range of hydraulic conductivities including literature values for sand and gravel in the calculations of potential impacts as a result of the water levelling effect to ensure that the worst case scenario is considered. While calculating impacts please use different methodologies to evaluate the extent of the groundwater level drawdown because each of the analytical methods has its limitations.

The hydraulic conductivity values estimated from the well response testing ranged from 1×10^{-5} to 1×10^{-4} metres per second (m/s) with a geometric average of 4×10^{-5} m/s based on data from MW20-1 to MW20-5. The radius of influence based on one metre of water table change (increase or decrease) was estimated to be 50 metres using the empirical formula developed by Marinelli and Niccoli (2000) as illustrated on Figure 2 in the Water Report.

To address the MNRF request, a sensitivity analysis was undertaken by increasing the hydraulic conductivity value from the geometric average of 4×10^{-5} m/s to 1×10^{-4} m/s which was the highest value recorded at the site. Also, the average of the absolute value of maximum predicted drawdown at monitoring wells MW20-1 to MW20-5 based on the April 14, 2021 groundwater elevations (2.8 metres) was used in the calculations. In addition, a number of different empirical formulas were used to calculate the radius of influence of the change in water level. Results of the analysis are presented in Table 1 (rounded to the nearest 5 metres) and in **Attachment 3**

Table 1: Predicted Radius of Influence

	Hydraulic Conductivity (m/s)	
	4×10^{-5} (Geomean)	1×10^{-4} (Maximum)
Marinelli and Niccoli (2000)	175 metres	250 metres
Sichardt (1930)	55 metres	85 metres
Kusakin (in Bear, 1979)	35 metres	60 metres
Wrobel (1980)	80 metres	130 metres

Based on the increase in the hydraulic conductivity, the maximum radius of influence based on one metre of water table change (increase or decrease) was estimated to be 250 metres using the empirical formula developed by Marinelli and Niccoli (2000). This radius of influence can be considered conservative as it incorporates the maximum predicted drawdown, the maximum measured hydraulic conductivity and also was selected based on the empirical formula that predicts the largest radius of influence.

The impact assessment based on the estimated 250 metre radius of influence does not change from the original impact assessment due to a combination of factors.

In the south corner of the proposed site, the updated predicted radius of influence continues to intersect with the wetland associated with Long Sault Creek. The proposed licensed area (and limit of extraction) west of Anderson Lane (i.e., Extraction Area 2), has been reduced in size (as shown in **Attachment 2**). This change has increased the separation distance between the limit of extraction and Long Sault Creek from 200 metres (i.e., the originally proposed limit of extraction) to approximately 300 metres or more for the reduced/revised limit of extraction, thus limiting the propagation of the updated predicted radius of influence in the direction of Long Sault Creek. In addition, the shallow bedrock between the proposed excavation and Long Sault Creek prevents the drawdown in the sand and gravel deposit from propagating to the southeast under Long Sault Creek. As well, the direction of groundwater flow within the proposed limits of extraction on the property is to the northeast towards Barbers Lake and not from the site towards Long Sault Creek to the south/southeast.

In the area adjacent to Barbers Lake, the predicted radius of influence intersects with the wetlands. It is predicted that as a result of pit development and the associated levelling of the water level associated with the rehabilitated pit lake, the groundwater levels will experience an increase in this area leading to increased groundwater flow to the wetlands.

The revised radius of influence extends as far as the mapped limits of the wetlands north of Highland Line. In this area, based on the maximum groundwater levels recorded at MW20-2, the maximum drawdown would be 2 metres (at the edge of the pit lake) and the radius of influence would not extend as far as the maximum that is illustrated on Figure 2. Between the limit of extraction and the wetlands to the north, there is shallow bedrock mapped that would separate the shallow overburden flow zone on the extraction area from the wetland. Areas

that have not been developed for agriculture are also a good indication for the presence of bedrock near the surface.

Two water supply wells (3500651 and 7106890) are identified within the revised radius of influence. Well 3500651 is identified in the MECP water well records as a bedrock well and is constructed with casing extending into the bedrock and, as such, would not be influenced by drawdown (<3 metres) in the overburden. Well 7106890 indicates gravel underneath 4.8 metres of granite. This well is also likely a bedrock well and, as such should not be influenced by drawdown in the overburden. However, as gravel is indicated on the well record at depth, a consideration of the available drawdown can be developed. The available drawdown in the well is 13.8 metres based on the water found depth and the static groundwater level recorded in the well record. The predicted percent reduction in available drawdown, based on the maximum drawdown predicted on the north side of the site, at the extraction limit (2 metres at MW20-2), is 15%. In all likelihood, the well owner would not perceive the reduction in available drawdown in the well.

Comment #45

Please provide information as to how drawdown because of water levelling effect would impact the Natural Environment Exclusion Zone.

The Natural Environment Exclusion Zone has been established to protect the maternity roost habitat for tri-coloured bat. As such, the water levelling effect would have no adverse impact on the tri-coloured bat habitat. The tri-coloured bat habitat is located on a bedrock knob that is present at ground surface.

Comment #46

Please provide information as to how the expected change water balance as a result of the change of runoff pattern will impact the near-by natural heritage features.

The implication of the above-described hydrological changes brought about as a result of pit development and rehabilitation were discussed in Section 6.2 and 6.3 of the December 2022 Natural Environment Report. Sections 6.2 and 6.2 of the Natural Environment Report as presented below (Note: figures references below refer to the December 2022 Natural Environment Report).

6.2 Significant Wetlands and Coastal Wetlands

Significant wetlands are areas identified as provincially significant by the MNRF using evaluation procedures established by the province, as amended from time to time (MMAH 2020). Wetlands are assessed based on a range of criteria, including biology, hydrology, societal value and special features (MNRF 2014c).

There are no provincially significant wetlands (PSW) on the Site or in the Study Area. Unevaluated wetlands are mapped on the Site and in the Study Area (Figure 1). These wetlands will be buffered from extraction by a 30 m setback (Figure 2), so there will be no physical intrusion into the wetlands.

The water balance assessment completed as part of the hydrological assessment for the proposed pit suggests that overall, there will be a decrease in water surplus of 10% for the Site under operational conditions. Rehabilitated conditions are expected to have a similar decrease in surplus compared to

existing conditions. Runoff volumes to Barber's Lake and Long Sault Creek are expected to decline; however, baseflow to these waterbodies is expected to slightly increase as a result of the increase in infiltration at the pit. This change from site runoff to infiltration is expected to decrease peak flow contributed from the Site and slightly increase a steadier base flow from the Site.

Overall, the surface water impacts associated with the proposed pit are not considered to be significant. Changes in contributing catchment to the locations discussed are on the order of 2%, while infiltration is still estimated to report to the adjacent waterbodies as baseflow.

There are no coastal wetlands on the Site or in the Study Area.

No further analysis of wetlands is warranted.

6.3 Fish Habitat

No fish habitat was identified on the Site, however, within the Study Area, Barber's Lake provides fish habitat.

As discussed in Section 6.2, the water balance assessment completed as part of the hydrological assessment for the proposed pit suggests that overall, surplus within the Site will decrease by 10% as a result of aggregate extraction under operational and rehabilitated conditions. Under operational and rehabilitation conditions, runoff volumes to Barber's Lake are expected to decrease as a result of catchment loss, however, an outlet to Barber's Lake will be placed at the east edge of the proposed pit (at an elevation of 186 masl) to offset the loss in runoff. Under operational and rehabilitation conditions, runoff volumes to Long Sault Creek are also expected to decrease as a result of catchment loss, however, the initial contributing Site catchment was 24% of the total Site area and less than 2% of its total catchment (850 ha) before its confluence with Barber's Lake. Although the pit area will no longer be directing a substantial amount of runoff to either waterbody, the water surplus collected within the pit will also infiltrate and continue downgradient to these two waterbodies as shallow groundwater flow. This change from site runoff to infiltration is expected to decrease peak flow contributed from the Site and slightly increase a steadier base flow from the Site.

Overall, the surface water impacts associated with the proposed pit are not considered significant. Changes in contributing catchment to the locations discussed are on the order of 2%, while infiltration is still estimated to report to the adjacent waterbodies as baseflow. Based on this, no substantial changes to existing fish habitat are expected as a result of this decrease (i.e., lake morphology and water levels are anticipated to remain the same). No further analysis is warranted.

Comment # 47

Please provide information as to how the potential water level rise of +5 m will be managed operationally.

The alteration of the groundwater table as a result of pit development will take place over the operational life of the pit and will have no adverse impact on the operation of the pit. Extraction equipment will be positioned above the pit water level and the aggregate resources would be extracted without any dewatering of the pit excavation.

Comment #48

Please propose additional monitoring locations to ensure no impacts to the Natural Heritage features (wetlands, natural environment exclusion zone, cold streams and seeps) and propose increase frequency of monitoring.

As discussed above in the response to Comment #45, the development of the proposed Highland Line Pit would have no adverse impact on the tri-coloured bat habitat (Natural Environment Exclusion Zone).

In Section 6.0 of the Water Report, the following water monitoring program was originally proposed:

- Quarterly groundwater level monitoring during pit operations, in monitoring wells MW20-1, MW20-2, MW20-3, MW20-4, MW20-5 and MW20-6 once the pit is operating below the water table.
- Quarterly surface water level monitoring during pit operations, at surface water station SG-1 once the pit is operating below the water table.

Based on agency review comments received to date from the MECP and MNRF, enhance monitoring commitments have been developed and added to the Page 4 of 5 of the site plans (**Attachment 4**).

In summary, the following additional components are proposed to be added to the water monitoring program and will be included:

- A baseline sampling program would be undertaken prior to commencement of pit operations. This one-time baseline groundwater quality characterization program would include the sampling of the six monitoring wells installed on the property. Each groundwater sample would be submitted for a general chemistry suite of analyses.
- Groundwater seep(s) in the area between the proposed extraction limit and Barbers Lake (i.e., at SG-1) would be sampled, a surface water sample from Barbers Lake (at SG-3) would be collected and up to 5 private water supply wells in the area of the site would be sampled provided that owner consent is provided. This sampling program would be undertaken prior to commencement of pit operations. Each groundwater sample and/or surface water sample would be submitted for a general chemistry suite of analyses including, but not limited to, total suspended solids, total dissolved solids, alkalinity, turbidity, nutrients and field measurements of temperature, pH and conductivity.
- The monitoring program was enhanced to include the installation of a datalogger (that also records water temperature) in monitoring well MW20-3 adjacent to the wetland associated with Barbers Lake, monitoring well MW20-6 on the south part of the Cavanagh property, and surface water monitoring station SG-1 (groundwater seep) within the wetland associated with Barbers Lake. In addition, these three monitoring locations outfitted with dataloggers would be monitored/sampled on an annual basis (once the pit is operating below the water table) for the following parameters (as a minimum): temperature, pH, conductivity, total suspended solids, total dissolved solids, alkalinity, turbidity, and nutrients.
- Water quality at the outlet of the pit pond at Barbers Lake would also be monitored when and if surface water outflow connectivity occurs in the operational and rehabilitated phase.

Comment # 49

Please update the site plans with the updated water level information and monitoring details.

The proposed updated Site Plan Notes to address the additional monitoring commitments, as discussed in the response to Comment #48, are provided on Page 4 of 5 of the site plans (**Attachment 4**).

The updated water level information from Figure 1A in **Attachment 1** has been added to Page 2 of 5 of the site plans.

Comment #50

I note that additional hydrogeology related comments may arise as a result of the Proponent response to MNRF comments.

Comment acknowledged.

Closure

A revised site plan incorporating these changes is enclosed as **Attachment 4**. The changes which are identified in redline include other changes made in response to public and agency comments on the application.

If you have any questions on this submission, please contact the undersigned.

Yours truly,

WSP Canada Inc.



Brian Henderson, M.A.Sc., P.Eng.
Environmental Engineer



Kris Marentette, M.Sc., P.Geo.
Senior Hydrogeologist

BJH/KAM/rk

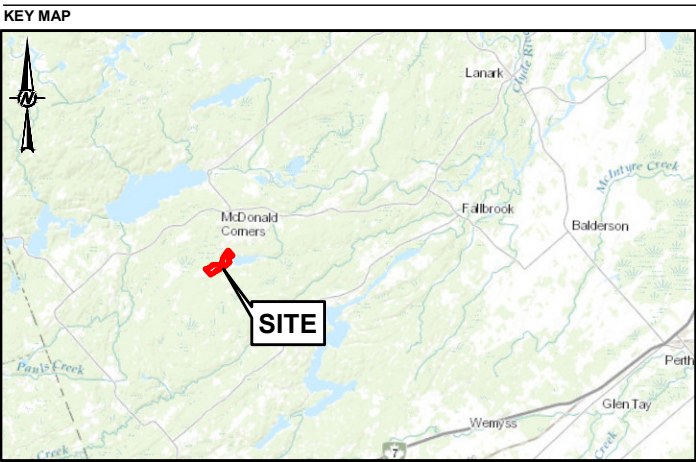
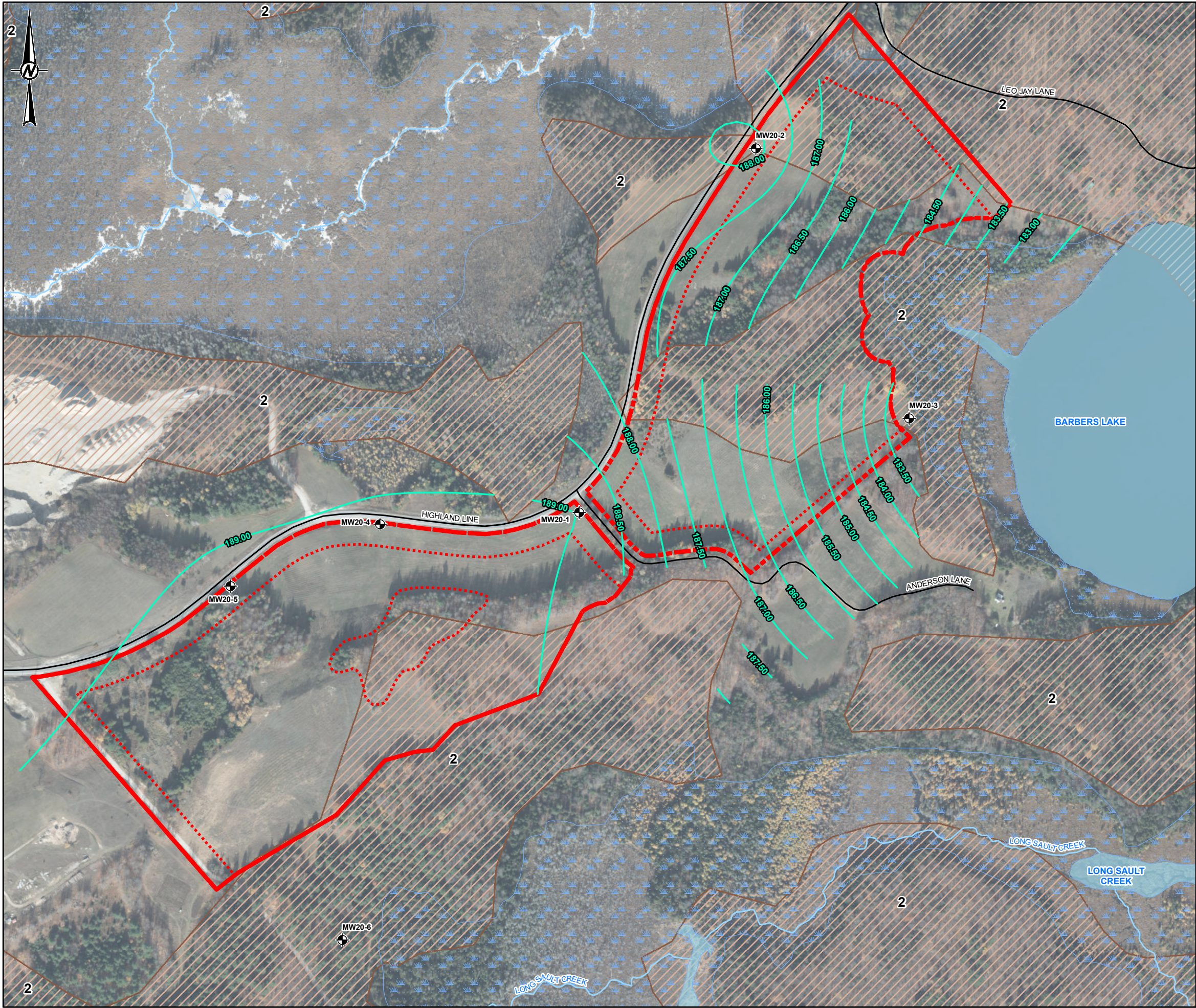
CC: Phil White, Thomas Cavanagh Construction Limited
Neal DeRuyter, MHBC Planning

Attachments: Attachment 1: Revised Figure 1 and Figure 1A from the Maximum Predicted Water Table Report
Attachment 2: Revised Figure 2 and Figure 3 from the Water Report
Attachment 3: Empirical Formulae Analytical Results
Attachment 4: Revised Site Plan

[https://wsonline.sharepoint.com/sites/gld-112126/project/files/6 deliverables/response to comments/mnrf comments/final/19126620-l-rev0-response to mnrf_13jan2025.docx](https://wsonline.sharepoint.com/sites/gld-112126/project/files/6%20deliverables/response%20to%20comments/mnrf%20comments/final/19126620-l-rev0-response%20to%20mnrf_13jan2025.docx)

ATTACHMENT 1

**Revised Figure 1 and Figure 1A
from the Maximum Predicted Water
Table Report**



- LEGEND**
- BOREHOLE/MONITORING WELL
 - LICENSED AREA
 - LIMIT OF EXTRACTION
 - UPDATED MAXIMUM WATER TABLE CONTOURS (0.5 METRES)
 - ROADWAY
 - WATERCOURSE
 - WATERBODY
- WETLAND SIGNIFICANCE**
- UNEVALUATED PROVINCIAL WETLAND
- OGS SURFICIAL GEOLOGY**
- 2. BEDROCK-DRIFT COMPLEX IN PRECAMBRIAN TERRAIN:



NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. IMAGERY CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
RIDEAU VALLEY CONSERVATION AUTHORITY (RVCA)
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

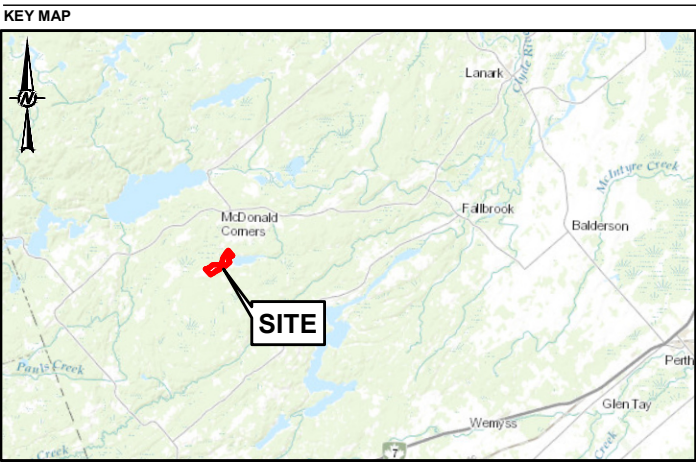
CLIENT
THOMAS CAVANAGH CONSTRUCTION LIMITED

PROJECT
HIGHLAND LINE PIT PROPERTY, PART OF LOTS 4 & 5,
CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY,
ONTARIO

TITLE
SITE PLAN

CONSULTANT	YYYY-MM-DD	12/5/2024
	DESIGNED	BH
	PREPARED	BR
	REVIEWED	BH
	APPROVED	KAM

PROJECT NO. 19126620 CONTROL 0025 REV. A FIGURE 1



SCALE 1:350,000

LEGEND

- BOREHOLE/MONITORING WELL
- LICENSED AREA
- LIMIT OF EXTRACTION
- WATER TABLE CONTOURS - APRIL 14, 2021 (0.5 METRES)
- ROADWAY
- WATERCOURSE
- WATERBODY

WETLAND SIGNIFICANCE

- UNEVALUATED PROVINCIAL WETLAND

OGS SURFICIAL GEOLOGY

- 2. BEDROCK-DRIFT COMPLEX IN PRECAMBRIAN TERRAIN:

0 50 100 200
1:5,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. IMAGERY CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
RIDEAU VALLEY CONSERVATION AUTHORITY (RVCA)
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

THOMAS CAVANAGH CONSTRUCTION LIMITED

PROJECT

HIGHLAND LINE PIT PROPERTY, PART OF LOTS 4 & 5,
CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY,
ONTARIO

TITLE

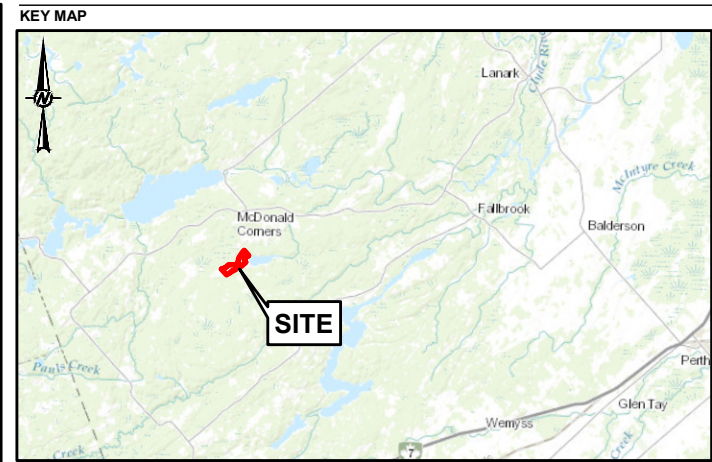
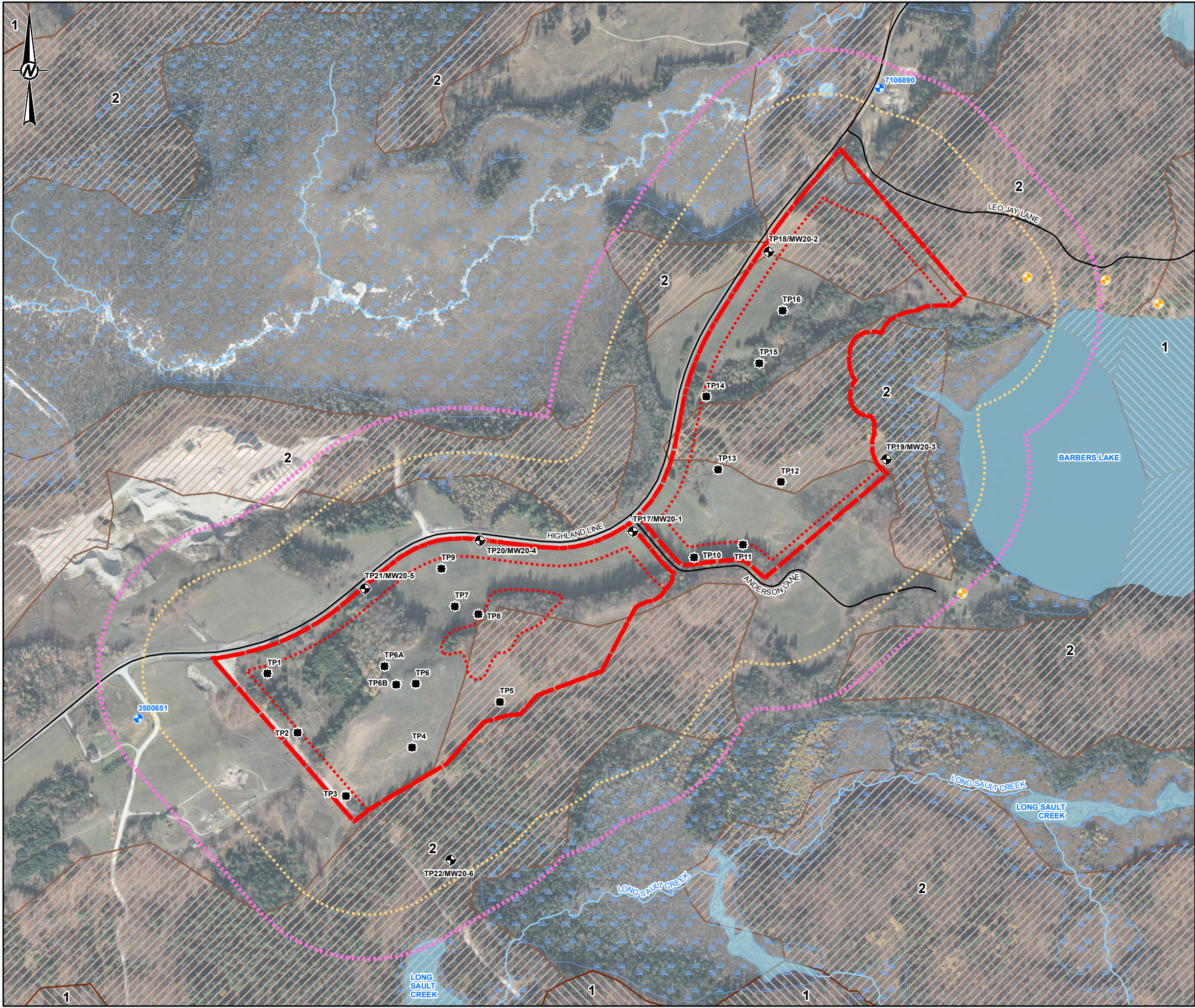
SITE PLAN

CONSULTANT	YYYY-MM-DD	12/10/2024
DESIGNED	BH	
PREPARED	BR	
REVIEWED	BH	
APPROVED	KAM	

PROJECT NO. 19126620 **CONTROL** 0025 **REV.** A **FIGURE** 1A

ATTACHMENT 2

**Revised Figure 2 and Figure 3 from
the Water Report**



LEGEND

- TEST PIT/MONITORING WELL
- TEST PIT LOCATION
- MECP WWIS WATER WELL LOCATION
- ASSUMED WATER WELL
- LICENSED AREA
- LIMIT OF EXTRACTION
- ESTIMATED RADIUS OF INFLUENCE (INCREASE OR DECREASE) RELATED TO PIT DEVELOPMENT BASED ON HIGHEST HYDRAULIC CONDUCTIVITY AND MAXIMUM DRAWDOWN
- ESTIMATED RADIUS OF INFLUENCE (INCREASE OR DECREASE) RELATED TO PIT DEVELOPMENT BASED ON GEOMETRIC AVERAGE HYDRAULIC CONDUCTIVITY AND MAXIMUM DRAWDOWN
- ROADWAY
- WATERCOURSE
- WATERBODY

WETLAND SIGNIFICANCE

- UNEVALUATED PROVINCIAL WETLAND

OGS SURFICIAL GEOLOGY

- 1. PRECAMBRIAN BEDROCK
- 2. BEDROCK-DRIFT COMPLEX IN PRECAMBRIAN TERRAIN:

DRAFT

0 65 130 260
1:6,500 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. IMAGERY CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

THOMAS CAVANAGH CONSTRUCTION LIMITED

PROJECT

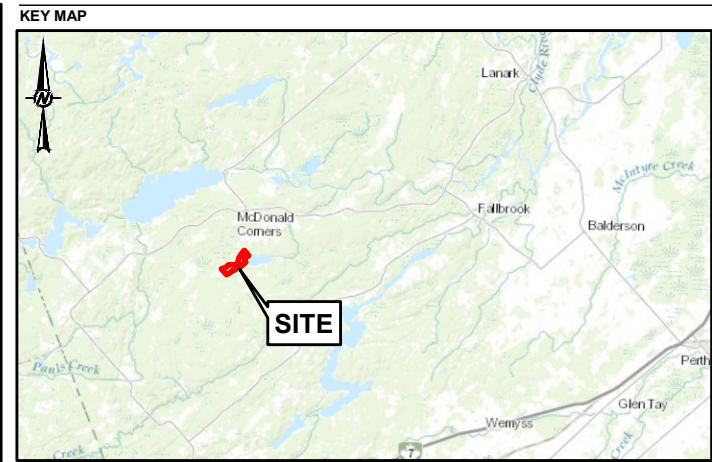
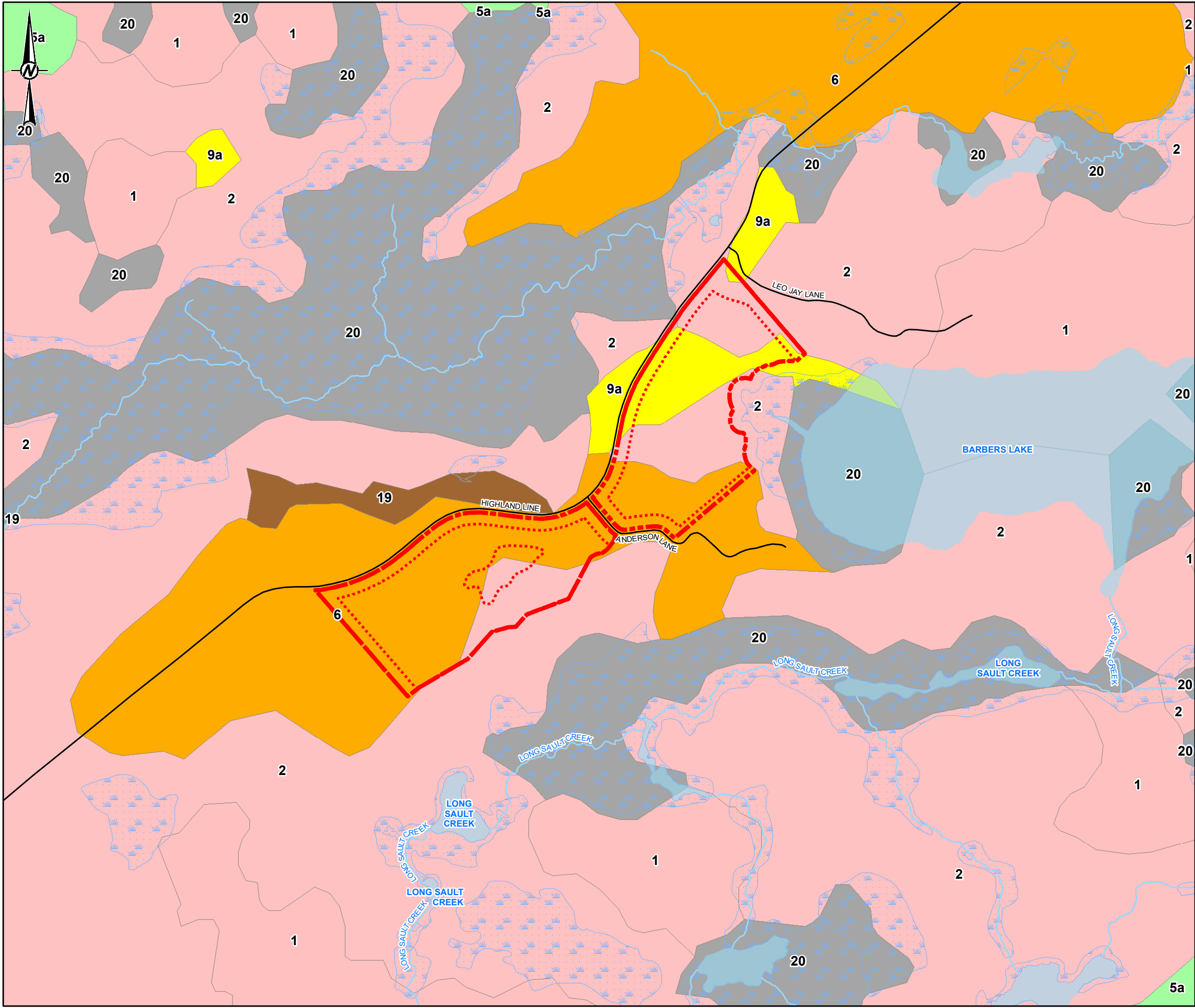
HIGHLAND LINE PIT PROPERTY, PART OF LOTS 4 & 5,
CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY,
ONTARIO

TITLE

WATER SUPPLY WELLS

CONSULTANT	YYYY-MM-DD	12/5/2024
DESIGNED	BH	
PREPARED	BR	
REVIEWED	BH	
APPROVED	KAM	

PROJECT NO. 19126620 **CONTROL** 0025 **REV.** A **FIGURE** 2



LEGEND

- LICENSED AREA
- LIMIT OF EXTRACTION
- ROADWAY
- WATERCOURSE
- WATERBODY

WETLAND SIGNIFICANCE

- UNEVALUATED PROVINCIAL WETLAND

OGS SURFICIAL GEOLOGY

- 1. PRECAMBRIAN BEDROCK
- 2. BEDROCK-DRIFT COMPLEX IN PRECAMBRIAN TERRAIN:
- 5a. TILL: SILTY SAND TO SAND-TEXTURED TILL ON PRECAMBRIAN TERRAIN
- 6. ICE-CONTACT STRATIFIED DEPOSITS: SAND AND GRAVEL MINOR, SILT, CLAY AND TILL
- 9a. COARSE-TEXTURED GLACIOLACUSTRINE DEPOSITS: SAND, GRAVEL, MINOR SILT AND CLAY; DELTAIC DEPOSITS
- 19. MODERN ALLUVIAL DEPOSITS: DAY, SILT, SAND, GRAVEL, MAY CONTAIN ORGANIC REMAINS
- 20. ORGANIC DEPOSITS: PEAT, MUCK, MARL

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. ONTARIO GEOLOGICAL SURVEY 2010. SURFICIAL GEOLOGY OF SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MISCELLANEOUS RELEASE-DATA 128-REV
2. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
3. IMAGERY CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

DRAFT

0 100 200 400
1:10,000 METRES

CLIENT
THOMAS CAVANAGH CONSTRUCTION LIMITED

PROJECT
HIGHLAND LINE PIT PROPERTY, PART OF LOTS 4 & 5,
CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY,
ONTARIO

TITLE
SURFICIAL GEOLOGY MAP

CONSULTANT	YYYY-MM-DD	12/2/2024
	DESIGNED	BH
	PREPARED	BR
	REVIEWED	BH
	APPROVED	KAM

PROJECT NO.	CONTROL	REV.	FIGURE
19126620	0025	A	3

ATTACHMENT 3

Empirical Formulae Analytical Results

Parameter	Geomean K	Highest Site K
Drawdown (s), metres	2.8	2.8
Hydraulic Conductivity (K), metres per second	4E-05	1E-04
Aquifer Saturated Thickness (B), metres	12.8	12.8
Length of Pit Lake(L), metres	1110	1110
Saturated Thickness of Aquifer (h) at Radius R, metres	11.8	11.8
Saturated Thickness at Pit Wall (h _p), metres	10	10
Recharge Flux (W), metres per second	6.30E-09	6.30E-09
Radial Distance from Center of Pit to Zero Drawdown (r ₀), metres	832	1101
Effective Pit Radius (r _p), metres	300	300

Author	Formula	R (m)	R (m)
Sichardt (1930)	$R = 3000s\sqrt{K}$	53	84
Kusakin (in Bear, 1979)	$R = 575s\sqrt{BK}$	36	58
Wrobel (1980)	$R = 1500s\sqrt{K} \log L$	81	128
Marinelli and Niccoli (2000)	$h = \sqrt{h_p^2 + \frac{W}{K} \left[r_0^2 \ln \left(\frac{R}{r_p} \right) - \frac{(R^2 - r_p^2)}{2} \right]}$	174	247

ATTACHMENT 4

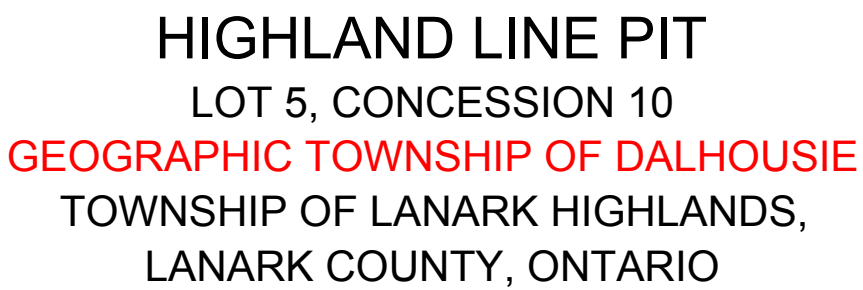
Revised Site Plan



AMENDMENTS	DATE	APPROVAL DATE

SITE PLANS APPROVED BY THE MINISTRY OF NATURAL RESOURCES AND FORESTRY.

SIGNATURE _____ DATE _____



APPLICANT:
THOMAS CAVANAGH CONSTRUCTION LIMITED
9094 CAVANAGH ROAD
ASHTON, ONTARIO
K0A 1B0

PIT LICENCE NO. 626599

NOTE(S)

1. LICENCED AREA, HIGHLAND LINE PIT **37.6** HECTARES.
2. AREA OF OPERATION, HIGHLAND LINE PIT **28.4** HECTARES.
3. THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR A CLASS A MINING PERMIT. THE DISTANCE FROM A PIT BELOW THE GROUND WATER TABLE IS 10 METERS.
4. THIS PLAN WAS PREPARED USING PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHS.
5. LOT, CONCESSION AND BOUNDARY LINES OF THIS PLAN ARE APPROXIMATE.
6. THIS IS NOT A FIELD SURVEY DRAWING IN CONFORMANCE WITH THE PROVISIONS OF THE SURVEY ACT. THIS DRAWING WAS PRODUCED USING STANDARD PHOTOGRAMMETRIC PRACTICES.

LEGEND

- | | |
|--------------------------------|---|
| | BOUNDARY OF AREA TO BE LICENCED |
| | 120-METRE SURROUND |
| | BOREHOLE / MONITORING WELL |
| | PRIVATE WELL (AS PER MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS WATER WELL INFORMATION SYSTEM) |
| CON 10, LOT 5
CON 10, LOT 4 | LOTS AND CONCESSION LINES |
| MAR-h | LAND ZONING BY-LAW |
| | ADJACENT PIT AND QUARRY BOUNDARY |
| | UTILITY POLE |
| | BUILDING: S-SILO, H-HOUSE, G-GARAGE, B-BARN, S-SHED,
O-OFFICE, SC-SCALE HOUSE |
| | ROAD: PAVED |
| | ROAD: GRAVEL |
| | CONTOURS/INDEX CONTOURS |
| | WOODED AREA |
| | WATERCOURSE |
| | WETLAND |
| x x | PAGE WIRE FENCE / GATE |
| | ENTRANCE |
| | EXIT |

REFERENCE(S)

1. KEY PLAN: Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P
corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia,
© OpenStreetMap contributors, and the GIS User Community.
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDBER ASSOCIATES LTD.
UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS
PRINTER 2016
3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM
ZONE 18, VERTICAL DATUM: CGVD28

EXISTING FEATURES - GENERAL NOTES (PAGE 1 OF 5)

NOTE: THE NUMBERS BELOW REFER TO AGGREGATE RESOURCES OF ONTARIO: SITE PLANNING STANDARDS (AUGUST 2020)

16 EXISTING ZONING

THE EXISTING ZONING OF LAND ON AND WITHIN 120 METRES OF THE SITE IS SHOWN ON THIS PLAN (PAGE 1 OF 5).

CLIENT
THOMAS CAVANAGH CONSTRUCTION LIMITED

PROJECT HIGHLAND LINE PIT

TITLE
EXISTING FEATURES - GENERAL

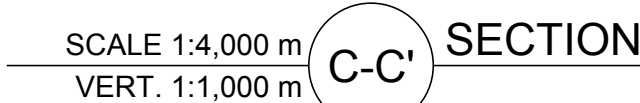
APPLICANT

**THOMAS
CAVANAGH
CONSTRUCTION LIMITED**

PROJECT NO.	CONTROL	REV.	DRAWING
19126620	0014	1	1 OF 5



PROFILE



*SHIELDING OF RECEPTORS REPRESENTING VACANT LOTS ONLY REQUIRED FOLLOWING DEVELOPMENT OF A NEW NOISE SENSITIVE DEVELOPMENT

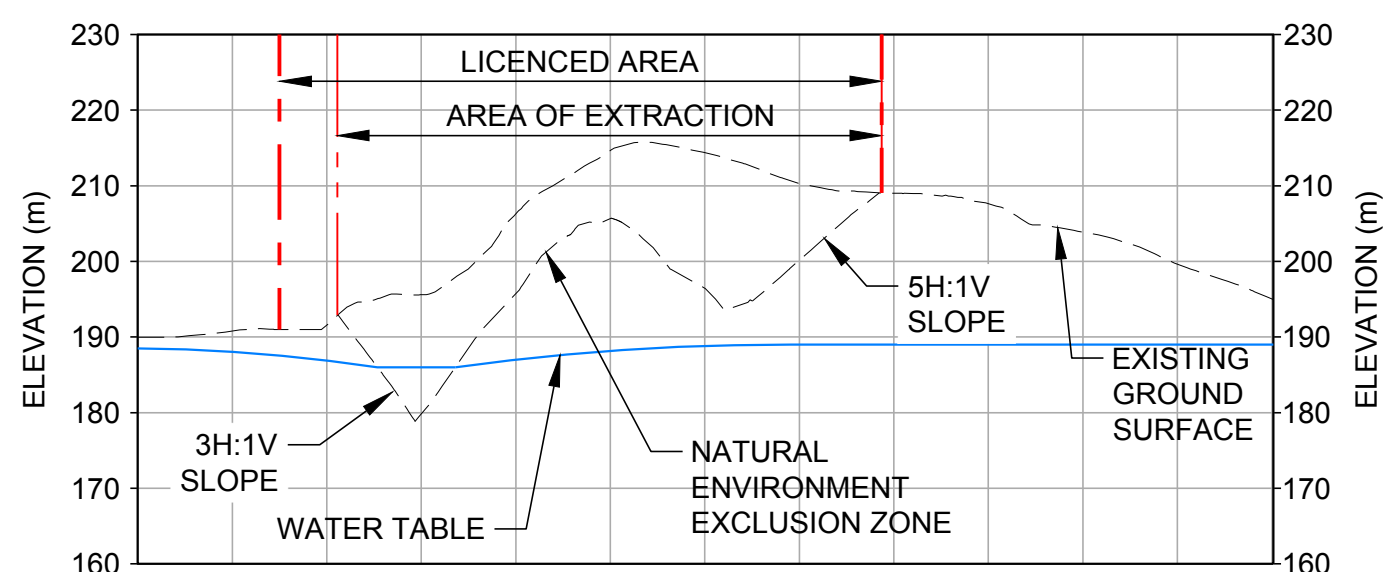
	_____	01-13-25
SIGNATURE OF APPLICANT/AUCSEENEE	_____	DATE
	_____	01-13-25
PREPARED UNDER THE DIRECTION OF: BRIAN HENDERSON	_____	DATE

TYPICAL BERM DETAIL
SCALE NTS





SCALE 1:4,000 m
VERT. 1:1,000 m

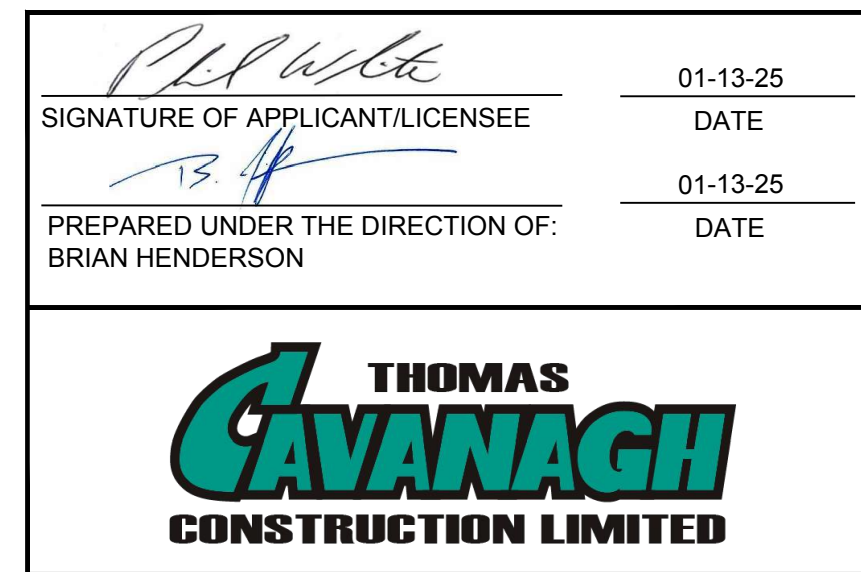
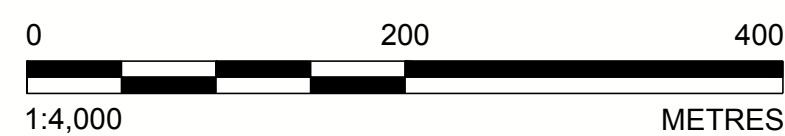


SCALE 1:4,000 m
VERT. 1:1,000 m

B-B' SECTION



A CROSS-SECTION OF A TYPICAL BERM DESIGN IS SHOWN ADJACENT TO THE REHABILITATION CROSS-SECTIONS (PAGE 5 OF 5).

[illegible]

1. KEY PLAN: Service Layer Credits: Sources: ESRI, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDBER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2016
3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

APPLICANT	YYYY-MM-DD	2025-01-13
	DESIGNED	BH
	PREPARED	JM
	REVIEWED	KAM
	APPROVED	KAM

PROJECT NO.	CONTROL	REV.	DRAWING
19126620	0014	1	5 OF 5

ATTACHMENT 2

**MNR Objection Form Response
(March 11, 2025)**

March 11, 2025

Thomas Cavanagh Construction Ltd.
9094 Cavanagh Road
Ashton, Ontario,
K0A 1B0

**Subject: *Aggregate Resources Act Application # 626599 – Objection Form Response*
 Thomas Cavanagh Construction Ltd. – Highland Line Pit
 Aggregate Licence for a Pit Below the Ground Water Table
 Lot 5, Concession 10, Geographic Township of Dalhousie
 *Township of Lanark Highlands, County of Lanark***

Dear Phil White,

The Ministry of Natural Resources (MNR), Aggregates Section has received Thomas Cavanagh Construction Ltd.'s 20-day Objection Form (dated February 19, 2025) for the proposed Highland Line Pit under the *Aggregate Resources Act* (ARA). At the conclusion of the initial ARA notification and 60-day consultation period, the MNR provided official comments on the license application, as outlined in our June 23, 2023, letter.

MNR Aggregates Section has also received the project team's response (dated January 15, 2025) to our June 23, 2023, comments. The response is supported by the following documents:

- Response to MNR Review Comments (prepared by Cambium, January 10, 2025)
- Response to MNR Review Comments (prepared by WSP, January 13, 2025)

MNR staff appreciate the project team's attention to our comments on the license application. We have reviewed the January 15, 2025, response and several of our comments have been addressed. However, we continue to have outstanding concerns, as outlined in the following comments. The Ministry therefore objects to the licence application at this time.

Natural Environment

6. Partially resolved – MNR staff appreciate the updates to the site plan, regarding the delineation of wetland boundaries in the field by an OWES evaluator prior to operations. However, the NER appears to identify an additional wetland, where staff gauge SG2 is

located (Water Report, Section 3.2.1.1), that is not shown on the site plan. NER Figure 3 describes this wetland as a mixed mineral shallow marsh (MAS1), and this feature appears to be identified as general habitat for Blanding's Turtle on the site plan. It is recommended that this wetland boundary be included on the site plan so appropriate setbacks from the feature can be established in the field.

7. Please note that our review of this comment is deferred, until our outstanding hydrogeological comments (43, 44, 46 and 48) are addressed.
9. Please note that this comment is resolved, pending verification that any recommendations from DFO have been incorporated on the site plan, as required.

Site Plans

18. Partially resolved – To improve the clarity of the site plan, please include the area to be excavated in the setback in the legend on page 3 of 5.
24. Partially resolved – To support the progressive rehabilitation of the site, MNR staff support, in-principle, incorporating a 50% maximum disturbed area on the site plan. However, it is recommended for clarity that the revision to note 60 on the Rehabilitation Plan describe what the 'disturbed area' is intended to represent (e.g., processing and storage areas, stripped areas, extraction areas, and unrehabilitated side slopes etc.).

The second sentence in the revision to note 60 also indicates that progressive rehabilitation will be initiated once the 50% maximum disturbed area is reached. This would appear to contradict the first sentence in this note, which suggests that progressive rehabilitation will be ongoing when there is available space in each phase (e.g., in Extraction Area 1 and 2). To ensure clear direction is provided on the site plan, it is recommended that the second sentence in the revised note be removed.

Hydrogeology

43. Partially resolved – MNR staff appreciate the response to this comment. However, the response only addresses potential impacts to Barbers Lake, resulting from the anticipated water table rise, and does not evaluate potential impacts on the wetlands and coldwater watercourses adjacent to the proposed pit. Based on the results of the drawdown analysis (as requested in comment #44), please evaluate the potential impacts on the adjacent wetlands and watercourses within the calculated cone of drawdown. This evaluation may require that additional mitigation measures be considered to address any potential adverse impacts to these features.
44. Partially resolved - It is important to evaluate potential impacts on the adjacent wetlands and watercourses within the radius of influence of the anticipated groundwater drawdown. MNR staff appreciate that the response has evaluated the

maximum radius of influence based on a 1 m water table change (e.g., revised Figure 2). However, to assess the extent of potential impacts on these features, please provide an estimate of the cone of drawdown with a 0.1 m cutoff. This assessment is important, as even a slight groundwater decline could lead to potential impacts on these features (e.g., coldwater watercourses no longer receiving sufficient groundwater, potentially negatively impacting spawning and incubation areas).

We also recognize that the presence of shallow bedrock may impede the propagation of the cone of drawdown in certain parts of the site by acting as a no-flow boundary. However, the extent of shallow bedrock in the study area requires further confirmation, as provincial scale mapping (e.g., OGS Surficial Geology) may not be accurate to evaluate site specific conditions. For example, Figure 2 (Attachment 2) shows that an existing pit, northwest of the site, is within a mapped bedrock area.

46. Partially resolved - To address this comment, please provide delineated catchment areas for the adjacent wetlands and watercourses. This mapping should be used to estimate the potential loss of surface water runoff to these features, by comparing water balances within each catchment area (pre- and post-extraction).

48. Partially resolved - To confirm the impact assessment for the adjacent wetlands and watercourses, including monitoring the performance of any mitigation measures (e.g., setbacks etc.), it is recommended that the groundwater and surface water monitoring program on the site plan be enhanced to include:

- Installing additional monitoring wells.
- Establishing additional surface water monitoring stations.
- Incorporating SG2 into the monitoring program.
- Increasing the frequency of water level readings.
- Establishing trigger thresholds at the monitoring locations and developing an adaptive management plan/response plan.

MNR Aggregates Section appreciates the project team's attention to these comments, and we would be pleased to continue working with Thomas Cavanagh Construction Ltd. to address our outstanding concerns with the license application. Please note that we may have additional comments to provide when a response to our comments has been provided for review.

To expediate our review of any follow up submissions, we would also appreciate if proposed changes to the technical reports and/or site plan are clearly highlighted.

If you have any questions, or require additional information, please contact Melanie Teitler, Aggregate Specialist, at melanie.teitler@ontario.ca.

Sincerely,

A handwritten signature in black ink, appearing to read 'Dave Marriott', with a stylized flourish at the end.

Dave Marriott
Aggregate Resources Planner
MNR Aggregates Section

ATTACHMENT 3

Empirical Formulae Analytical Results

Inflow to the Open Pit (1)
Based on Equations by Marinelli and Niccoli (2000)

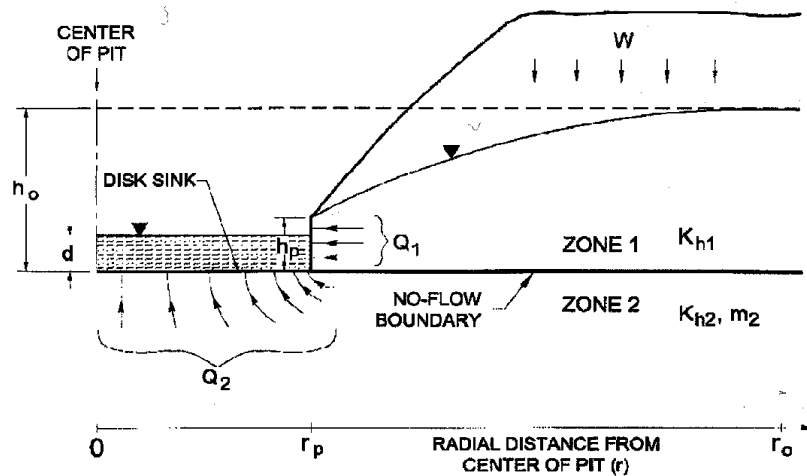


Figure 2. Pit inflow analytical model.

Marinelli, F., and W. L. Niccoli. 2000. Simple analytical equations for estimating ground water inflow to a mine pit. Ground Water 38, no. 2: 311-314.

$$(A) \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$(A1) \quad h = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r}{r_p} \right) - \frac{(r^2 - r_p^2)}{2} \right]}$$

$$(B) \quad Q_1 = W\pi(r_o^2 - r_p^2),$$

$$(C) \quad Q_2 = 4r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

$$(D) \quad m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

Input Parameters

W (m/s)	6.3E-09	recharge flux
Kh1 (m/s)	4.0E-05	horizontal hydraulic conductivity in Zone 1
Kh2 (m/s)	4.0E-05	horizontal hydraulic conductivity in Zone 2
Kv2 (m/s)	4.0E-06	vertical hydraulic conductivity in Zone 2
ho (m)	12.8	initial saturated thickness above the base of Zone 1
hp (m)	10.0	saturated thickness at the pit wall
rp (m)	300.1	effective pit radius
d (m)	10.0	depth of the pit lake

Inflow to the Open Pit (2) Based on Equations by Marinelli and Niccoli (2000)

Inflow from Zone 1

ro (m)	832.4	radius of influence calculated by iterating equation A
(known ho)	(ho calculated using eq. A)	
12.8	=	12.8
Q1 (m3/s)	1.2E-02	pit inflow from Zone 1 calculated using equation B
Q1 (m3/day)	1030.7	
Q1 (USgpm)	189.1	

Inflow from Zone 2

m2	3.16227766	anisotropy parameter calculated using equation D
Q2 (m3/s)	4.3E-02	pit inflow from Zone 2 calculated using equation C
Q2 (m3/day)	3673.8	
Q2 (USgpm)	674.1	

Total Pit Inflow

Q (m3/s)	5.4E-02
Q (m3/day)	4704.5
Q (USgpm)	863.2

One Metre Radius of Influence

r (m)	708.5	radius of influence calculated by iterating equation A1
(known h)	(h calculated using eq. A1)	
12.7	=	12.7

Pit Area

	Area (ha)	Area (m2)	R (m)	Radius of Influence (m)
Operations	38.1	381000	300	708.5
				408

Inflow to the Open Pit (1)
Based on Equations by Marinelli and Niccoli (2000)

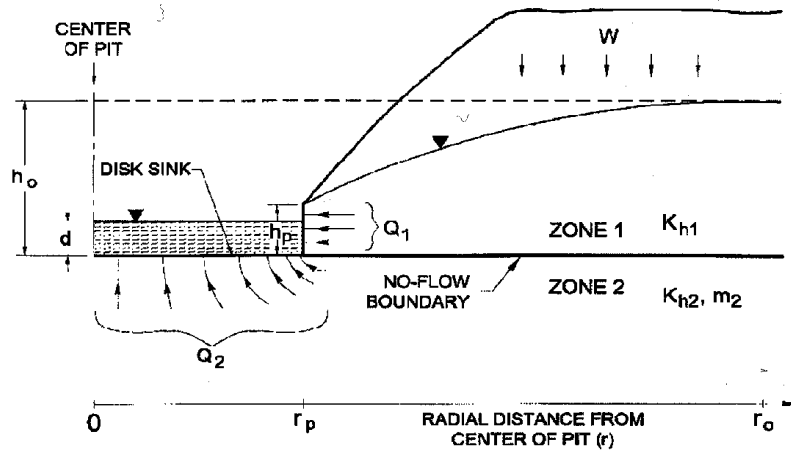


Figure 2. Pit inflow analytical model.

Marinelli, F., and W. L. Niccoli. 2000. Simple analytical equations for estimating ground water inflow to a mine pit. *Ground Water* 38, no. 2: 311-314.

$$(A) \quad h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r_o}{r_p} \right) - \frac{(r_o^2 - r_p^2)}{2} \right]}$$

$$(A1) \quad h = \sqrt{h_p^2 + \frac{W}{K_{h1}} \left[r_o^2 \ln \left(\frac{r}{r_p} \right) - \frac{(r^2 - r_p^2)}{2} \right]},$$

$$(B) \quad Q_1 = W\pi(r_o^2 - r_p^2),$$

$$(C) \quad Q_2 = 4r_p \left(\frac{K_{h2}}{m_2} \right) (h_o - d)$$

(D)

Input Parameters

W (m/s)	6.3E-09	recharge flux
Kh1 (m/s)	1.0E-04	horizontal hydraulic conductivity in Zone 1
Kh2 (m/s)	1.0E-04	horizontal hydraulic conductivity in Zone 2
Kv2 (m/s)	1.0E-05	vertical hydraulic conductivity in Zone 2
h _o (m)	12.8	initial saturated thickness above the base of Zone 1
h _p (m)	10.0	saturated thickness at the pit wall
r _p (m)	300.1	effective pit radius
d (m)	10.0	depth of the pit lake

Inflow to the Open Pit (2)
Based on Equations by Marinelli and Niccoli (2000)

Inflow from Zone 1

ro (m)	1100.6	radius of influence calculated by iterating equation A
(known ho)	(ho calculated using eq. A)	
12.8	=	12.8
Q1 (m3/s)	2.2E-02	pit inflow from Zone 1 calculated using equation B
Q1 (m3/day)	1917.4	
Q1 (USgpm)	351.8	

Inflow from Zone 2

m2	3.16227766	anisotropy parameter calculated using equation D
Q2 (m3/s)	1.1E-01	pit inflow from Zone 2 calculated using equation C
Q2 (m3/day)	9184.2	
Q2 (USgpm)	1685.2	

Total Pit Inflow

Q (m3/s)	1.3E-01
Q (m3/day)	11101.6
Q (USgpm)	2037.0

One Metre Radius of Influence

r (m)	905.4	radius of influence calculated by iterating equation A1
(known h)	(h calculated using eq. A1)	
12.7	=	12.7

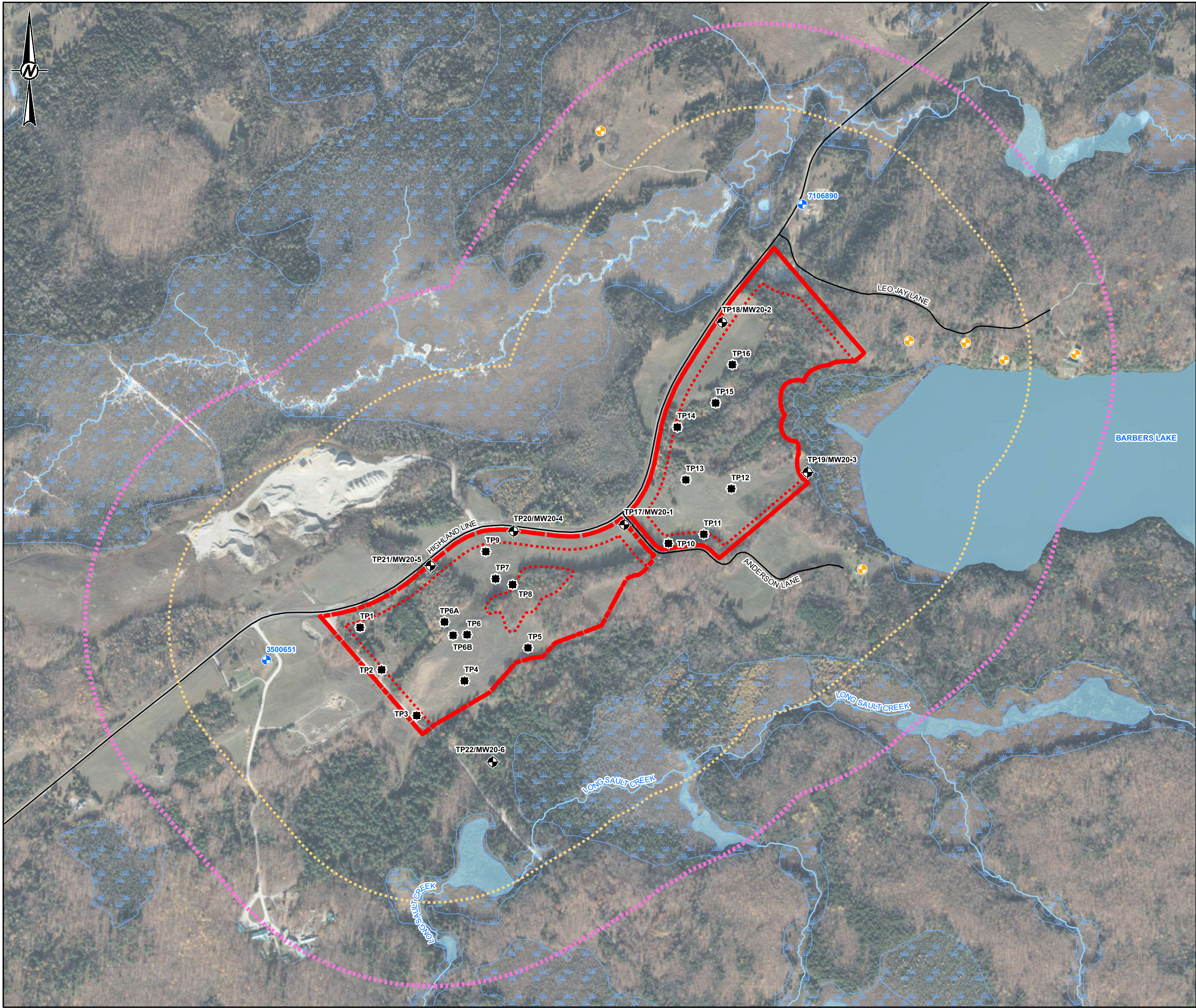
Pit Area

	Area (ha)	Area (m2)	R (m)	Radius of Influence (m)	
Operations	38.1	381000	300	905.4	605

ATTACHMENT 4

Figures

Path: S:\Clients\Thomas_Cavanagh_Construction\Durcan_P\109_PROJ\19126620_Cavanagh_ABA\0025_MNRF_Responses\19126620-0025-CH-0002.mxd



KEY MAP



SCALE 1:350,000

LEGEND

- TEST PIT/MONITORING WELL
- TEST PIT LOCATION
- MECP WWIS WATER WELL LOCATION
- ASSUMED WATER WELL
- LICENSED AREA
- LIMIT OF EXTRACTION
- ESTIMATED RADIUS OF INFLUENCE (INCREASE OR DECREASE) RELATED TO PIT DEVELOPMENT BASED ON THE HIGHEST HYDRAULIC CONDUCTIVITY AND MAXIMUM DRAWDOWN (0.1 METRE CONTOUR)
- ESTIMATED RADIUS OF INFLUENCE (INCREASE OR DECREASE) RELATED TO PIT DEVELOPMENT BASED ON THE GEOMETRIC AVERAGE HYDRAULIC CONDUCTIVITY AND MAXIMUM DRAWDOWN (0.1 METRE CONTOUR)
- ROADWAY
- WATERCOURSE
- WATERBODY
- WETLAND SIGNIFICANCE
- UNEVALUATED PROVINCIAL WETLAND



NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. IMAGERY CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

THOMAS CAVANAGH CONSTRUCTION LIMITED

PROJECT

HIGHLAND LINE PIT PROPERTY, PART OF LOTS 4 & 5,
CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY,
ONTARIO

TITLE

ESTIMATED DRAWDOWN

CONSULTANT



YYYY-MM-DD	9/26/2025
DESIGNED	BH
PREPARED	BR
REVIEWED	BH
APPROVED	KAM

PROJECT NO.
19126620

CONTROL
0025

REV.
0

FIGURE
1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 28mm

ATTACHMENT 5

Thermal Assessment of Barbers Lake and Long Sault Creek



TECHNICAL MEMORANDUM

DATE October 8, 2025

Project No. CA-GLD-19126620

TO Mr. Phil White, Quality Control
Thomas Cavanagh Construction Limited

CC Brian Henderson, Kris Marentette

FROM Warren Aken, M.Sc.

EMAIL warren.aken@wsp.com

THERMAL ASSESSMENT OF BARBERS LAKE AND LONG SAULT CREEK ASSOCIATED WITH THE PROPOSED HIGHLAND LINE PIT, TOWNSHIP OF LANARK HIGHLANDS, ONTARIO

The purpose of this technical memorandum is to present the results of the thermal assessment of Barbers lake and Long Sault Creek undertaken for the Thomas Cavanagh Construction Limited (Cavanagh) proposed Highland Line Pit property (refer to APPENDIX A) to assess the potential thermal impacts as they relate to local fisheries. The assessment was undertaken for the purpose of addressing concerns raised by the public and regulators related to the proposed aggregate pit development at the site, particularly regarding Brook Trout (*Salvelinus fontinalis*).

1.0 WATER FEATURES OF CONSIDERATION

Within the proposed licensed area, surface water features include a single small intermittent watercourse that drains toward Barbers Lake, as well as unevaluated wetlands. Barbers Lake, Long Sault Creek, and an unnamed northern wetland are situated outside the site boundaries but receive drainage from the site (see Water Report Level 1/2 for further details – WSP 2022). Barbers Lake discharges into Long Sault Creek, which is a tributary of the Mississippi River. Long Sault Creek consists of northern and southern branches that pass on either side of the site before converging downstream between Dalhousie 9th Concession A and Highway 12.

This assessment considers Barbers Lake as well as Long Sault Creek.

2.0 DATA GATHERING

2.1 Mississippi Valley Conservation Authority

Information related to water temperature monitoring in Long Sault Creek and Brook Trout catch data was obtained from the Mississippi Valley Conservation Authority (MVCA). Downstream of the Site, Long Sault Creek is known to be a cold to cool water system that supports a sensitive Brook Trout population. To track natural variation in the water temperature of Long Sault Creek, MVCA established long-term monitoring stations (MVCLS-15LS004 and MVCLS-15LS003) in 2015, with temperature logger data collected in 2015, and from 2017 to 2023 (Table 1, Figure 3, Figure 4, and Figure 9 in APPENDIX B).

MVCA field-based fish community assessments have confirmed Brook Trout presence downstream of the Site at Milton Road.

Table 1: MVCA long-term monitoring stations – water temperature

Site Code	Road Crossing	2015	2016	2017	2018	2019	2020	2021	2022	2023	Number of Data Records
MVCLS-15LS003	Concession Road 9A Dalhousie	yes	no	no	no	no	yes	no	yes	no	41,647
MVCLS-15LS004	Milton's Road	yes	no	yes	yes	yes	yes	yes	yes	yes	109,237

MVCLS-15LS003 is located at 381398.649mE, 4977258.563mN (18T)

MVCLS-15LS004 is located at 382026.222mE, 4979120.985mN (18T)

2.2 Ministry of Natural Resources (MNR)

The Ministry of Natural Resources (MNR) Land Information Ontario (LIO) Aquatic Resources Area (ARA) Map Layers were access online. The ARA Survey Points and Fish ON-Line databases shows records of Brook Trout in Long Sault Creek at Milton's Road as well as at McDonalds Corner Rd (MNR 2025a and MNR 2025b). Further to this, the mapping shows that a mix of coldwater, coolwater, and warmwater species, including Brook Stickleback (*Culaea inconstans*), Brown Bullhead (*Ameiurus nebulosus*), Burbot (*Lota lota*), Central Mudminnow (*Umbra limi*), Common Shiner (*Luxilus cornutus*), Creek Chub (*Semotilus atromaculatus*), Finescale Dace (*Chrosomus neogaeus*), Northern Pike (*Esox lucius*), Pumpkinseed (*Lepomis gibbosus*), Rock Bass (*Ambloplites rupestris*), White Sucker (*Catostomus commersonii*), and Yellow Perch (*Perca flavescens*) also occur in Long Sault Creek (MNR 2025a).

The LIO Fish Activity Area spatial database has a *Brook Trout Spawning Area* mapped on Long Sault Creek, beginning approximately 230 m upstream of Milton's Road to approximately 600 m downstream of McDonalds Corner Rd (MNR 2025a).

Barbers Lake is documented to contain a mix of coolwater and warmwater species, including Banded Killifish (*Fundulus diaphanus*), Blacknose Shiner (*Notropis heterolepis*), Bluntnose Minnow (*Pimephales notatus*), Brook Silverside (*Labidesthes sicculus*), Brown Bullhead, Central Mudminnow, Common Shiner, Mottled Sculpin (*Cottus bairdii*), Northern Pike, Pumpkinseed, Rock Bass, Spottail Shiner (*Hudsonius hudsonius*), Yellow Bullhead (*Ameiurus natalis*), White Sucker, and Yellow Perch (MNR 2025a; MNR 2025b). The LIO Fish Activity Area spatial database has a Northern Pike Spawning Area mapped at the outlet of Barbers Lake (MNR 2025a). No records of aquatic species at risk (SAR) or critical habitat is documented within the Long Sault Creek or Barbers Lake (DFO 2025).

The thermal regime of Long Sault Creek has been classified as coldwater (MNR, 2025a). The thermal regime of Barbers Lake has not been classified (classified as Unknown; MNR 2025a).

2.3 WSP

2.3.1 Temperature Logger Stations

As part of an ongoing surface water and groundwater monitoring program, WSP has established water temperature loggers at five locations in and around Barbers Lake and Long Sault Creek. A list of the monitoring stations, their approximate locations and their installation dates are provided in Table 2.

Table 2: Water Temperature Monitoring Locations

Station Name	Zone	Northing	Easting	Installation Date	Measurements ¹
SG-2	18	4977535	379561	October 16, 2020	Water Temperature (15 Minute Interval)
SG-3	18	4977184	379684	October 16, 2020	Water Temperature (15 Minute Interval)
SG-4	18	4976182	378980	April 18, 2025	Water Temperature (15 Minute Interval)
SG-5	18	4977921	379701	April 18, 2025	Water Temperature (15 Minute Interval)
SG-6	18	4977257	381400	April 28, 2025	Water Temperature (15 Minute Interval)

Notes:

(1) All measurements at each station are seasonal (no winter measurements).

2.3.2 Barbers Lake Water Temperature and Dissolved Oxygen Profiles

WSP undertook a field investigation in August 2025 to collect dissolved oxygen and water temperature profiles within the deep basin of Barbers Lake. Profiles were obtained using a calibrated AquaTroll 600. These data were used to determine the suitability of habitat for Brook Trout during the warmer summer months.

Barbers Lake was surveyed in July 1966 by the Department of Lands and Forestry, with mapping indicating a single basin with a maximum depth of 28 feet (8.5 meters) (Figure 1). In addition, the 2025 Garmin Canada, East & Great Lakes - Lakes, Rivers and Coastal Marine Charts were consulted for planning purposes.

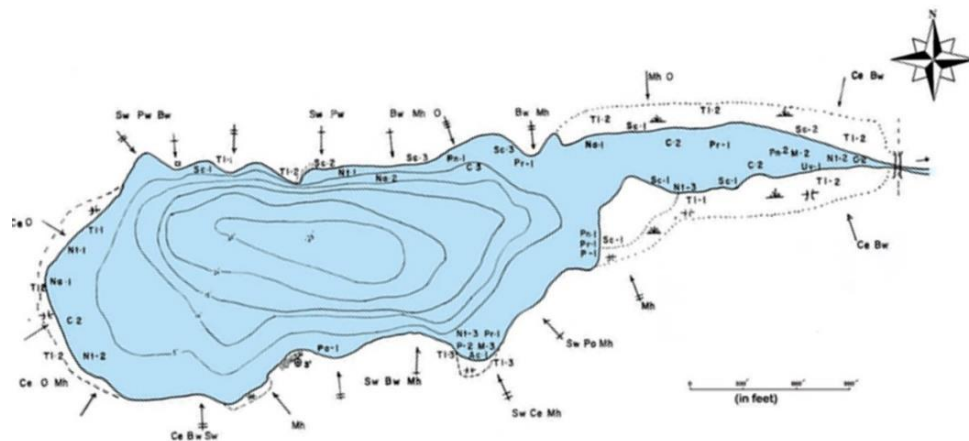


Figure 1: Barbers Lake Bathymetry - 1966 (www.lanarkcountytourism.ca)

3.0 BROOK TROUT

Brook Trout are recognized as a coldwater indicator species, favouring well-oxygenated habitats with clear, cool to cold water to complete their life cycle and reproduce. Spawning typically takes place in the fall (October), with egg development continuing from November through March of the following year. Hatching typically begins later in February with larvae emerging from the substrate in spring (April-May).

Hypolimnetic (deep water below the thermocline) oxygen concentrations are a key element of habitat quality for many coldwater species, including Brook Trout. Therefore, within lakes, Brook Trout habitat volumes are at their minimum during late summer, immediately before the time when surface waters have cooled.

Cold groundwater from springs and upwelling is essential to maintain river temperatures that support Brook Trout during the summer (Briggs 2018). Additionally, a widely accepted hypothesis for the link between Brook Trout and groundwater is that the groundwater remains consistently between 4–6 °C during winter, helping to stabilize the thermal environment for developing eggs and protecting them from freezing (Kovach 2016).

3.1 Temperature Thresholds for Brook Trout

In order to assess the potential impacts of temperature on Brook Trout populations, one needs to consider the physiological tolerances for the various life stages (spawning, egg development and adult behaviour (i.e. growth)), assessing both the optimal and upper limits.

The optimal temperature for different life stages of Brook trout as reported by Hasnain *et al.* (2010) include optimal spawning temperature (**10.7°C**), optimal egg development temperature (**6.1°C**), and optimal adult / growth temperature (**14.2°C**).

The upper temperature thresholds are set based on a broad review of literature, taking a conservative approach. For this assessment, the following upper thresholds were defined: spawning (**16°C**), egg development (**11.7°C**) and adult / growth (**19°C**) (Hokanson et al. 2011; Finch and D'Amelio 2009; Scott & Crossman 1973).

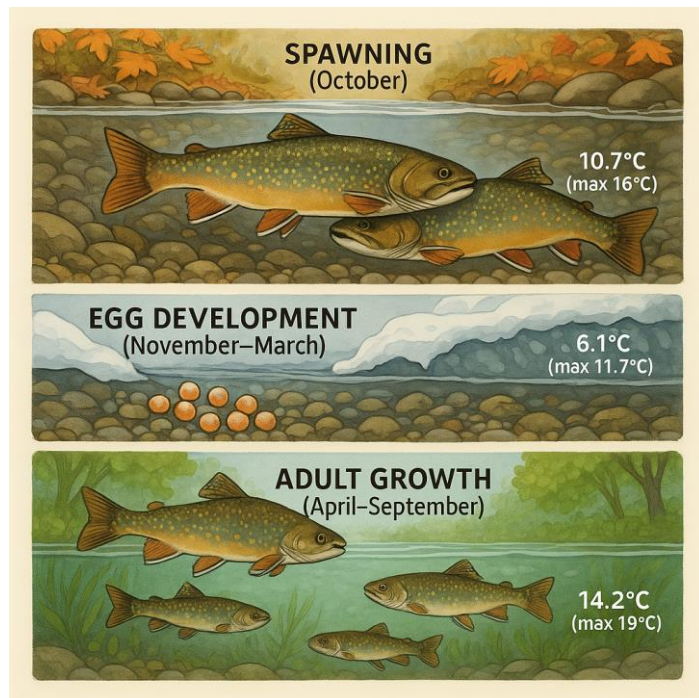


Figure 2: Optimal Water Temperatures for Brook Trout (*Salvelinus fontinalis*) at Various Life Stages Developed using Literature.

WSP generated image using AI.

4.0 THERMAL ASSESSMENT

4.1 Mississippi Valley Conservation Authority Temperature Data

Temperature thresholds were compared to the continuous water temperature data collected by MVCA at Concession Road 9A Dalhousie and Milton's Road from 2015-2023 (station MVCLS-15LS003 and MVCLS-15LS004; Table 1, Figure 9 in APPENDIX B). The minimum, 75th percentile, 95th percentile and maximum water temperature for each month was assessed against the optimal and upper temperature thresholds (Figure 3, Figure 4 and Table 3 and Table 4 in APPENDIX B). The 75th and 95th percentiles were used as they are less sensitive to outliers, making them a more stable indicator of elevated conditions.

Water temperature data collected from sites MVCLS-15LS003 and MVCLS-15LS004 indicate that thermal conditions frequently exceed the physiological tolerances of Brook Trout as detailed above in Figure 2. At both sites, the 75th percentile temperatures consistently surpassed the species' optimal range and often exceeded the upper thermal threshold, suggesting that Brook Trout are likely experiencing thermal stress in Long Sault Creek during warmer periods. Notably, the 95th percentile values, which reflect the highest temperature extremes, also frequently exceeded the upper threshold, particularly during summer months, indicating a lower likelihood of thermal refuge even under peak conditions. At the upstream site (MVCLS-15LS003), minimum daily temperatures frequently exceeded the optimal range, with some months surpassing the upper threshold entirely. In contrast, the downstream site (MVCLS-15LS004) exhibited generally cooler minimum temperatures, often remaining below the optimal range, potentially offering limited thermal relief. These findings highlight persistent and spatially variable thermal stress conditions that may impact Brook Trout distribution and survival within the monitored reaches, and are consistent with communications received from MVCA, in which they reported having caught Brook Trout downstream at site MVCLS-15LS004.

When considering October as a key spawning month for Brook Trout, temperature data show that both sites exceeded the optimal temperature range at the 75th and 95th percentiles, indicating that even during this critical life stage, thermal conditions may be suboptimal or stressful. Site MVCLS-15LS003, in particular, exhibited consistently warmer temperatures compared to MVCLS-15LS004. This is likely attributable to its location at the outlet of Barbers Lake, where lake outflows can elevate stream temperatures.

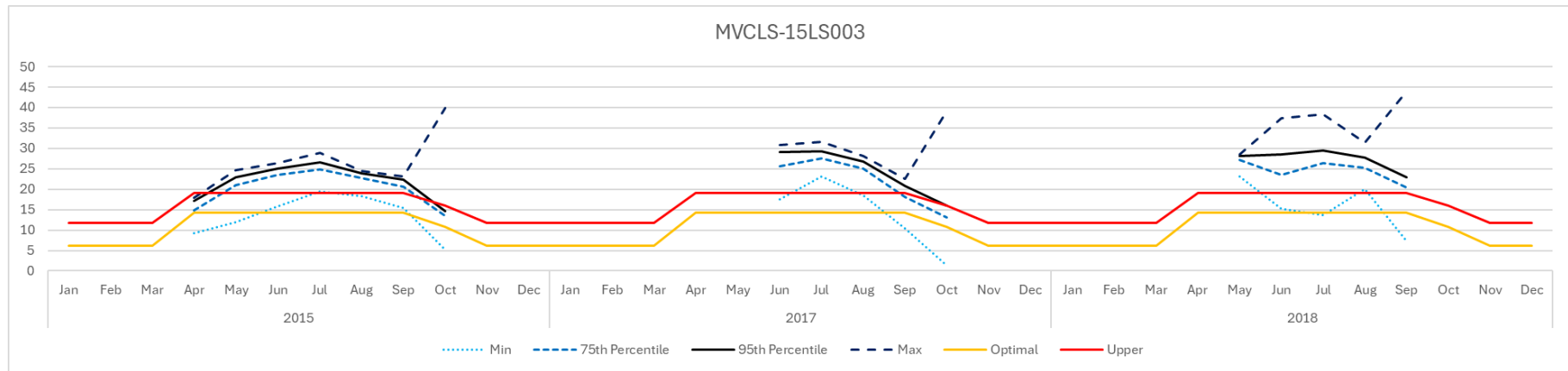


Figure 3: Water temperatures logger data (MVCLS-15LS003), plotted against Brook Trout thresholds

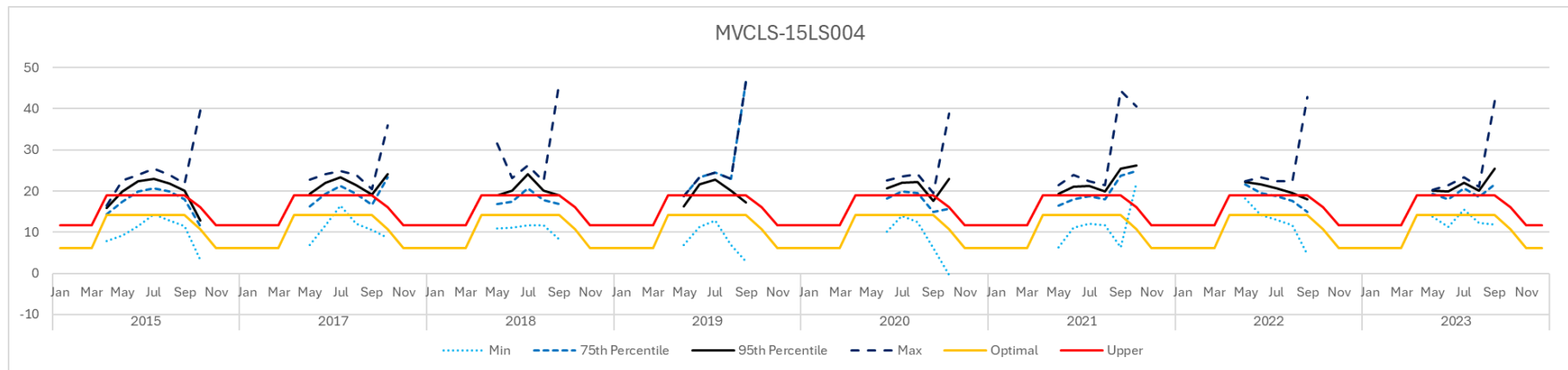


Figure 4: Water temperatures logger data (MVCLS-15LS004), plotted against Brook Trout thresholds

4.2 WSP Temperature Data

4.2.1 Surface Water and Groundwater Temperature Loggers

Water temperatures at SG-2 to SG-6 exhibited a typical seasonal pattern, gradually warming through the spring as air temperatures increased and consistently remained above 0°C (Figure 5 and Figure 6). This warming trend continued into late summer, after which daily air temperatures began to decline. For stations that were deployed throughout the winter months (SG-2 and SG-3), temperatures then dropped rapidly through the fall and remained below 1°C throughout the winter until the onset of the spring freshet.

The temperature data collected from five monitoring sites (SG-2 to SG-6) between July 2020, and September 2025 show seasonal fluctuations, with peaks during summer and lows in winter (Figure 5). These trends are compared against two critical thresholds for brook trout: a black line indicating the optimal temperature range for growth, feeding, and reproduction, and a red line representing the maximum temperature threshold beyond which survival is at risk (as detailed above in Figure 2). While temperatures at all sites generally remain below the maximum threshold, they frequently exceed the optimal range during warmer months, indicating periods of thermal stress. This thermal stress can have several ecological impacts on Brook Trout, including increased metabolic demands that may not be met by available food and oxygen, leading to energy deficits. Prolonged exposure to suboptimal temperatures can also impair growth and reproductive success, increase vulnerability to disease, and trigger behavioral changes such as seeking cooler refuges, which may reduce feeding and alter habitat use. Additionally, warmer water holds less dissolved oxygen, compounding physiological stress. Although lethal conditions are avoided, the recurring exceedance of optimal temperatures suggests chronic stress that could reduce long-term fitness and population resilience.

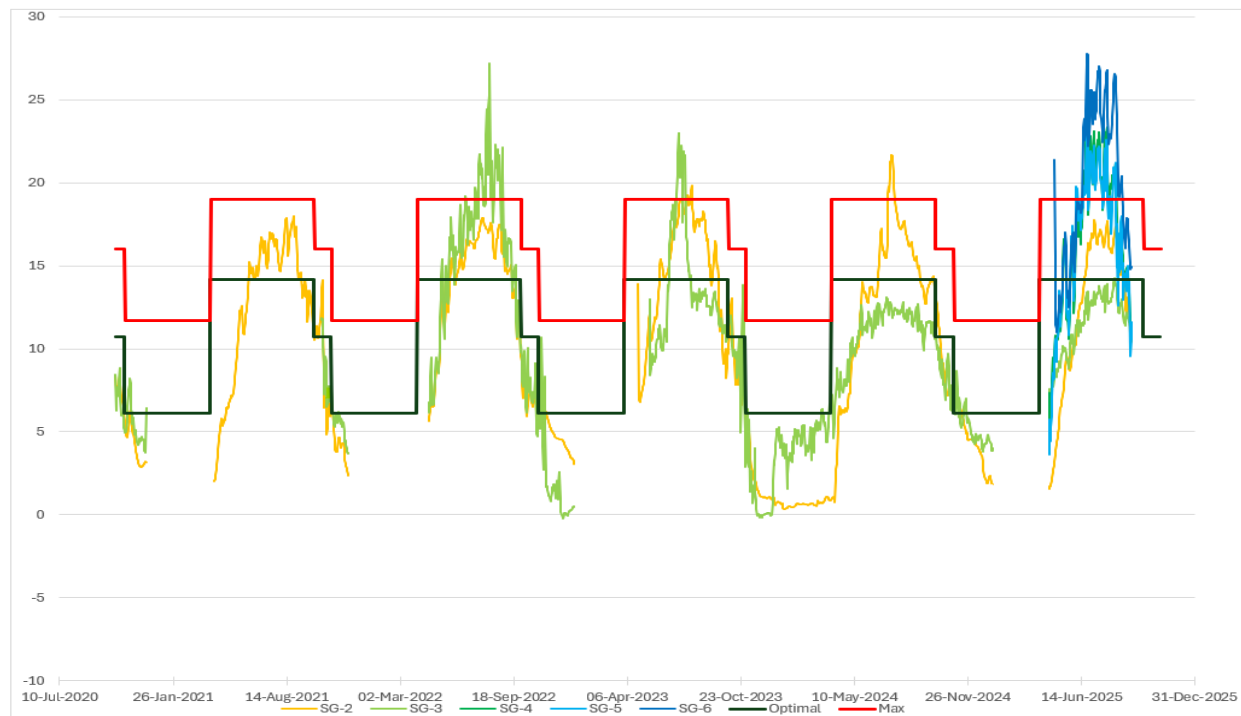


Figure 5: WSP Water Temperature Logger Data (2020 – 2025), plotted against Brook Trout thresholds

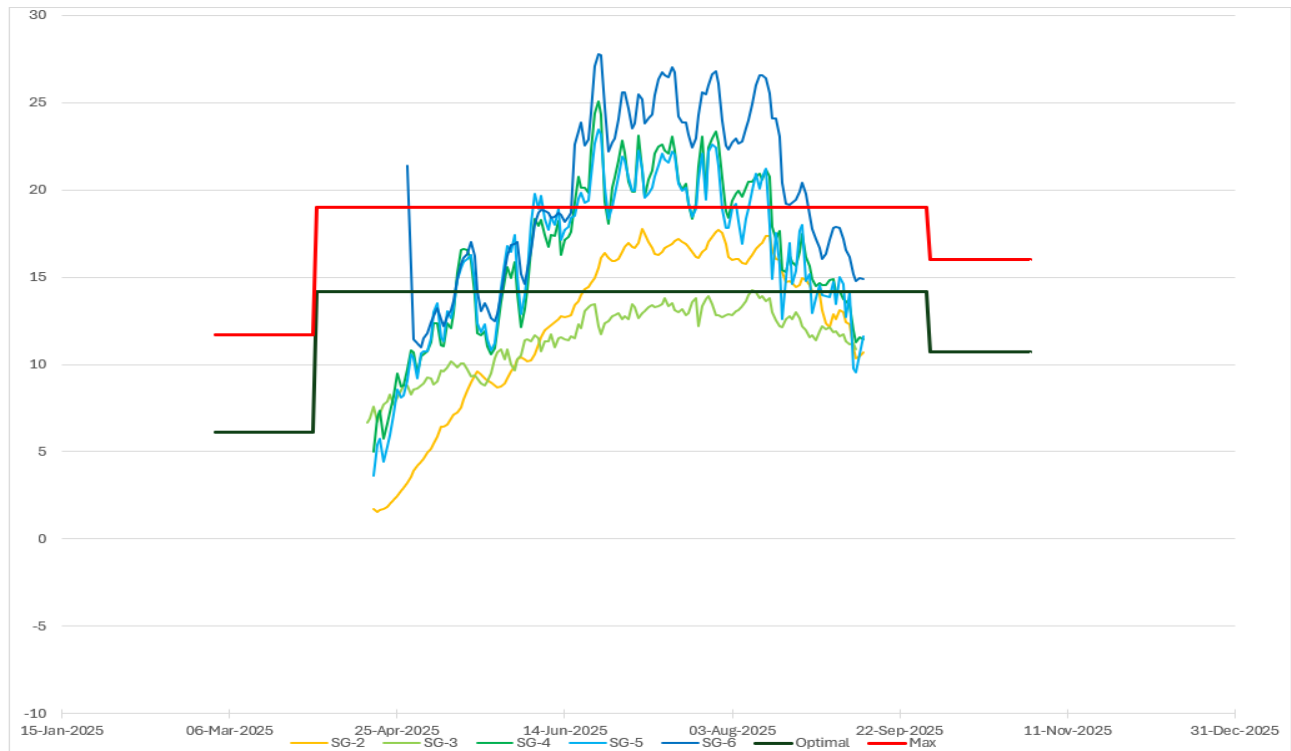


Figure 6: WSP Water Temperature Logger Data (2025), plotted against Brook Trout thresholds

4.2.2 Thermal Transport Simulation Modelling

Groundwater thermal impacts are not anticipated at either the north or south tributaries of Long Sault Creek because both are located above the estimated pit lake water level of 186 meters above sea level (masl). At this elevation, groundwater generally does not flow toward these surface water features, so thermal impacts from groundwater are unlikely. Where some sections of the north tributary appear to come close to 186 masl, based on the available mapping, these sections are roughly 500 meters away from the closest point of the proposed pit lake. This distance exceeds the range where thermal impacts are expected (Yang 1995; Markle and Schincariol 2007). Additionally, these sections are not hydraulically downgradient of the proposed pit lake, so they are unlikely to be affected by its thermal plume.

A thermal transport model was run to predict the groundwater temperature entering Barbers Lake, downgradient of the proposed highland Line Pit for both the existing conditions and the rehabilitated conditions (APPENDIX C). Under the current site conditions, the seasonal variation in groundwater temperature entering the lake is predicted to range from a minimum of about 7.7°C in the spring to a maximum of 8.6°C during the fall, with an annual average of 8.3°C (APPENDIX C). Under rehabilitated conditions, the seasonal variation in groundwater temperature entering the lake is predicted to range from a minimum of 8.1°C in the spring to a maximum of 9.7°C in the fall, with an annual average of 9.0°C (APPENDIX C).

4.2.3 Barbers Lake Thermal and Dissolved Oxygen Profile

Based on the two mapping sources described in 2.3.2, water temperature and dissolved oxygen profiles were taken at three locations in Barbers Lake to ensure the deepwater basin was sampled. Results of the profiles are presented below in Figure 7.

During the summer months, it is common for lakes to develop a thermocline—a distinct layer characterized by a rapid decrease in temperature with depth. This stratification results in warmer, less dense water near the surface and cooler, denser water at the bottom, with the thermocline acting as a barrier that inhibits vertical mixing between these layers. Photosynthetic activity, and thus oxygen production, is largely confined to the upper, sunlit zone where aquatic plants thrive. In contrast, the deeper zone receives no new oxygen input and experiences oxygen depletion as bacteria consume oxygen while decomposing organic matter. Consequently, the dissolved oxygen profile of the lake often mirrors the temperature profile, with well-oxygenated conditions above the thermocline and potentially severe oxygen deficits below it.

Vertical profiles of dissolved oxygen (DO) and water temperature were collected at measured intervals from the surface to the maximum depth of 9.2 meters (30 feet) in Barbers Lake. The profiles revealed a distinct stratification, with a strong thermocline evident from the temperature gradient. Dissolved oxygen concentrations were relatively high in the upper layers but decline sharply below 4.5 meters, where the lake becomes anoxic. This oxygen depletion in the lower portion of the water column corresponds with the temperature profile, indicating a strong density gradient that inhibits mixing between surface and bottom waters (Figure 7). The presence of anoxia below 4.5 meters suggests limited oxygen replenishment and active microbial decomposition of organic matter in the hypolimnion.

The August 18, 2025 profiles of Barbers Lake indicate that conditions are inhospitable for Brook Trout throughout the water column. From the surface down to approximately 4.5 meters, water temperatures reach around 24°C—well above the preferred thermal range for Brook Trout, which typically thrive in cooler waters below 14.2°C (max. 19°). Below 4.5 meters, although temperatures may be more suitable, the lake is entirely anoxic, lacking the dissolved oxygen necessary to support Brook Trout survival (> 5 mg·L). This combination of elevated surface temperatures and oxygen-depleted deeper waters during summer effectively eliminates any viable habitat for Brook Trout, which require both cool and well-oxygenated environments.

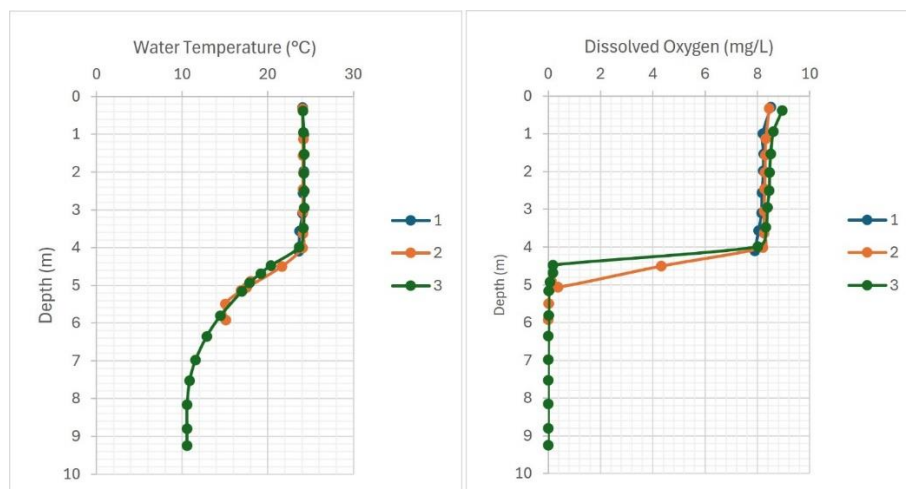


Figure 7: Water Temperature and Dissolved Oxygen Profile (18 August 2025)

5.0 CONCLUSION

The data presented above for the thermal assessment of Barbers Lake and Long Sault Creek indicate that the thermal conditions around the Site are not ideal for Brook Trout.

The water temperature recorded at MVCA and WSP data logger stations in Long Sault Creek show that the water temperature frequently exceeds the physiological tolerances of Brook Trout. At both MVCA sites, temperatures consistently surpassed the species' optimal range and often exceeded the upper thermal threshold, suggesting that Brook Trout are likely experiencing thermal stress in Long Sault Creek during warmer periods. Further, the highest temperature extremes also frequently exceeded the upper threshold, particularly during summer months, indicating a lower likelihood of thermal refuge even under peak conditions. At MVCA's upstream logger station (MVCLS-15LS003), minimum daily temperatures frequently exceeded the optimal range, with some months surpassing the upper threshold entirely. In contrast, at MVCA's downstream logger station (MVCLS-15LS004) was generally cooler (minimum temperatures), often remaining below the optimal range, potentially offering limited thermal relief.

The temperature and dissolved oxygen profiles collected in Barbers Lake show that there is no summer refugia habitat available for Brook Trout to escape thermal stress in Long Sault Creek. Barbers Lake had a surface temperature of 24°C which stayed consistent until a depth of 4.5 m, at which point water temperature began to quickly decrease with depth until it reached 10-11°C from 7 m deep to the maximum depth. While these temperatures at depth are suitable for Brook Trout growth and survival, the dissolved oxygen profile shows that the conditions become anoxic below 4.5 m deep. As such, the conditions in Barber Lake as sampled in August, indicate that during the warmer summer months, the lake would be inhospitable for Brook Trout.

Based on the results of the thermal transport model, during an average year, the presence of the pit lake would result in an increase in the temperature of the groundwater contribution to Barbers Lake in comparison to the current site conditions. On average, the magnitude of this increase ranges from 0.3°C in the Spring to 1.2°C in the Fall (see Table 2 in APPENDIX C). Given that the Highland Line property contributes only a small portion of the total groundwater discharge to Barbers Lake - approximately 10% to 15% of the lake's shoreline - and considering the larger volumes of water entering the lake from the unaffected southern tributary of Long Sault Creek and from precipitation and overland runoff, the overall thermal impact of the slightly warmer groundwater is expected to be negligible. Therefore, it is unlikely that these localized thermal changes, which are considered small, will have any measurable impact on fish species dependent on Barbers Lake or the downstream Long Sault Creek.

6.0 CLOSURE

We trust this information serves your purposes and any inquires, or clarifications are welcome.

WSP Canada Inc.



Andrew Rous, Ph.D.
Senior Fisheries Biologist



Warren Aken, M.Sc.
Principal Fisheries Biologist

AR/WA/ld

Distribution: Neal DeRuyter – MHBC Planning

Attachments: Appendix A – Site Maps
Appendix B – Summary of MVCA Temperature Data
Appendix C – Highland Line Pit Thermal Study

[https://wsponline.sharepoint.com/sites/gld-112126/project files/5 technical work/thermal impacts report/fisheries/19126620-rev0-highland line thermal assessment_sep2025.docx](https://wsponline.sharepoint.com/sites/gld-112126/project%20files/5%20technical%20work/thermal%20impacts%20report/fisheries/19126620-rev0-highland%20line%20thermal%20assessment_sep2025.docx)

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- Aquatic Resource Area Survey Point ([Aquatic Resource Area Survey Point | Ontario GeoHub](#))
- Fish Activity Area ([Fish activity area | Ontario GeoHub](#))
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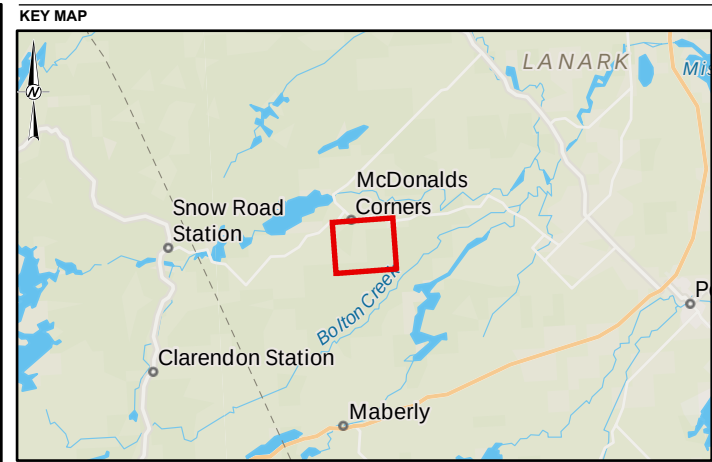
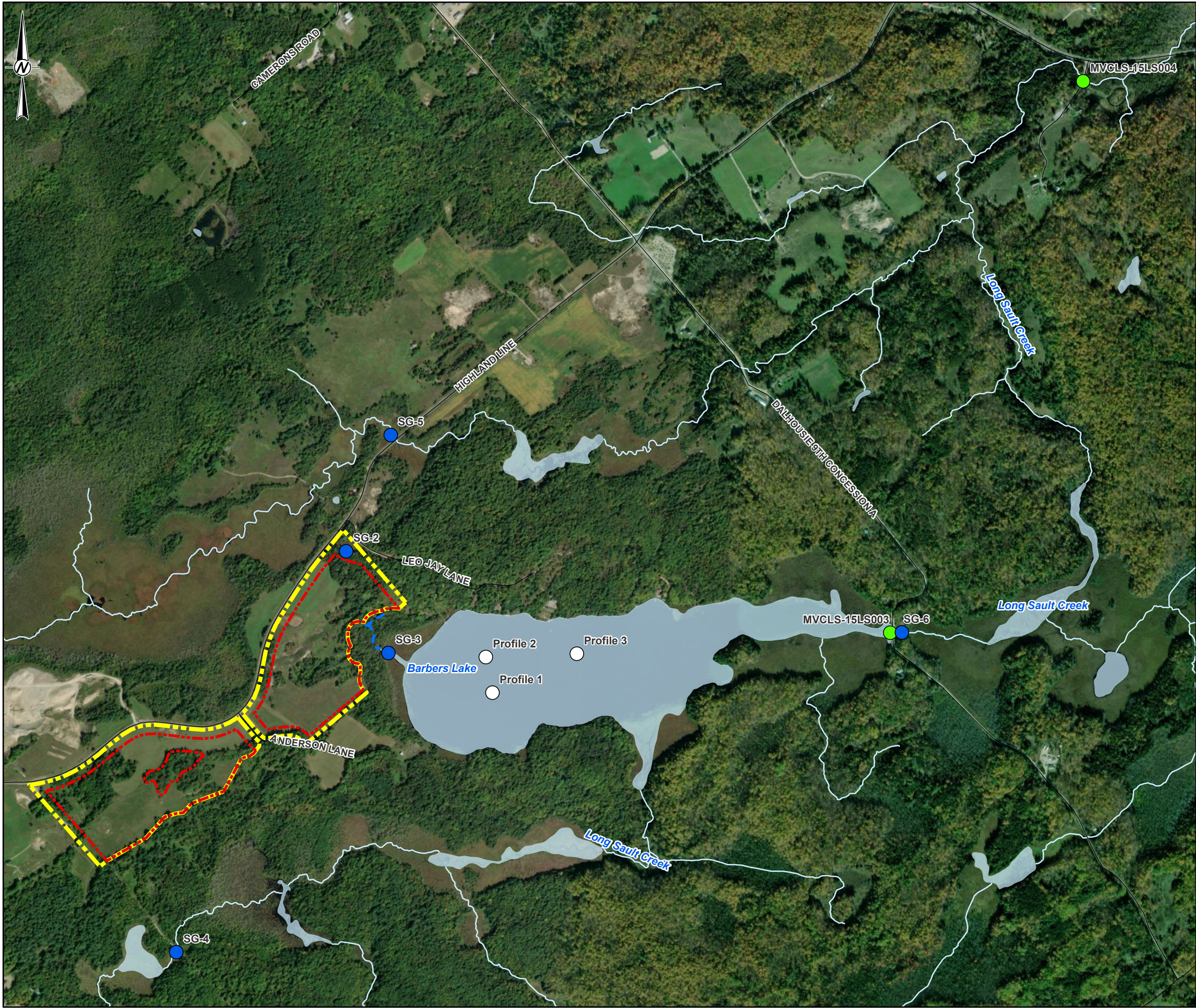
Summary of references used to determine Brook Trout Temperature Thresholds

Reference from:	Thresholds
Baldwin, N.S. 1951. A Preliminary Study of Brook Trout Food Consumption and Growth at Different Temperatures. Res. Council Ontario, 5th Tech. Session. 18 pp.	Optimum growth rate at 14°C
Bowlby, J.N., and J.G. Imhof. 1989. Alternatives in predicting trout biomass in streams. In J.A. Gore, and G. Petts (ed.) Alternatives in regulated river management. CRC Press, Inc. Chapter 13, pp. 317-330.	Brook Trout are not restricted to waters that remain solely below the optimal temperature of 20°C and are not restricted to streams with temperatures of 16°C and lower.
Finch, M. and S. D'Amelio, 2009. Trout Unlimited Canada Technical Report No. ON-058. 2009 Temperature Report for the Bronte Creek Watershed. 23 pp.	- Scientific literature suggests variable temperature range tolerances for Brook Trout, with the optimal range for activity, growth, and metabolism (all life stages) generally falling in the range of 10°C to 19°C, and a narrower preferred range identified as 15°C to 17°C for adult trout. - Brook Trout avoid areas where temperatures approach 24°C.
Hasnain, S.S., Minns, C.K. and B.J. Shuter. 2010. Key Ecological Temperature Metrics for Canadian Freshwater Fishes.	- Optimal Spawning (OS) = 10.7°C. - Optimum egg development temperature (OE) = 6.1°C. - Optimum growth temperature (OGT) = 14.2°C.
Hokanson, K.E.F., J.H. McCormick, B.R. Jones, and J.H. Tucker. 2011. Thermal Requirements for maturation, spawning, and embryo survival of the brook trout, <i>Salvelinus fontinalis</i> . Journal of the Fisheries Research Board of Canada. 30:975-984.	- Ovulation and spawning occur at 16°C or lower. - Egg viability decreases above 11.7°C. 19°C is critical as temperatures above this are considered suboptimum.
Jones, N. and B. Schmidt. 2019. Thermal habitat: Understanding stream temperature and thermal classifications. Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Science and Research Information Report IR-18. 13 p	Brook Trout can tolerate daily mean temperatures of 21°C for ~60 days, but only 3 days at 24°C.
McAfee, W.R. 1966. Eastern brook trout. Pages 242-260 in A. Calhoun, ed. Inland fisheries management. Calif. Dept. Fish Game.	Brook Trout do poorly in streams where water temperatures exceed 20°C for extended periods.
Raleigh, R. F. 1982. Habitat suitability index models: Brook Trout. U.S. Dept. Int., Fish Wildl. Serv. FWS/OBS-82/10.24. 42 pp.	- Brook Trout generally do poorly in streams where water temperature exceeds 20°C for extended periods of time. - Habitat Suitability Index (HSI) for Brook Trout assumes that the temperature range for Brook

Reference from:	Thresholds
	Trout is 0-24°C, with an optimal range for growth and survival of 11-16°C.
Stewart, E.M.C. <i>et al.</i> 2024. 'Differences in embryo survivorship among populations of brook trout (<i>Salvelinus fontinalis</i>) under variable winter thermal regimes', <i>Environmental Biology of Fishes</i> , 107(2), pp. 189–202. doi:10.1007/s10641-024-01524-3.	- Embryo mortality was found to be higher at an elevated temperature (9°C). - Other studies on brook trout incubation and survival similarly found that early life survivorship was related to temperature, with temperatures above 6°C (Hokanson et al. 1973) and 8 °C (Marten 1992) reducing survival.
Scott, W.B. and E.J. Crossman, 1973. Freshwater fishes of Canada. Bull. Fish. Res. Board Can. 184: xi+1-966.	- Upper lethal limit for developing eggs is about 11.7°C. - Seek temperatures below 20°C.
Stewart, E.M.C. <i>et al.</i> 2024. 'Local conditions drive interpopulation variation in field-based critical thermal maximum of brook trout', <i>Conservation Physiology</i> , 12(1), pp. 1–20. doi:10.1093/conphys/coae086.	- In Brook Trout, growth declines above 16°C and negative growth occurs above 23.4°C (Chadwick and McCormick, 2017), systematic cellular stress becomes pronounced around 22°C (Lund et al., 2003; Chadwick et al., 2015; Chadwick and McCormick, 2017; Mackey et al., 2021 In lakes, air and water temperatures above 20–22°C affect brook trout reproductive timing and success (Robinson et al., 2010; Warren et al., 2012), and they change their behavioural tactics when epilimnion temperatures reach 22.4°C (Goyer et al., 2014). - Brook trout populations decline or are absent when stream temperatures are above 20–24°C (Creaser, 1930; Barton et al., 1985; Meisner, 1990; Eaton et al., 1995; Martin and Petty, 2009; Petty et al., 2012; DeWeber and Wagner, 2015).

APPENDIX A

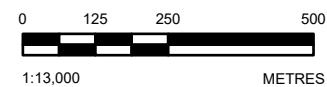
Site Maps



SCALE: 1:500,000

LEGEND

- MISSISSIPPI VALLEY CONSERVATION AUTHORITY LOGGER STATION
- WSP SURFACE WATER LOGGER STATIONS
- WSP TEMPERATURE AND DISSOLVED OXYGEN PROFILE LOCATIONS
- INTERMITTENT WATERCOURSE WSP 2022
- WATERCOURSE
- LICENSED BOUNDARY
- LIMIT OF EXTRACTION
- WATERBODY



NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. BASE MAP: SOURCES: ESRI, TOMTOM, GARMIN, FAO, NOAA, USGS, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY, MAXAR
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 18N

CLIENT

THOMAS CAVANAGH CONSTRUCTION LIMITED

PROJECT

HIGHLAND LINE PIT
LANARK HIGHLANDS, ONTARIO

TITLE

WATER TEMPERATURE MONITORING LOCATIONS

CONSULTANT



YYYY-MM-DD	2025-09-18
DESIGNED	----
PREPARED	HK
REVIEWED	----
APPROVED	----

PROJECT NO.
CA-GLD-19126620

CONTROL
0001

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FIGURE
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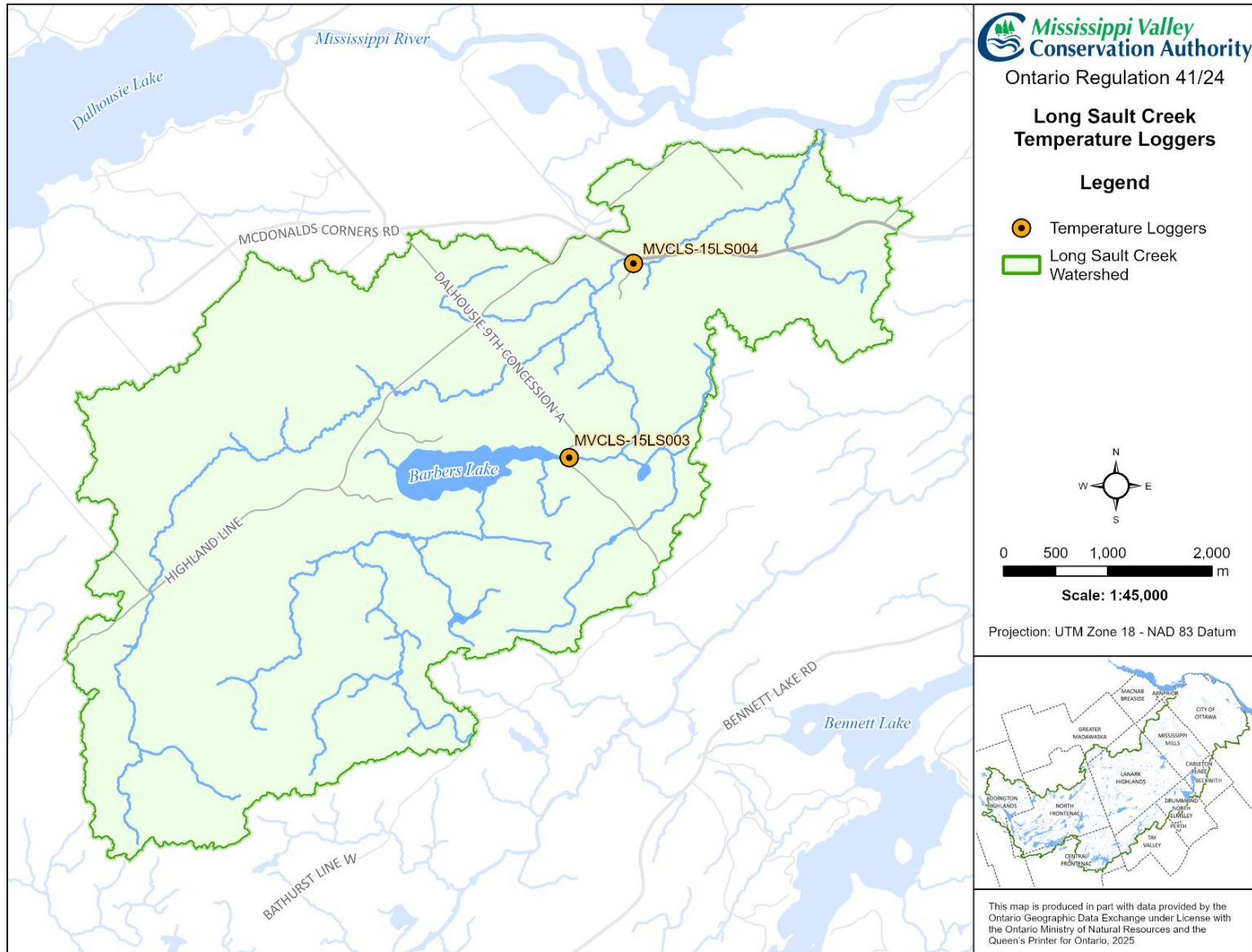


Figure 9: MVCA Long Sault Creek Temperature Logger Map

APPENDIX B

Summary of MVCA Temperature Data

Table 3: Monthly Temperature Thresholds for Brook Trout at Station MVCLS-15LS003

Month/Year	Life Stage*	Temperature Threshold (°C)	Optimal Temperature (°C)	Station MVCLS-15LS003 Temperature records (°C)			
				Min	75 th Percentile	95 th Percentile	Max
Apr (2015)	Growth	19	14.2	9.21	14.87	17.11	17.87
May	Growth	19	14.2	11.88	20.91	22.85	24.65
Jun	Growth	19	14.2	15.80	23.45	25.07	26.40
Jul	Growth	19	14.2	19.48	24.77	26.62	28.84
Aug	Growth	19	14.2	18.25	22.75	23.91	24.53
Sep	Growth	19	14.2	15.34	20.65	22.35	23.11
Oct	Spawning	16	10.7	5.28	13.45	14.73	39.80
Jun (2020)	Growth	19	14.2	17.57	25.61	29.05	30.86
Jul	Growth	19	14.2	23.20	27.47	29.25	31.57
Aug	Growth	19	14.2	18.43	25.13	26.88	28.16
Sep	Growth	19	14.2	10.36	18.05	20.90	22.62
Oct	Spawning	16	10.7	1.33	13.12	15.90	39.05
May (2022)	Growth	19	14.2	23.10	27.10	28.16	28.56
Jun	Growth	19	14.2	15.19	23.48	28.46	37.38
Jul	Growth	19	14.2	13.75	26.39	29.55	38.38
Aug	Growth	19	14.2	19.95	25.32	27.67	31.47
Sep	Growth	19	14.2	7.28	20.33	23.00	43.84

*Life stage with lowest temperature equipment used to assess

Orange highlighted cells indicate values above 'Optimal Temperatures'

Red text and highlighted cells indicate values above 'Upper Temperatures Thresholds'

Table 4: Monthly Temperature Thresholds for Brook Trout at Station MVCLS-15LS004

Month/Year	Life Stage*	Temperature Threshold (°C)	Optimal Temperature (°C)	Station MVCLS-15LS004 Temperature records (°C)			
				Min	75 th Percentile	95 th Percentile	Max
Apr (2015)	Growth	19	14.2	7.90	14.34	15.90	16.37
May	Growth	19	14.2	9.26	17.37	19.94	22.56

Month/Year	Life Stage*	Temperature Threshold (°C)	Optimal Temperature (°C)	Station MVCLS-15LS004 Temperature records (°C)			
				Min	75 th Percentile	95 th Percentile	Max
Jun	Growth	19	14.2	11.54	19.89	22.35	23.98
Jul	Growth	19	14.2	14.29	20.60	22.87	25.48
Aug	Growth	19	14.2	12.85	19.82	21.77	23.93
Sep	Growth	19	14.2	11.57	18.06	20.08	21.89
Oct	Spawning	16	10.7	3.30	11.54	12.82	39.66
May (2017)	Growth	19	14.2	6.98	16.24	19.38	22.72
Jun	Growth	19	14.2	11.63	19.38	22.05	24.06
Jul	Growth	19	14.2	16.43	21.28	23.39	24.84
Aug	Growth	19	14.2	12.01	19.28	21.38	23.97
Sep	Growth	19	14.2	10.46	16.71	19.09	20.52
Oct	Spawning	16	10.7	8.58	23.32	24.06	35.86
May (2018)	Growth	19	14.2	10.85	16.90	18.98	31.47
Jun	Growth	19	14.2	11.04	17.48	20.14	23.20
Jul	Growth	19	14.2	11.72	20.64	24.16	26.29
Aug	Growth	19	14.2	11.72	17.86	20.14	22.43
Sep	Growth	19	14.2	8.28	16.90	18.90	46.47
May (2019)	Growth	19	14.2	6.88	18.71	16.33	18.71
Jun	Growth	19	14.2	11.33	23.29	21.67	23.29
Jul	Growth	19	14.2	12.88	24.45	22.72	24.45
Aug	Growth	19	14.2	6.88	22.91	20.04	22.91
Sep	Growth	19	14.2	2.84	46.59	17.28	46.59
Jun (2020)	Growth	19	14.2	10.10	18.20	20.75	22.54
Jul	Growth	19	14.2	14.03	19.87	21.99	23.45
Aug	Growth	19	14.2	12.41	19.58	22.18	24.05
Sep	Growth	19	14.2	6.15	14.86	17.65	19.53
Oct	Spawning	16	10.7	-0.28	15.68	23.02	38.90

Month/Year	Life Stage*	Temperature Threshold (°C)	Optimal Temperature (°C)	Station MVCLS-15LS004 Temperature records (°C)			
				Min	75 th Percentile	95 th Percentile	Max
May (2021)	Growth	19	14.2	6.37	16.43	19.38	21.47
Jun	Growth	19	14.2	11.14	18.05	21.09	23.87
Jul	Growth	19	14.2	12.11	18.71	21.19	22.43
Aug	Growth	19	14.2	11.63	18.05	19.85	21.38
Sep	Growth	19	14.2	6.27	23.77	25.51	44.46
Oct	Spawning	16	10.7	22.05	24.84	26.20	40.53
May (2022)	Growth	19	14.2	18.24	21.69	22.26	22.33
Jun	Growth	19	14.2	14.23	19.57	21.57	23.39
Jul	Growth	19	14.2	12.98	18.71	20.71	22.43
Aug	Growth	19	14.2	11.63	17.57	19.57	22.33
Sep	Growth	19	14.2	4.52	15.00	18.02	42.88
May (2023)	Growth	19	14.2	13.75	19.31	20.14	20.23
Jun	Growth	19	14.2	11.24	18.05	19.95	21.38
Jul	Growth	19	14.2	15.57	20.71	22.05	23.29
Aug	Growth	19	14.2	12.30	18.62	20.04	21.00
Sep	Growth	19	14.2	11.92	21.66	25.51	41.93

*Life stage with lowest temperature equipment used to assess

Orange highlighted cells indicate values above 'Optimal Temperatures'

Red text and highlighted cells indicate values above 'Upper Temperatures Thresholds'

APPENDIX C

Highland Line Pit Thermal Impact Study



TECHNICAL MEMORANDUM

DATE September 29, 2025 19126620

TO Phil White, Quality Control, Thomas Cavanagh Construction Limited

CC Brian Henderson, Kris Marentette, WSP Canada Inc.

FROM Bradley Markham, M.Sc., P.Geo. (Limited) **EMAIL** brad.markham@wsp.com

HIGHLAND LINE PIT THERMAL IMPACT STUDY

Introduction

In response to comments from the Ministry of Natural Resources (MNR) and the Ministry of Environment, Conservation and Parks (MECP) on the licence application for Thomas Cavanagh Construction Limited (Cavanagh) proposed Highland Line Pit (Aggregate Resources Act Application #626599), WSP Canada Inc. is pleased to share this thermal modelling impact study of the proposed pit.

Background

The proposed pit is located on the south side of Highland Line, west of Leo Jay Lane in the Township of Lanark Highlands, Lanark County, Ontario (Figure 1). Extraction operations below the groundwater table will not involve active dewatering of the excavation and at the cessation of operations a permanent pit lake will form which will have an elevation of approximately 186 metres above sea level (asl).

The ground surface elevation within the site area ranges from approximately 184 to 216 metres asl and is highest along a ridge running east-west in the southern portion of the site.

Surface water features within the proposed licensed area include a single small intermittent watercourse that flows to Barbers Lake and unevaluated wetlands. The watercourse originates from two seepage areas and is located outside of the proposed limit of extraction. There are low-moist areas throughout some of the forests on the site, including a small pond in the mixed forest, which are associated with the lowest topography. Barbers Lake is not within the proposed license area, but it is immediately adjacent to it. Outside of the proposed licensed area, located to the north and south of the proposed pit (see Figure 1) are tributaries of Long Sault Creek, one of which (South Tributary of Long Sault Creek) discharges to Barbers Lake.

While not within the proposed license area these tributaries and Barbers Lake are located close enough to the proposed pit that the MNR has requested an assessment of the potential thermal impacts of the on-site pit lake under the rehabilitated site conditions.

Potential Thermal Receptors

Surface water temperatures generally vary more throughout the year than groundwater temperatures in shallow aquifers. Prior studies in Ontario have indicated that the thermal influence from below-water pits typically do not

migrate further than 120 to 250 metres downstream of the pit pond before their effect becomes negligible (Yang 1995, and Markle and Schincariol 2007).

Three surface water receptors near the proposed pit location were initially identified as having potential for being impacted by changes to groundwater temperatures imposed by the pit lakes under the rehabilitated site conditions, these are the tributaries of Long Sault Creek north and south of the proposed pit and Barbers Lake east of the proposed pit.

Tributaries of Long Sault Creek

The north and south tributaries of Long Sault Creek are shown on Figure 1. Based on available topographical mapping, both of these creeks are located at elevations above 186 metres asl which is the anticipated elevation of the pit lakes under rehabilitation conditions. Since the elevation of these features are higher than the proposed pit lake, the anticipated groundwater flow directions (and thermal gradient) will not be toward these features.

Some sections of the north tributary of Long Sault Creek do appear to come close to 186 metres asl, based on the available mapping, but these sections are 1) roughly 500 metres away from the closest point of the pit lakes and therefore beyond the distance in which thermal impacts may be anticipated, and 2) these portions of the north tributary are not hydraulically downgradient of the proposed pit lakes and would not be expected to be within the thermal plume of the pit lakes. Given these factors, thermal impacts are not anticipated at either the north or south tributaries of Long Sault Creek.

Barbers Lake

The proposed pit lakes will come to within roughly 140 metres of Barbers Lake under the rehabilitated site conditions (Figure 2) which is within the range where thermal impacts from the pit lakes may be expected. To evaluate the potential impact of the pit lakes on the thermal inputs to Barbers Lake, a 2D numerical thermal transport model was developed for the site and used to predict changes to the groundwater temperature discharging to Barbers Lake. The development and calibration of the model is described below.

2D Thermal Transport Model Development

To estimate the potential influence on groundwater temperature discharging to the nearby surface water receptor from the proposed future pit lake, a simplified two-dimensional (2D) numerical groundwater flow and heat transport model was set up using the modelling software package FEFLOW.

FEFLOW version 8 (Diersch, 2014), is a commercially available software package designed for simulating groundwater flow and contaminant and heat fate and transport. FEFLOW is widely used in industry and is accepted by regulatory agencies.

Model Inputs, Boundary Conditions and Calibration

The 2D numerical model was set up using simplifying assumptions with respect to the model inputs, hydrostratigraphy and domain boundaries. The following simplifying assumptions were used in the numerical model:

- Simulated hydrostratigraphic units at the site consist of an unconfined overburden unit which sits atop bedrock. The overburden is comprised primarily of sand and ranges from 12 metres to 25 metres thick,

Bedrock is assumed to extend to a depth of 100 metres below the overburden contact to the bottom of the model domain. Groundwater contribution below 100 metres depth is assumed to be negligible.

- Hydraulic and thermal properties (i.e., hydraulic conductivity, thermal conductivity, and heat capacity) of the respective units are assumed to be uniform across the model domain, and;
- Model domain boundaries are set to extend from the pit lake (on the upgradient side of the model domain boundary) to Barbers Lake which represents the down gradient model boundary.

The FEFLOW model domain, numerical mesh, and model boundaries for the existing site conditions are shown on Figure 3. On the upgradient side of the model domain, constant head nodes are assigned to allow the movement of groundwater from the upgradient recharge areas into the model domain. Elevations of these boundaries have been set so that the average observed groundwater level elevation of 182.7 metres asl is replicated at MW20-3 (location shown on Figure 2). Barbers lake is simulated on the downgradient side of the model domain by applying constant head nodes at 182 metres asl to the bottom of the lake footprint.

The model top is specified at the ground surface which is based on the provincially available Ontario Digital Terrain Model (MNR, 2025). The bottom elevation of Barbers Lake was taken from publicly available mapping. Top of bedrock was assigned at 170 metres asl, the model bottom is specified to be 100 metres below the top of bedrock to ensure there are no boundary influences on the thermal/flow solution.

Assumed input values for hydraulic conductivity for each of the stratigraphic units are as follows:

- Overburden: 3E-04 m/s (based on hydraulic testing from Golder 2022)
- Bedrock: 1E-06 m/s (literature value, i.e., Freeze and Cherry, 1979)

Hydraulic conductivity values are assumed to be isotropic (i.e., $k_h = k_v$)

Assumed input values for thermal properties for each of the stratigraphic units are based on literature values and are shown below in Table 1:

Table 1: Thermal Properties of Hydrostratigraphic Units

Unit	Heat Capacity of Solid (MJ/m ³ /K)	Thermal Conductivity of the Solid (J/m/s/K)	Thermal Porosity (-)	Comments
Topsoil ⁽¹⁾	1.65	1.65	0.6	Literature values (Andersland and Ladnyi, 2003)
Overburden ⁽²⁾	2.5	2.5	0.3	
Bedrock	2.5	2.5	0.05	

⁽¹⁾ Assumed 0.2m thick across model domain

⁽²⁾ Primarily Sand

The average daily air temperatures for the site, along with observed groundwater temperatures at MW20-3 (located along the model cross section) and MW20-6 are shown on Figure 4. Air temperature data were processed to monthly average values (Figure 5) and applied as thermal input boundaries to the ground surface (Figure 3). Note that the values shown on Figure 5 were truncated at -1 °C due to the insulating effect of the snowpack during the winter months.

Using the model inputs described above, the model was run assuming steady-state groundwater flow conditions and transient thermal conditions. Model computed temperatures at MW20-3, compared against the observed values are shown on Figure 6. This figure demonstrates good agreement between the simulated and observed values at MW20-3. As a model validation check, the simulation results were also compared against the observed values at MW20-6 (location shown on Figure 1), which is located off the model cross section and at a different depth than MW20-3. Model computed and observed groundwater temperature values at this location are also shown on Figure 6 and show good agreement with each other, thus demonstrating that the model is adequately calibrated.

Once calibrated, the model was used in predictive mode to simulate the potential thermal effects from the pit lake on Barbers Lake for the rehabilitated conditions. In order to simulate the rehabilitated conditions that model was modified to incorporate the pit lake.

Modifications to the model are shown on Figure 7 and consisted of:

- setting excavated portions of the pits to inactive.
- applying constant head nodes at 186 metres elevation along the pit lake bottom to simulate the flooded pit lake conditions, and;
- applying the assumed pit lake input temperatures shown on Figure 5 to the pit lake bottom as a thermal boundary condition.

Pit lake temperatures shown on Figure 5 were developed from experience at similar sites in Ontario which generally show a minimum temperature of about 5 °C for a pit lake of this depth and a maximum temperature similar to the maximum observed air temperature which is offset by about a month relative to the air temperature.

Predictive Simulation Results

Steady-State model predicted groundwater temperatures entering Barbers Lake for both the existing conditions and the rehabilitated conditions are shown on Figure 8.

Under the current site conditions, the seasonal variation in groundwater temperature entering the lake is predicted to range from a minimum of about 7.7 °C in the spring to a maximum of 8.6 °C during the fall. The average annual groundwater temperature predicted to enter the lake for the current conditions is 8.3 °C.

Under the rehabilitation conditions, the seasonal variation in groundwater temperature entering the lake is predicted to range from a minimum of 8.1 °C in the spring to a maximum of 9.7 °C in the fall. The timing of the maximum and minimum peaks appears to shift by about three weeks earlier in the year relative to the existing conditions. The average annual groundwater temperature predicted to enter the lake for the future pit lake conditions is 9.0 °C.

A summary of the seasonal average groundwater temperatures entering the lake under the existing and future pit lake conditions is shown in Table 2.

Table 2: Seasonal Average Model Predicted Groundwater Temperature Entering Barber Lake

Average Groundwater Temperature Entering Lake (°C)			
Season	Existing Conditions	Rehabilitated Conditions	Difference
Spring	8.0	8.3	+0.3
Summer	7.9	8.6	+0.7
Fall	8.4	9.6	+1.2
Winter	8.4	9.3	+0.9

References

Andersland, Orlando B., Ladanyi, Branko. Frozen Ground Engineering, 2nd Edition. Wiley. 2003. ISBN:978-0-471-61549-1.

Freeze RA, Cherry JA, Freeze RA. Groundwater. Prentice-Hall; 1979.

Golder Associates, 2022. Level 1 and Level 2 Water Report. Golder Report # 19126620 -Rev0

Markle, J. and Schincariol, R. (2007). Thermal plume transport from sand and gravel pits – Potential thermal impacts on cool water streams. Journal of Hydrology, 38: 174-195.

Ministry of Natural Resources (MNR). 2025. User Guide for Ontario Digital Terrain Model (Lidar-Derived) Land Information Ontario Dataset. Available online at [OntarioDTM_LidarDerived_DataPackageLinks.docx \(live.com\)](#)

WSP Canada Inc., Responses to Ministry of Natural Resources and Forestry review comments on proposed Highland Line Pit Technical Reports, Township of Lanark Highlands, Ontario (Aggregate Resources Application #626599). Project #19126620.

Yang, Zen-Fen. (1995). Application of the Heatflow model in a sand and gravel aquifer. M.Sc Thesis. Department of Earth Sciences, University of Waterloo, ON.

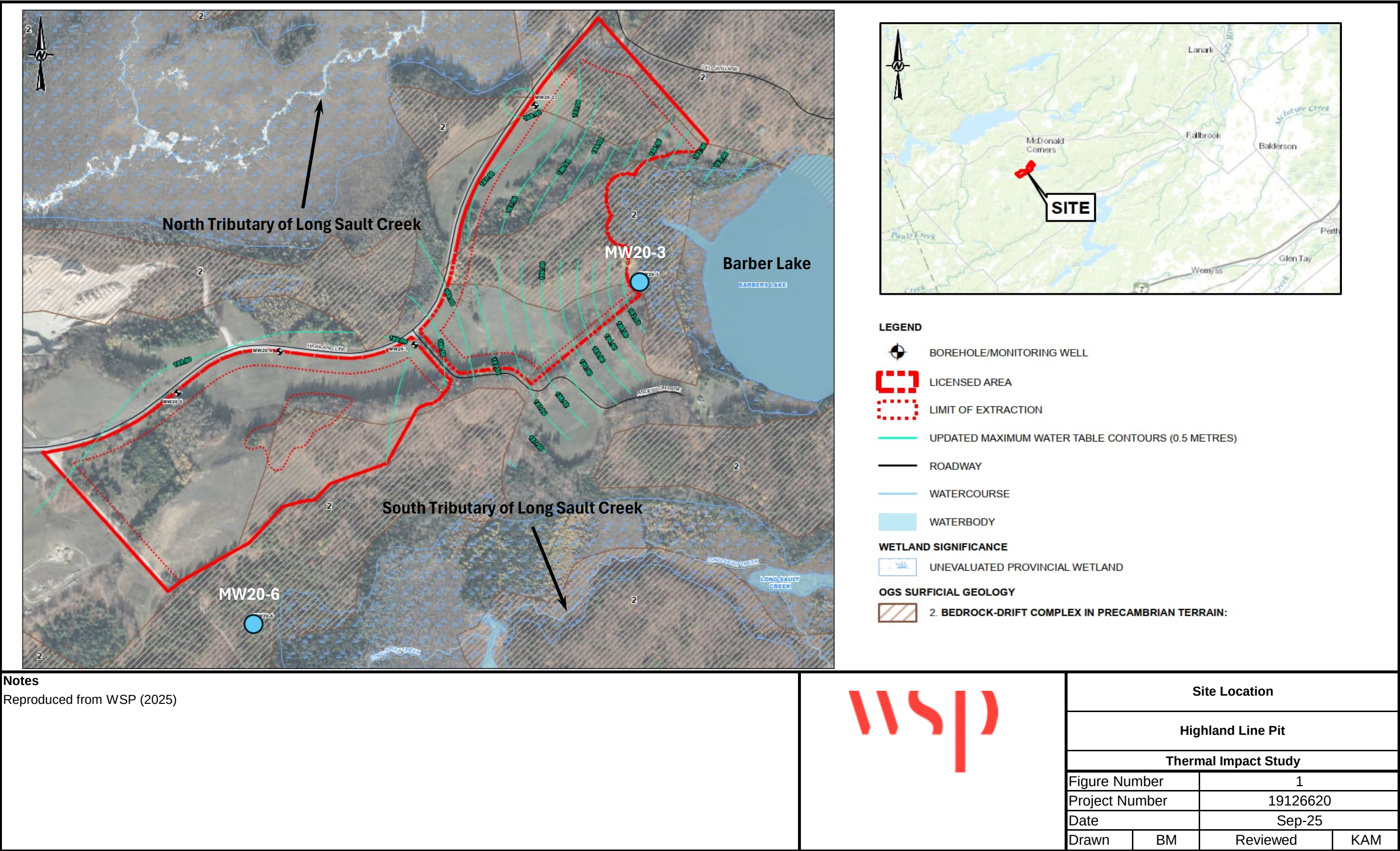
WSP Canada Inc.

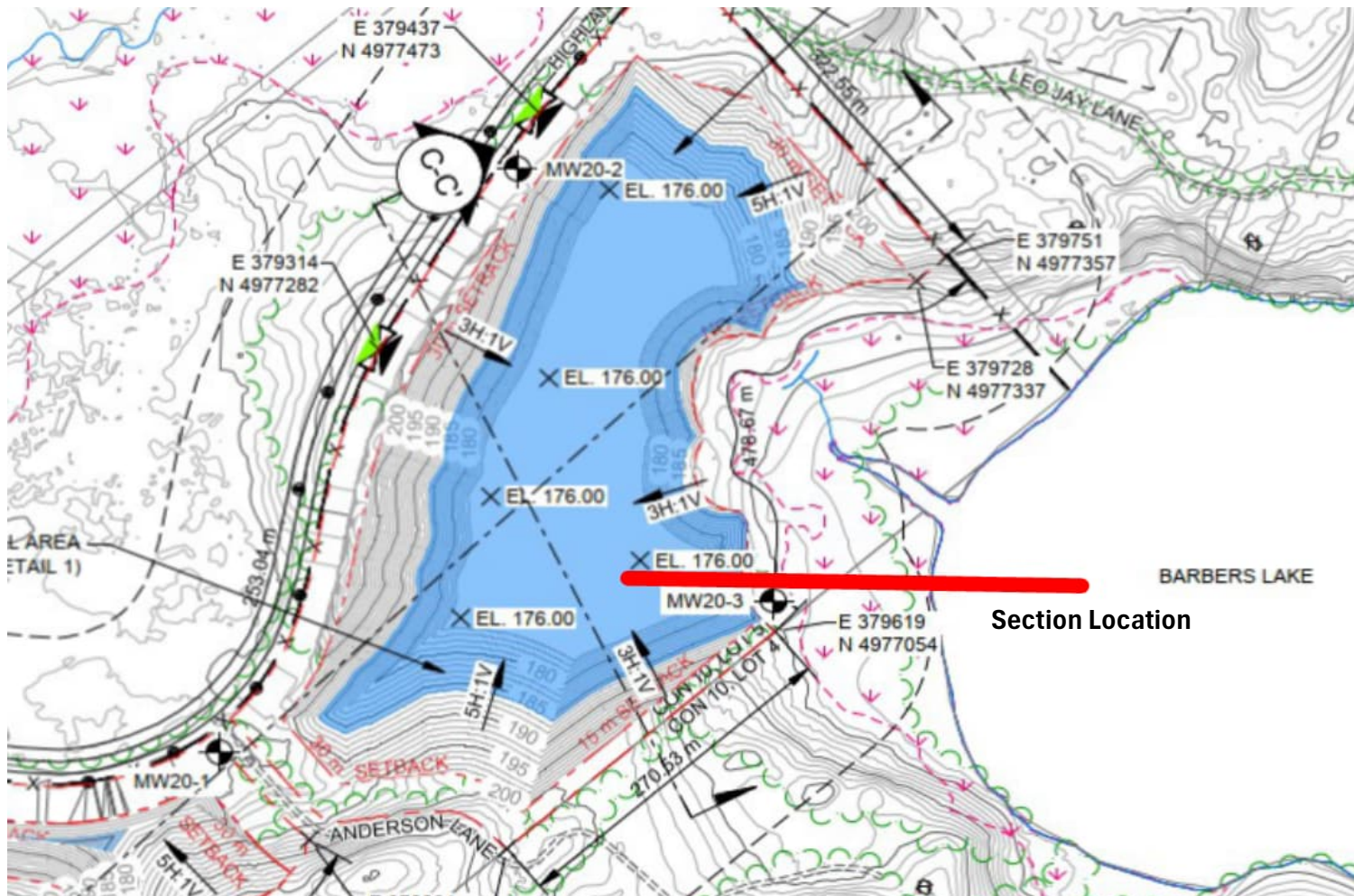
Brad Markham M.Sc., P.Geo. (Limited)
Principal Hydrogeologist



Kris Marentette. M.Sc., P.Geo.
Senior Principal Hydrogeologist

Attachments: Figure 1 – Site Location
Figure 2 – Proposed Pit Lake Detail
Figure 3 – Model Domain and Boundary Conditions – Existing Conditions
Figure 4 – Observed Temperature Data – 2020 to 2025
Figure 5 – Monthly Average Temperature Input Data
Figure 6 – Model Calibration and Verification Results
Figure 7 – Model Domain and Boundary Conditions – Rehabilitation Conditions
Figure 8 – Predictive Simulation Results





Section Location

Notes

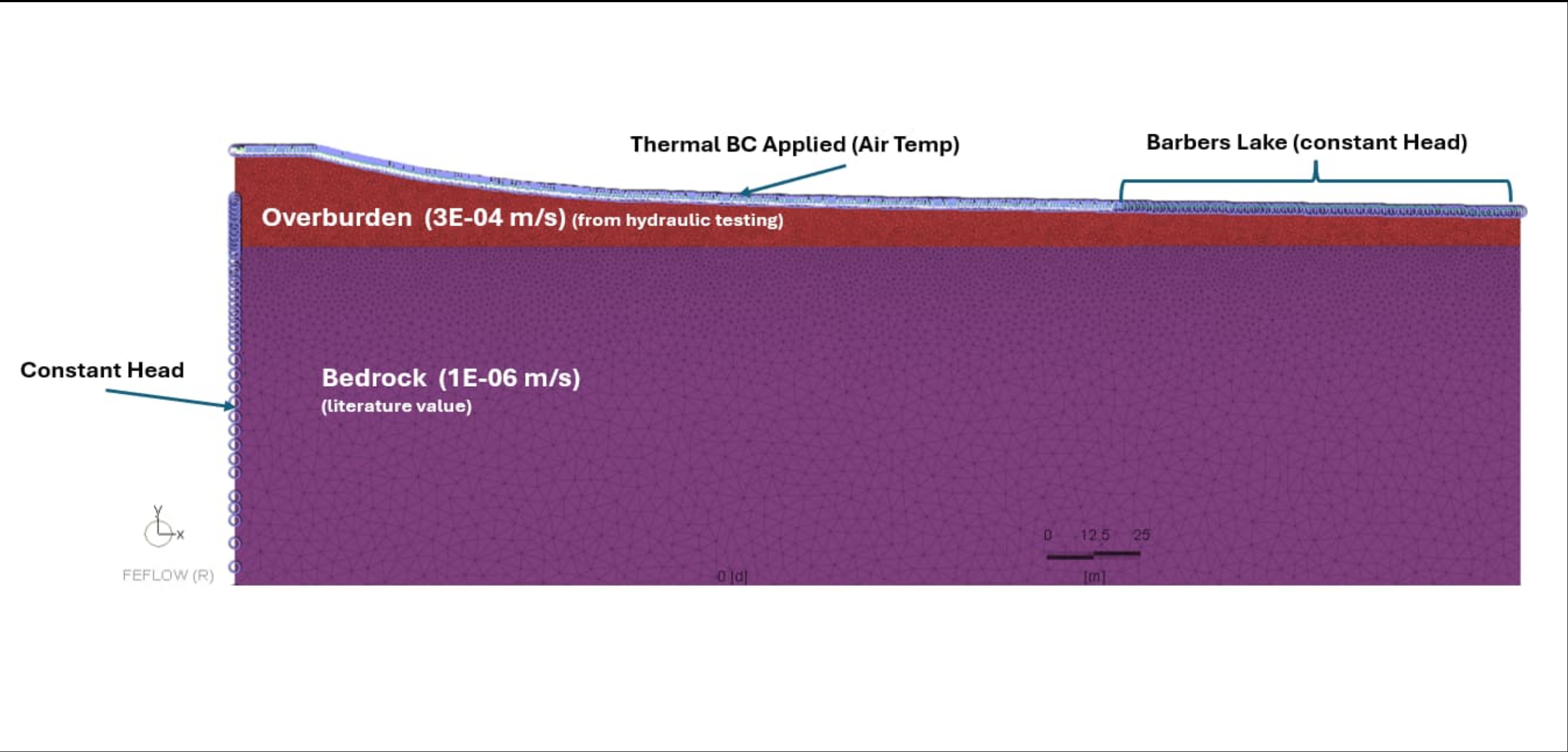


Proposed End Pit Lake Detail

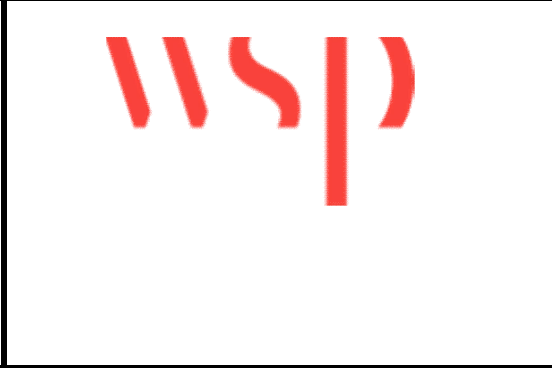
Highland Line Pit

Thermal Impact Study

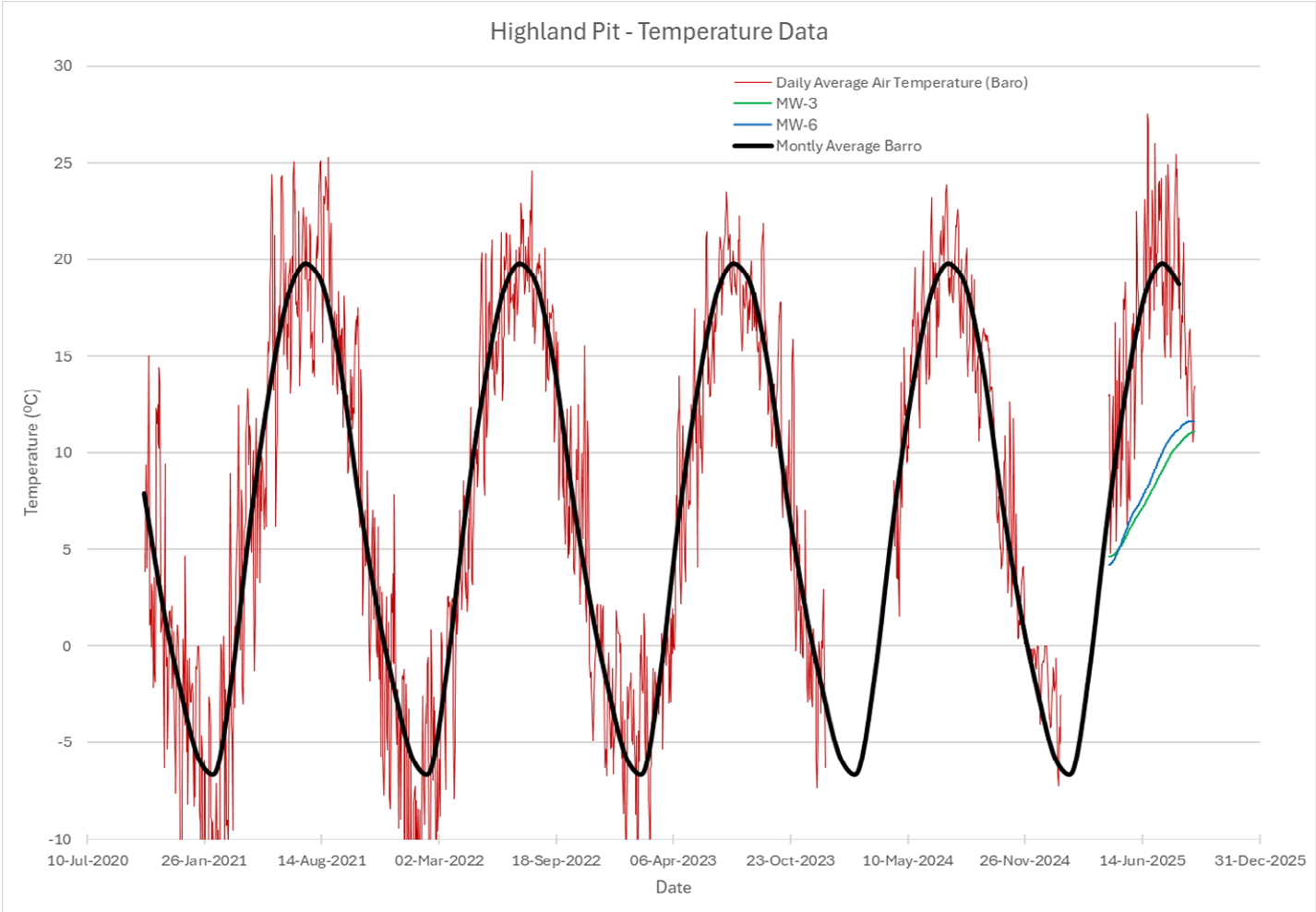
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Date		Sep-25	
Drawn	BM	Reviewed	KAM



Notes



Model Domain and Boundary Conditions Existing Conditions			
Highland Line Pit			
Thermal Impact Study			
Figure Number		3	
Project Number		19126620	
Date		Sep-25	
Drawn	BM	Reviewed	KAM



Notes

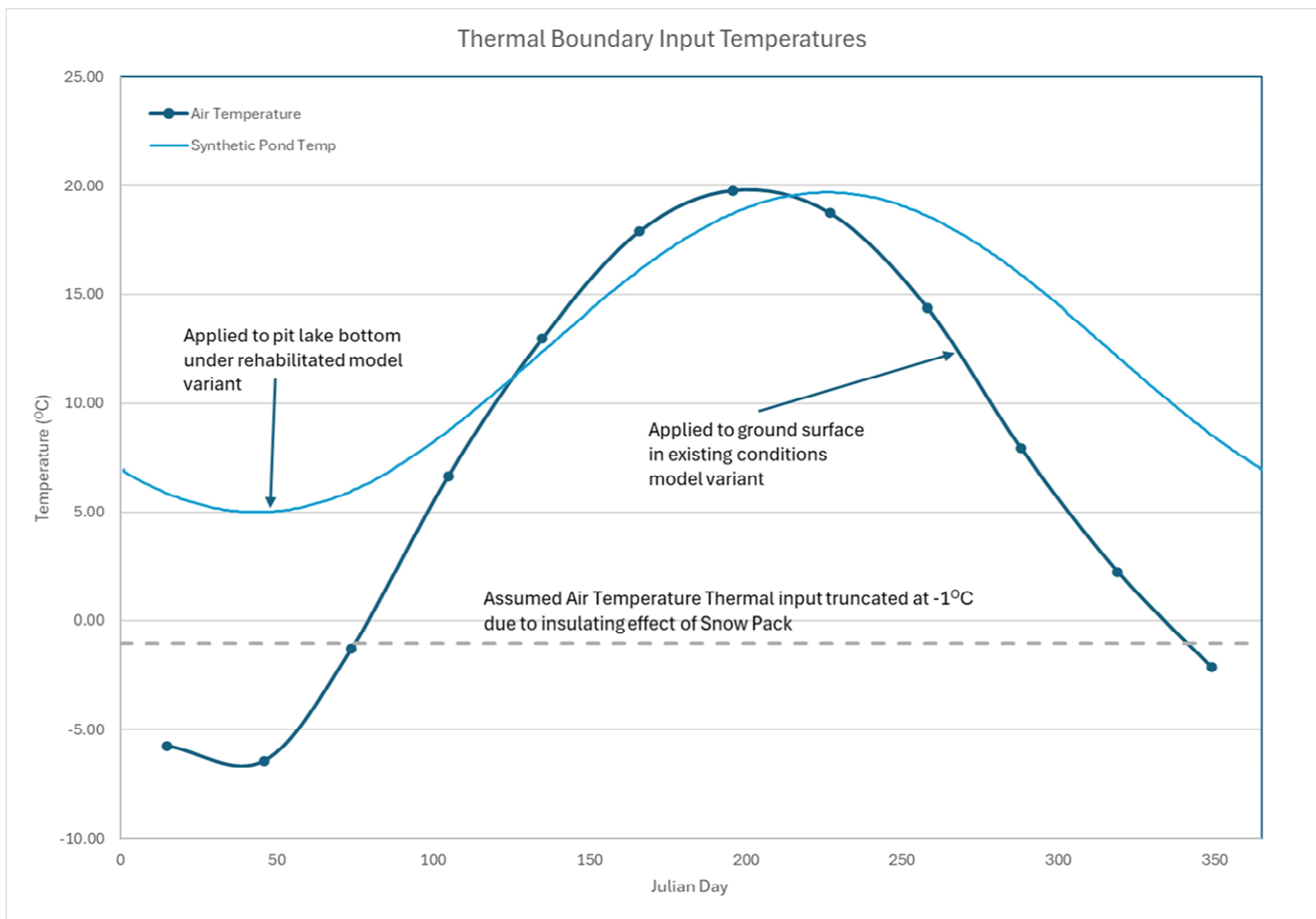


Observed Temperature Data
2020 to 2025

Highland Line Pit

Thermal Impact Study

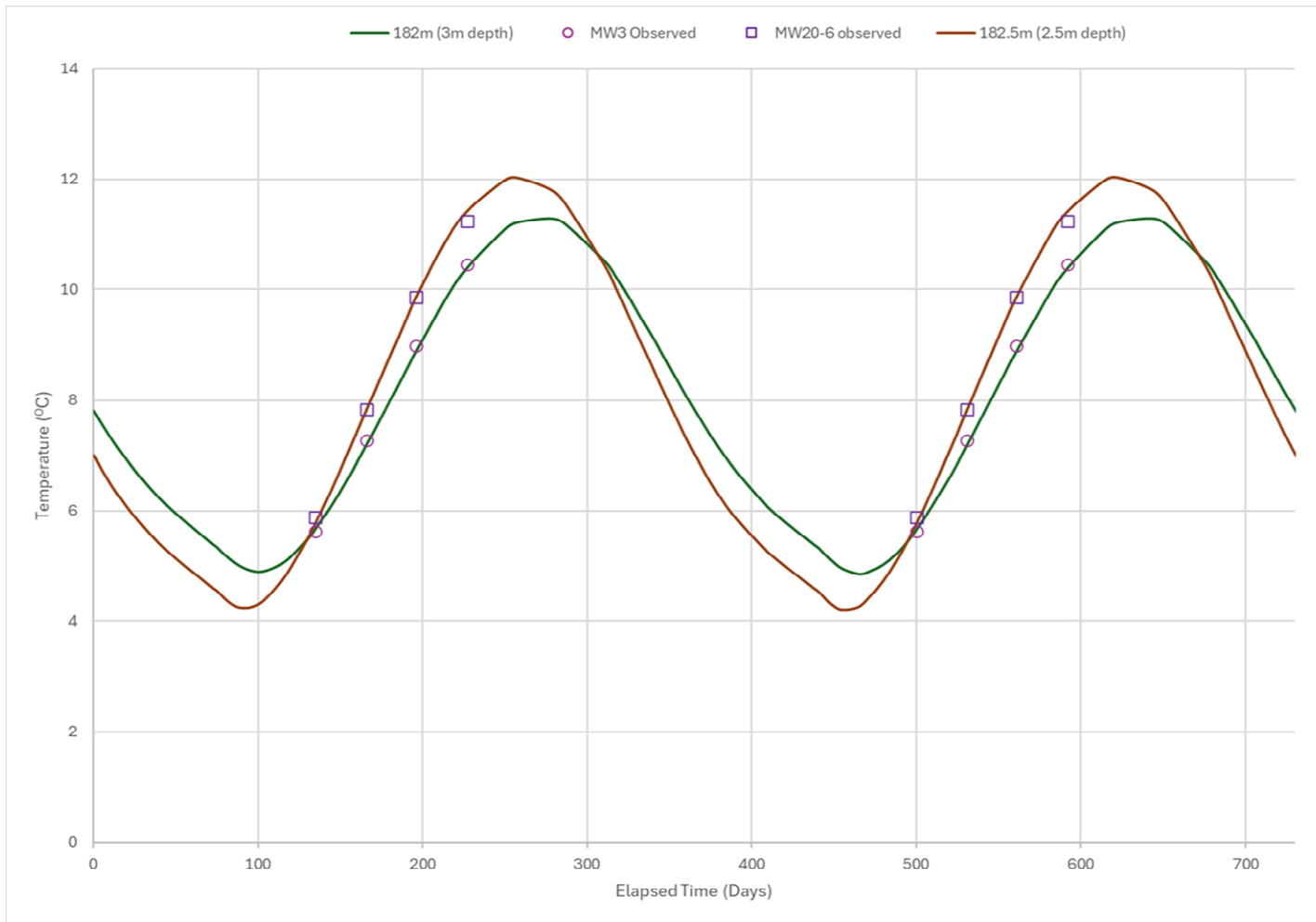
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Date		Sep-25	
Drawn	BM	Reviewed	KAM



Notes



Monthly Average Temperature Input Data			
Highland Line Pit			
Thermal Impact Study			
Figure Number		5	
Project Number		19126620	
Date		Sep-25	
Drawn	BM	Reviewed	KAM



Notes

Model calibration results shown over 2 year cycle

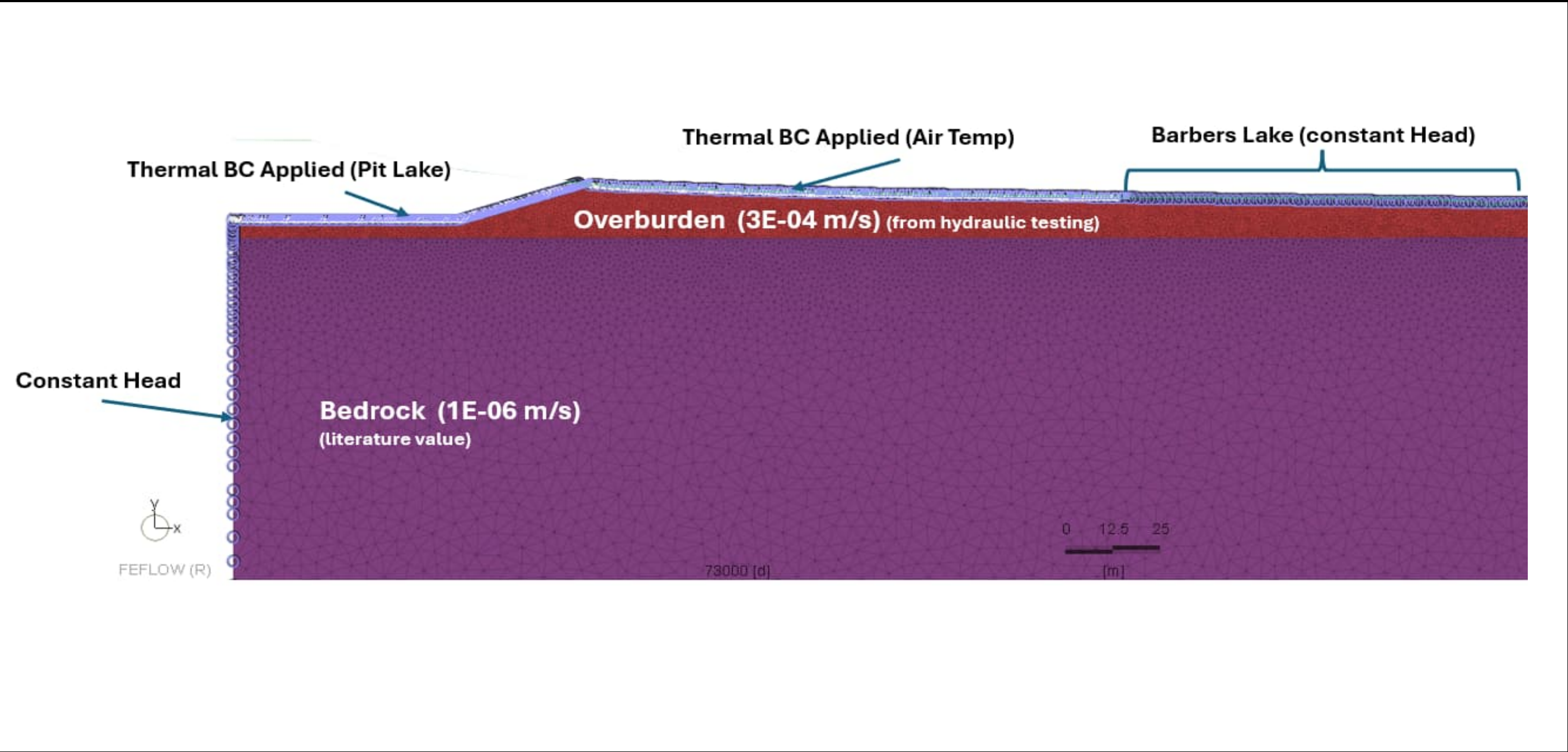


Model Calibration and Verification Results

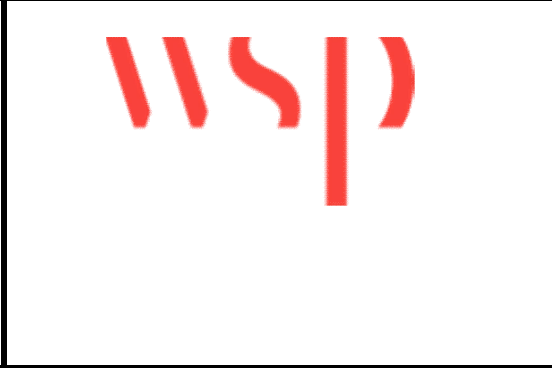
Highland Line Pit

Thermal Impact Study

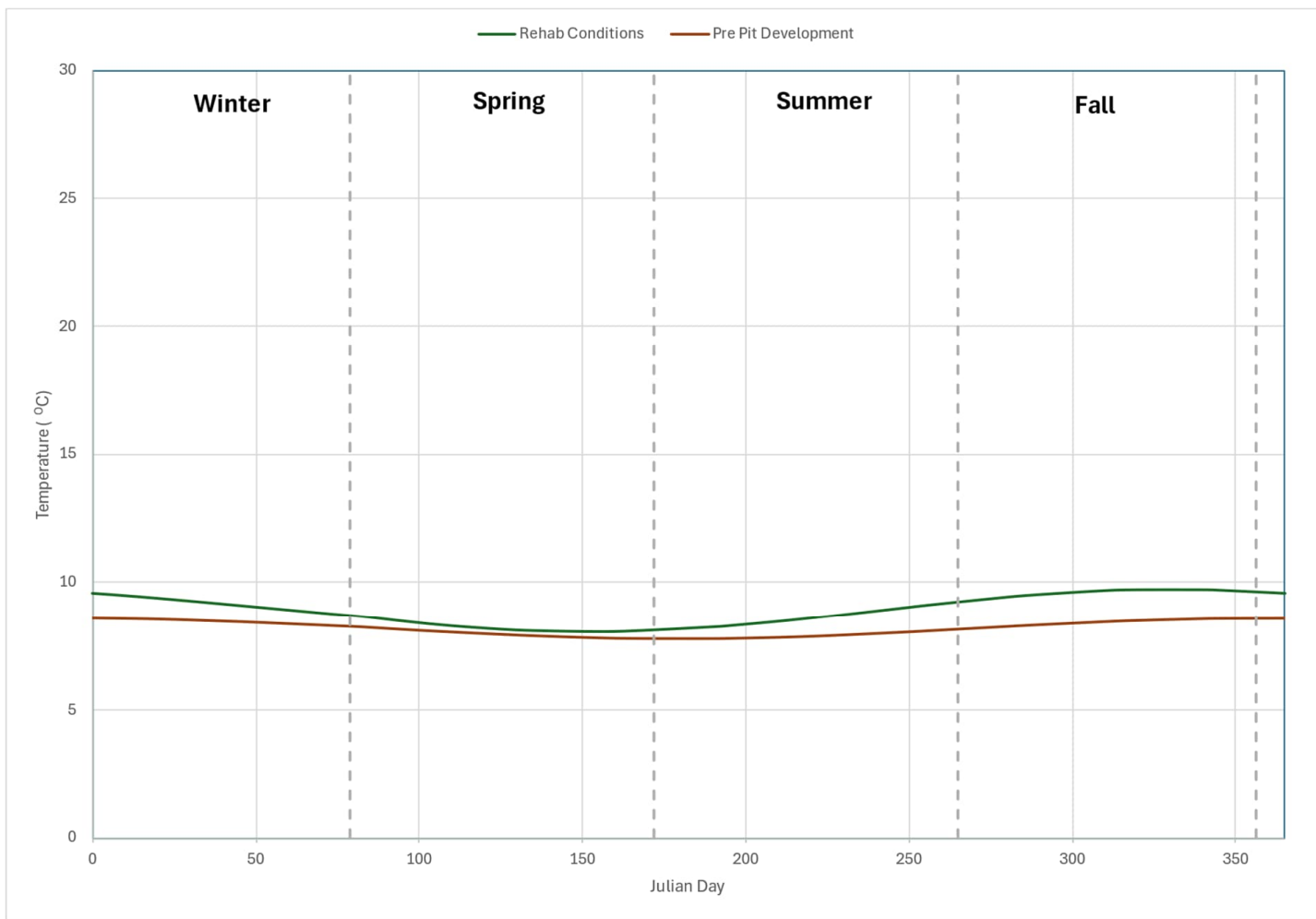
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Date	Sep-25		
Drawn	BM	Reviewed	KAM



Notes



Model Domain and Boundary Conditions Rehabilitation Conditions			
Highland Line Pit			
Thermal Impact Study			
Figure Number		7	
Project Number		19126620	
Date		Sep-25	
Drawn	BM	Reviewed	KAM



Notes

Model results shown over 1 year cycle and represent groundwater temperatures discharging to Barbers Lake



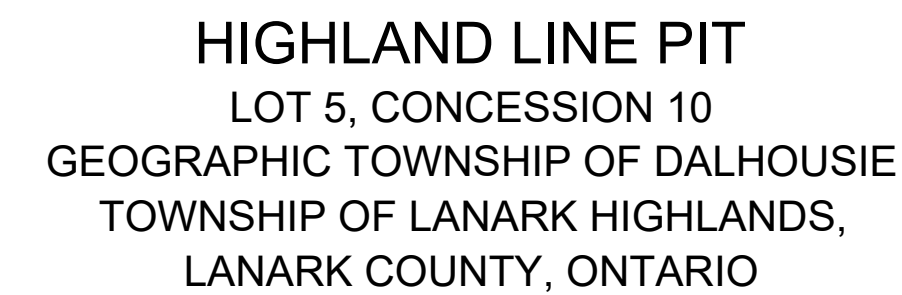
Predictive Simulation Results			
Highland Line Pit			
Thermal Impact Study			
Figure Number		8	
Project Number		19126620	
Date		Sep-25	
Drawn	BM	Reviewed	KAM

ATTACHMENT 6

**Revised Site Plan (October 8,
2025)**



AMENDMENTS	DATE	APPROVAL DATE
SITE PLANS APPROVED BY THE MINISTRY OF NATURAL RESOURCES.		
SIGNATURE _____	DATE _____	



APPLICANT:
THOMAS CAVANAGH CONSTRUCTION LIMITED
9094 CAVANAGH ROAD
ASHTON, ONTARIO
K0A 1B0

PIT LICENCE NO. 626599

NOTE(S)

1. LICENCED AREA, HIGHLAND LINE PIT **37.6** HECTARES.
2. AREA OF OPERATION, HIGHLAND LINE PIT **28.4** HECTARES.
3. THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR A CLASS A LICENSE FOR A PIT BELOW THE GROUND WATER TABLE.
4. THIS PLAN WAS PREPARED USING PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHS.
5. LOT, CONCESSION AND BOUNDARY LINES ON THIS PLAN ARE APPROXIMATE.
6. THIS IS NOT A LEGAL SURVEY DRAWING IN ACCORDANCE WITH THE PROVINCE OF ONTARIO SURVEYORS ACT 1987. THIS DRAWING WAS PRODUCED USING STANDARD PHOTOGRAMMETRIC PRACTICES.

LEGEND

- | | |
|---------------|---|
| | BOUNDARY OF AREA TO BE LICENCED |
| | 120-METRE SURROUND |
| | BOREHOLE / MONITORING WELL |
| | PRIVATE WELL (AS PER MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS WATER WELL INFORMATION SYSTEM) |
| | SURFACE WATER MONITORING STATION |
| CON 10, LOT 5 | LOTS AND CONCESSION LINES |
| CON 10, LOT 4 | |
| MAR-h | LAND ZONING BY-LAW |
| | ADJACENT PIT AND QUARRY BOUNDARY |
| | UTILITY POLE |
| | BUILDING; S-SILO, H-HOUSE, G-GARAGE, B-BARN, S-SHED,
O-OFFICE, SC-SCALE HOUSE |
| | ROAD: PAVED |
| | ROAD: GRAVEL |
| | CONTOURS/INDEX CONTOURS |
| | WOODED AREA |
| | WATERCOURSE |
| | WETLAND |
| | PAGE WIRE FENCE/GATE |
| | ENTRANCE |
| | EXIT |

REFERENCE(S)

1. KEY PLAN: Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDBER ASSOCIATES LTD., UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2016
3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

EXISTING FEATURES - GENERAL NOTES (PAGE 1 OF 5)

NOTE: THE NUMBERS BELOW REFER TO AGGREGATE RESOURCES OF ONTARIO: SITE PLAN STANDARDS (AUGUST 2020)

16 EXISTING ZONING

THE EXISTING ZONING OF LAND ON AND WITHIN 120 METRES OF THE SITE IS SHOWN ON THIS PLAN (PAGE 1 OF 5).

CLIENT
THOMAS CAVANAGH CONSTRUCTION LIMITED

PROJECT

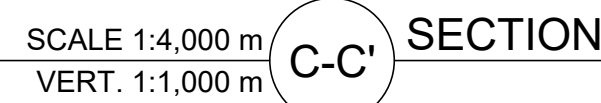
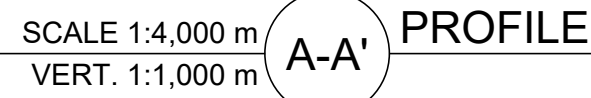
HIGHLAND LINE PIT

TITLE
EXISTING FEATURES - GENERAL

APPLICANT	YYYY-MM-DD	2025-10-08
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	DESIGNED	BH
	PREPARED	JM
	REVIEWED	KAM
	APPROVED	KAM

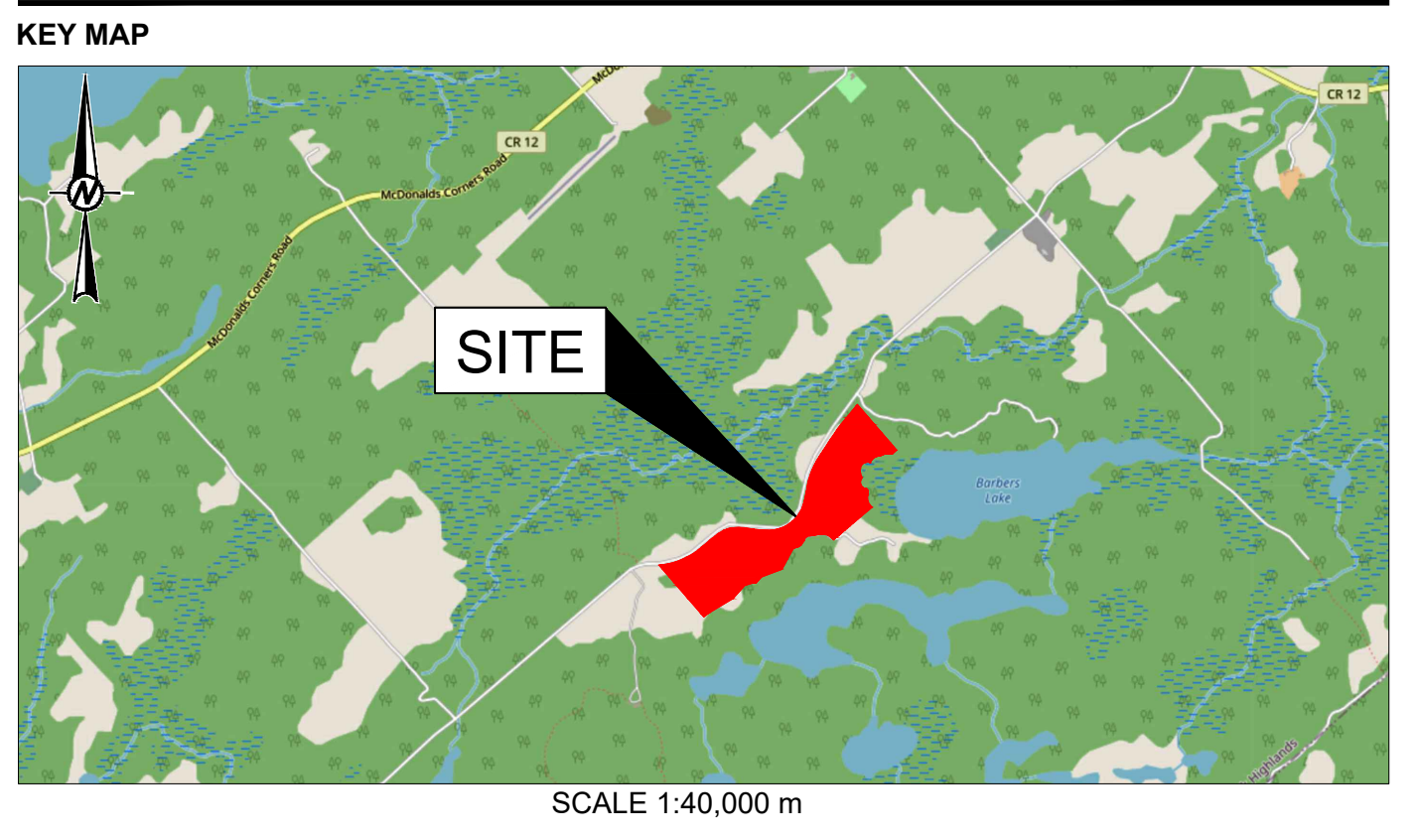
PROJECT NO. 19126620	CONTROL 0014	REV. 4	DRAWING 1 OF 5
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AMENDMENTS	DATE	APPROVAL DATE

SITE PLANS APPROVED BY THE MINISTRY OF NATURAL RESOURCES.

SIGNATURE _____ DATE _____



APPLICANT:
THOMAS CAVANAGH CONSTRUCTION LIMITED
9094 CAVANAGH ROAD
ASHTON, ONTARIO
K0A 1B0

NOTE(S)

1. LICENCED AREA, HIGHLAND LINE PIT **37.6** HECTARES.
2. AREA OF OPERATION, HIGHLAND LINE PIT **28.4** HECTARES.
3. THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR A CLASS A LICENCE FOR A PIT BELOW THE GROUND WATER TABLE.
4. THIS PLAN WAS PREPARED USING PHOTOGRAMMETRIC METHODS FOR AERIAL PHOTOGRAPHS.
5. LOT, CONCESSION AND BOUNDARY LINES ON THIS PLAN ARE APPROXIMATE.
6. THIS IS NOT A LEGAL SURVEY DRAWING IN ACCORDANCE WITH THE PROVINCE OF ONTARIO SURVEYORS ACT 1987. THIS DRAWING WAS PRODUCED USING STANDARD PHOTOGRAMMETRIC PRACTICES.

 BOUNDARY OF AREA TO BE LICENCED
 120-METRE SURROUND
 BOREHOLE / MONITORING WELL
 PRIVATE WELL (AS PER MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS WATER WELL INFORMATION SYSTEM)
 SURFACE WATER MONITORING STATION
 CON 10, LOT 5
 CON 10, LOT 4
 LOTS AND CONCESSION LINES
 ADJACENT PIT AND QUARRY BOUNDARY
 UTILITY POLE
 BUILDING; S-SILO, H-HOUSE, G-GARAGE, B-BARN, S-SHED, O-OFFICE, SC-SCALE HOUSE
 ROAD: PAVED
 ROAD: GRAVEL
 CONTOURS/INDEX CONTOURS
 WOODED AREA
 WATERCOURSE
 WETLAND
 PAGE WIRE FENCE/GATE
 POTENTIAL TRI-COLOURED BAT ROOST HABITAT
 POTENTIAL TRI-COLOURED BAT MATERNITY ROOST
 CATEGORY 1/2 BLANDING'S TURTLE HABITAT
 CATEGORY 3 BLANDING'S TURTLE HABITAT
 POTENTIAL CATEGORY 3 EASTERN MEADOWLARK HABITAT
 EASTERN WOOD PEEWEE
 BLACK ASH HABITAT
 CROSS-SECTIONS
 ENTRANCE
 EXIT

1. KEY PLAN: Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES. © QUEENS PRINTER 2016
3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

PROJECT HIGHLAND LINE PIT

TITLE
EXISTING FEATURES - SITE

APPLICANT	YYYY-MM-DD	2025-10-08
	DESIGNED	BH
	PREPARED	JM
	REVIEWED	KAM
	APPROVED	KAM

PROJECT NO. 19126620	CONTROL 0014	REV. 4	DRAWING 2 OF 5
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PROJECT NO.	CONTROL	REV.	DRAWING
19126620	0014	4	3 OF 5

OPERATIONS PLAN NOTES (PAGE 4 OF 5):

NOTE: THE NUMBERS BELOW REFER TO AGGREGATE RESOURCES OF ONTARIO: SITE PLAN STANDARDS (AUGUST 2020)

33 PROPOSED ENTRANCE AND EXIT

ACCESS TO THE SITE FOR HAULAGE PURPOSES WILL BE FROM/TO HIGHLAND LINE ROAD. THE ENTRANCE/EXIT POINTS FOR THE SITE ARE SHOWN ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5). ~~THE WESTERN MOST ACCESS IN EXTRACTON AREA 2 CANNOT BE USED BY HEAVY EQUIPMENT DUE TO DEFICIENT SITE ENTRANCE CHARACTERISTICS~~. ACCESS TO THE SITE WILL BE CONTROLLED BY GATES ERECTED AND MAINTAINED AT THE ENTRANCES/EXITS OF THE PROPERTY. THESE GATES WILL BE KEPT CLOSED WHEN THE SITE IS NOT IN OPERATION.

~~SHIPPING OF AGGREGATE PRODUCTS FROM THE SITE IS PROHIBITED DURING HALF-LOAD SEASON AS DETERMINED BY THE TOWNSHIP ON AN ANNUAL BASIS.~~

A SIGN WITH THE FOLLOWING WORDING SHALL BE PLACED AT ALL TRUCK ENTRANCES/EXITS: ATTENTION DRIVERS USE EXTRA CAUTION WHEN DRIVING ON LOCAL ROADS AS THEY ARE ALSO USED BY SCHOOL BUSES, PEDESTRIANS, AND OTHERS IN THE COMMUNITY.

34 AREA TO BE EXTRACTED

THE MAXIMUM AREA OF EXTRACTION IS 28.4 HECTARES. THE SITE WILL BE DIVIDED INTO TWO EXTRACTION AREAS (EXTRACTION AREA 1 AND 2) WITH THE TWO AREAS SEPARATED BY ANDERSON LANE. THE MAXIMUM AREA OF EXTRACTION FOR AREA 1 IS 14.4 HECTARES AND THE MAXIMUM AREA OF EXTRACTION FOR AREA 2 IS 14.0 HECTARES. THE BOUNDARY OF THE AREA OF EXTRACTION IS SHOWN ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5). THE EXTRACTION AREAS DO NOT INCLUDE THE NATURAL ENVIRONMENT EXCLUSION ZONE.

36 PROPOSED FENCING

THE EXISTING FENCING WILL BE REPAIRED/REPLACED, AS NECESSARY, BEFORE EXTRACTION OPERATIONS BEGIN AT THE SITE. NEW FENCING IS PROPOSED FOR THE SOUTHERN BOUNDARY OF THE SITE. ALL SIDES OF THE SITE WILL BE FENCED DURING THE OPERATIONAL PERIOD INCLUDING BOTH SIDES OF ANDERSON LANE. THE FENCING SHALL BE A MINIMUM OF 1.2 METRES IN HEIGHT. TURTLE EXCLUSION FENCING WILL BE COMBINED WHERE FEASIBLE WITH EXISTING AND/OR NEW FENCING.

TURTLE EXCLUSION FENCING SHALL BE INSTALLED AROUND THE ENTIRETY OF EXTRACTION AREA 1 AND EXTRACTION AREA 2 PRIOR TO EXTRACTION IN EACH AREA, WITH OPENINGS TO ALLOW SITE ACCESS AT THE SITE ENTRANCES/EXITS. THE TURTLE EXCLUSION FENCING SHALL INCLUDE A 'TURN-AROUND' AT THE END OF EACH FENCING SEGMENT WHERE IT MEETS THE SITE ENTRANCES/EXITS. FENCING SHALL BE SUITABLE FOR THE EXCLUSION OF TURTLES AT THE SITE AND WILL CONSIST OF METAL OR WOODEN FRAME WITH WIRE MESH AND/OR SLATS. THE FENCING SHALL BE DESIGNED TO BE HEAVY-DUTY AND SUITABLE FOR LONG-TERM USE. INSTALLATION METHODS WILL BE COMPLETED AS FOLLOWS:

1. MINIMUM HEIGHT OF 0.6 M
2. MINIMUM BURIED DEPTH OF 0.1 M
3. PLACE POSTS 2-3 M APART ON THE ACTIVITY SIDE OF THE FENCE
4. BACK-FILL AND COMPACT SOIL ON BOTH SIDES
5. INSTALL TURN-AROUNDS AT THE ENDS OF EACH FENCE SEGMENT OF AT LEAST 0.5 M WIDE AND 2.0 M LONG
6. INSTALL PRIOR TO EMERGENCE FROM HIBERNATION TO AVOID NESTING TURTLES OR NESTS BEING TRAPPED WITHIN THE FENCING

INSPECTION / MONITORING OF THE EXCLUSION FENCING BY SITE STAFF SHALL OCCUR TWICE ANNUALLY, ONCE DURING SPRING AFTER SNOW MELT AND ONCE EARLY SUMMER TO FACILITATE THE FENCE BEING IN GOOD CONDITION DURING THE MOST ACTIVE SEASON FOR TURTLES. ANY DEFICIENCIES SHALL BE ADDRESSED IMMEDIATELY.

IF A GRADIENT EXISTS SUCH THAT DISCHARGE TO WATERBODIES COULD OCCUR DURING WORKS AT THE SITE, SEDIMENT AND EROSION CONTROL FENCING WILL BE IMPLEMENTED.

37 PROPOSED BUILDINGS AND STRUCTURES, SCRAP STORAGE, STOCKPILES AND INTERNAL HAUL ROAD

1. NO BUILDINGS OR PERMANENT STRUCTURES ARE PROPOSED FOR THE SITE. A SCALE HOUSE AND SCALES WILL BE ESTABLISHED AT THE SITE HOWEVER IT WILL BE PORTABLE AND THE LICENSED AREA, THE SCALE HOUSE AND SCALES WILL INITIALLY BE ESTABLISHED NEAR THE ENTRANCE/EXIT AT THE NORTHEAST CORNER OF THE SITE GREATER THAN 30 METRES FROM THE LICENSED BOUNDARY.
2. SCRAP FROM THE SITE WILL BE TEMPORARILY STORED IN DESIGNATED AREAS. SCRAP STORAGE WILL INITIALLY BE ESTABLISHED WITHIN THE AREAS DESIGNATED ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5) HOWEVER MAY MOVE WITHIN THE LICENSED AREA DURING OPERATIONS. THE SCRAP AREAS MUST REMAIN GREATER THAN 30 METRES FROM ANY WATER BODY AND THE LICENSED BOUNDARY AT ALL TIMES. SHOULD THERE BE NO LOCATION(S) WITHIN THE LICENSED BOUNDARY THAT SATISFIES THE REQUIREMENTS OF THE SITE PLAN NOTE, THEN SCRAP CANNOT BE STORED ON SITE.
3. LOCATIONS OF THE AGGREGATE STOCKPILES WILL FOLLOW OPERATIONS AND THEREFORE VARY ON SITE. STOCKPILES WILL BE LOCATED NO CLOSER THAN 30 METRES TO THE LICENSED BOUNDARY. **THE MAXIMUM HEIGHT OF AGGREGATE STOCKPILES SHALL BE 15 METRES.**
- EXCESS TOPSOIL WILL BE STOCKPILED IN BERMS WITHIN THE LICENSED AREA AS IT BECOMES AVAILABLE, FOR LATER USE IN REHABILITATION.
4. INTERNAL HAUL ROADS WILL BE ESTABLISHED WITHIN THE PIT FOLLOWING THE DIRECTION OF EXTRACTION. DUST WILL BE MITIGATED ON SITE. WATER OR ANOTHER PROVINCIALY APPROVED DUST SUPPRESSANT WILL BE APPLIED TO INTERNAL HAUL ROADS AS OFTEN AS REQUIRED TO MITIGATE DUST.

38 LOCATION OF ANY PROPOSED PERMANENT AND/OR TEMPORARY PROCESSING AREA(S) ON THE SITE

PROCESSING WILL OCCUR IN ACCORDANCE WITH THE ACOUSTIC ASSESSMENT REPORT OF THE SITE PREPARED BY FREEFIELD LTD. AND THE OTHER TECHNICAL REPORTS. PROCESSING AREAS WILL OPERATE IN THE AREAS IDENTIFIED ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5). DUST WILL BE MITIGATED ON SITE. WATER OR ANOTHER PROVINCIALY APPROVED DUST SUPPRESSANT WILL BE APPLIED TO PROCESSING AREAS AS OFTEN AS NECESSARY TO MITIGATE DUST. PROCESSING EQUIPMENT WILL BE EQUIPPED WITH DUST SUPPRESSION OR COLLECTION DEVICES WHERE THE EQUIPMENT CREATES DUST AND IS BEING OPERATED WITHIN 300 METRES OF A SENSITIVE RECEPTOR.

PROCESSING EQUIPMENT WILL NOT BE LOCATED WITHIN 30 METRES OF THE LICENSED BOUNDARY.

39 LOCATION OF ANY PROPOSED RECYCLABLE MATERIALS

IMPORTATION OF RECYCLABLE MATERIALS WILL NOT BE PERMITTED ON THIS SITE.

40 SEQUENCE/DIRECTION OF OPERATION

THE SITE WILL BE DIVIDED INTO TWO EXTRACTION AREAS (EXTRACTION AREA 1 AND AREA 2). THE TWO EXTRACTION AREAS CAN BE OPERATED SIMULTANEOUSLY.

IN EXTRACTION AREA 1, EXTRACTION WILL COMMENCE IN THE AREA OF EACH THE ENTRANCE/EXIT AND PROCEED SOUTHEAST TO THE LIMIT OF EXTRACTION. EXTRACTION WILL THEN PROCEED TO THE SOUTHWEST AND NORTHWEST. EXTRACTION WILL THEN PROCEED TO THE SOUTHWEST, AND ALONG THE WESTERN SIDE OF THE EXTRACTION AREA AND MOVE TO THE NORTHEAST AND SOUTHEAST BEFORE MOVING TO TOWARDS THE NORTHWEST. ~~FROM THE NORTHERN ENTRANCE/EXIT, EXTRACTION WILL PROCEED TO THE SOUTHEAST AND THEN TO THE SOUTHWEST. FROM THE SOUTHERN ENTRANCE/EXIT, EXTRACTION WILL PROCEED TO THE SOUTHEAST AND NORTHEAST.~~

IN EXTRACTION AREA 2, EXTRACTION WILL COMMENCE IN THE AREA OF EACH THE ENTRANCE/EXIT AND PROCEED TOWARDS THE CENTER OF THE SITE. EXTRACTION WILL THEN PROCEED EAST TOWARDS BARBERS LAKE, AND SOUTHWEST. EXTRACTION WILL THEN PROCEED TO THE SOUTHWEST, AND ALONG THE SOUTHERN SIDE OF THE EXCLUSION ZONE BEFORE PROCEEDING TO THE NORTH. ~~FROM THE NORTHERN ENTRANCE/EXIT, EXTRACTION WILL PROCEED TO THE SOUTH AND EAST. FROM THE SOUTHERN ENTRANCE/EXIT, EXTRACTION WILL PROCEED TO THE NORTHEAST AND RADIATE TO THE NORTH, EAST AND SOUTH.~~

41 STRIPPING AND STOCKPILING OF TOPSOIL/OVERBURDEN

TOPSOIL, OR OVERBURDEN STRIPPED IN THE OPERATION OF THE SITE SHALL BE IDENTIFIED ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5) ~~WITHIN THE SETBACK ON ALL SIDES OF THE SITE. THE TOPSOIL OR OVERBURDEN STORED IN BERMS AND WILL BE USED IN THE REHABILITATION OF THE SITE.~~ DURING CONSTRUCTION AND EARTH-MOVING OPERATIONS, SEDIMENT CONTROL MEASURES WILL BE PUT IN PLACE TO PREVENT RUNOFF OF SUSPENDED SOLIDS FROM LEAVING THE SITE.

THE LOCATIONS OF THE BERMS ARE AS SHOWN ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5).

42 EXTRACTION LIFTS

THE EXTRACTION WILL TAKE PLACE IN A SERIES OF THREE LIFTS, WITH THE BOTTOM LIFT REACHING A FINAL ELEVATION OF 176 METRES ABOVE SEA LEVEL AS INDICATED ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5). THE MAXIMUM LIFT HEIGHT WOULD BE TEN (10) METRES.

EXTRACTION LIFTS AND BENCH HEIGHTS WILL BE IN COMPLIANCE WITH MINISTRY OF LABOUR REQUIREMENTS. THE PIT MAY OPERATE MULTIPLE LIFTS AND BENCHES IN ORDER TO MEET MARKET DEMAND AND/OR CONTRACT REQUIREMENTS FOR SPECIFIC MATERIALS.

43 SURFACE WATER DIVERSION/DISCHARGE

BASED ON TOPOGRAPHY, WATER FROM THE SITE CURRENTLY FLOWS NORTH TOWARDS HIGHLAND LINE, SOUTH TOWARDS THE UNEVALUATED WETLAND ALONG LONG SAULT CREEK, AND EAST TOWARDS BARBERS LAKE. DURING OPERATIONS, THE WATER FROM THE ACTIVE SITE WILL DRAIN TO THE OPEN PIT AREAS AND REMAIN AS WATER BODY FEATURES ONCE THE EXTRACTION IS BELOW THE WATER TABLE. THE PIT LAKES WILL OUTLET INTO BARBERS LAKE ON THE EASTERN LIMIT OF EXTRACTION AREA 1.

44 SOURCE WATER PROTECTION POLICIES

THE SITE FALLS OUTSIDE OF ANY IDENTIFIED SOURCE WATER PROTECTION AREAS AND, AS SUCH, NO SOURCE WATER PROTECTION POLICIES ARE APPLICABLE TO THE SITE.

45 PROPOSED FUEL STORAGE AREAS

A FUEL STORAGE AREA WILL BE ESTABLISHED AT THE SITE NEAR THE SCALE HOUSE. FUEL AND AGGREGATE PRODUCTS WILL BE STORED IN ABOVE GROUND TANKS OR CONTAINERS AND IN COMPLIANCE WITH THE TECHNICAL STANDARDS AND SAFETY ACT, 2000, LIQUID FUELS REGULATION O REG 21701 AND LIQUID FUELS HANDLING CODE, 2000. FUEL TRUCKS MAY BE USED FOR REFUELING OF ON-SITE EQUIPMENT WITHIN THE PIT IN ACCORDANCE WITH THE "PRESCRIBED CONDITIONS" THAT APPLY TO ALL CLASS A, BELOW WATER TABLE PIT LICENCES. A SPILLS CONTINGENCY PLAN WILL BE DEVELOPED PRIOR TO THE FIRST FUEL DELIVERY.

46 LOCATION OF ALL EXTRACTION SETBACKS

EXTRACTION SETBACKS INCLUDE A 30-METRE SETBACK ON THE NORTH (HIGHLAND LINE ROAD) AND WEST (ROAD ALLOWANCE BETWEEN CONCESSION 10 AND CONCESSION 11) SIDES OF THE SITE AND THROUGH THE CENTRE OF THE SITE ADJACENT TO ANDERSON LANE. A 30-METRE SETBACK ALSO EXISTS FROM WETLANDS ON OR WITHIN 120 METRES FROM THE SITE.

A 15-METRE SETBACK EXISTS ON THE NORTHEAST SIDE OF THE SITE AND ALONG THE WESTERN BOUNDARY OF THE PROPERTY. NO SETBACK IS PRESENT ALONG THE SOUTHEASTERN EDGE OF THE SITE WHERE THE ADJACENT LANDS ARE OWNED BY THOMAS CAVANAGH CONSTRUCTION LIMITED. PRIOR TO SITE OPERATIONS, ALL SETBACKS FROM NATURAL HERITAGE FEATURES SHALL BE CLEARLY MARKED UNDER THE DIRECTION OF A QUALIFIED ECOLOGIST.

THE EXTRACTION SETBACKS ARE AS SHOWN ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5).

47 FINAL ELEVATION

THE FINAL FLOOR ELEVATION OF THE SITE WILL BE APPROXIMATELY 176 METRES ABOVE SEA LEVEL AS INDICATED BY THE SPOT ELEVATIONS ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5).

48 PROPOSED BERMS

STORAGE BERMS FOR TOPSOIL AND OVERBURDEN WILL BE LOCATED WITHIN THE SETBACKS OF THE SITE WHERE THEY EXIST, OR ALONG THE EDGE OF THE EXTRACTION AREA, GREATER THAN 3 METRES FROM THE LICENSE BOUNDARY, IN AREAS WHERE NO SETBACKS EXIST. NO BERMS WILL BE CONSTRUCTED IN THE NORTHWEST CORNER OF EXTRACTION AREA 2, ADJACENT TO ANDERSON LANE OR ON THE EASTERN EDGE OF EXTRACTION AREA 1 AS IDENTIFIED ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5). THE MINIMUM HEIGHT FOR STORAGE BERMS WILL BE 2 METRES. THE MINIMUM HEIGHT FOR THE BERMS THAT ARE REQUIRED FOR NOISE ATTENUATION WILL BE CONSTRUCTED AS PER THE 'RECOMMENDED NOISE BARRIERS' TABLE (PAGE 3 OF 5). MATERIAL MAY BE IMPORTED TO COMPLETE THE NOISE ATTENUATION BERMS SHOULD THERE BE INSUFFICIENT ON-SITE MATERIAL. IMPORTED MATERIAL MUST MEET THE REQUIREMENTS OF NOTE 62 (PAGE 5 OF 5) ACOUSTIC BERMS WITHIN SETBACKS TO WETLANDS WILL BE PLACED AS CLOSE TO THE INNER EDGE (EXTRACTION SIDE) OF THE SETBACK AS FEASIBLE. BERMS WILL BE REMOVED AS PART OF SITE REHABILITATION.

49 BERM VEGETATION AND MAINTENANCE

BERMS WILL BE KEPT BACK AT LEAST 3 METRES FROM THE LICENSE BOUNDARY AND WILL HAVE AN APPROXIMATE SLOPE OF 2:1. THE SLOPES WILL BE SEEDED WITH NATIVE VEGETATION TO ENSURE THAT ADEQUATE VEGETATION IS ESTABLISHED AND MAINTAINED TO CONTROL EROSION.

50 METHOD OF EXTRACTION AND EQUIPMENT TO BE USED

THE AGGREGATE AT THE SITE WILL BE EXTRACTION USING EXCAVATION EQUIPMENT. THE EQUIPMENT TO BE LOCATED ON SITE WILL INCLUDE THE FOLLOWING: LOADERS, DUMP TRUCKS, WATER TRUCKS, EXCAVATORS, BULLDOZERS, HAULAGE TRUCKS, SCRAPPERS, AND MOBILE CRUSHING/SCREENING AND WASHING PLANTS.

THE PLANTS WILL INCLUDE A SCREENING/WASHING OPERATION CONSISTING OF, BUT NOT LIMITED TO, A HOPPER (FEED BIN), DRY SCREEN AND WET SCREEN DECKS, A CLASSIFIER, TWO DOUBLE SCREW MATERIAL WASHERS, A DEWATERING DERRICK, DIESEL ENGINE, SPRAYBARS AND CONVEYORS AND STACKERS, AND A CRUSHING OPERATION, CONSISTING OF, BUT NOT LIMITED TO, A HOPPER (FEED BIN), PRIMARY AND SECONDARY CRUSHING UNITS, A DIESEL ENGINE, VIBRATING SCREENS, A MAGNETIC SEPARATOR AND CONVEYORS.

51 PROPOSED TREE SCREENS

~~NO ADDITIONAL TREE SCREENS ARE PROPOSED AT THIS TIME. NATURAL TREE SCREENS CURRENTLY EXIST ON THE NORTHEAST-SOUTHEAST AND PORTIONS OF THE SOUTHWEST SIDES OF THE SITE.~~

A TREE SCREEN CONSISTING OF WHITE SPRUCE, WHITE PINE AND WHITE BIRCH WILL BE ESTABLISHED IN THE SETBACK ADJACENT TO HIGHLAND LINE IN THE AREA INDICATED ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5). WHERE BERMS ARE LOCATED WITHIN THIS SETBACK, THE TREE SCREEN WILL BE PLANTED BETWEEN THE BERM AND HIGHLAND LINE. SEE 'PLANTING DETAIL' ON PAGE 3 OF 5 FOR DETAILS REGARDING THE PROPOSED TREE SCREEN.

52 HOURS OF OPERATION

HOURS OF OPERATION ARE FROM 06:00 – 21:00 07:00 - 19:00 SUBJECT TO THE FOLLOWING RESTRICTIONS CONDITIONS: ~~DAYTIME OPERATIONS (07:00 – 19:00) – DURING THE DAYTIME PERIOD~~. ALL SIGNIFICANT NOISE SOURCES ARE ASSUMED TO BE IN OPERATION AND INCLUDE THE FOLLOWING:

1. ONE MOBILE SCREENING PLANT
2. ONE MOBILE WASH PLANT
3. ONE MOBILE CRUSHING PLANT
4. UP TO SIX LOADERS OR EXCAVATORS
5. ON-SITE TRUCK MOVEMENTS USED TO DELIVER MATERIAL TO THE MOBILE CRUSHING PLANT AND SHIP PROCESSED PRODUCT OFF-SITE.

OPERATIONS PLAN NOTES (PAGE 4 OF 5) CONTINUED:

~~DURING THE PERIOD FROM 06:00 – 07:00 AND 19:00 – 21:00, THE FOLLOWING SIGNIFICANT NOISE SOURCES MAY BE IN OPERATION:~~

1. ~~UP TO TWO LOADERS OR EXCAVATORS~~
2. ~~ON-SITE TRUCK MOVEMENTS USED TO SHIP PROCESSED PRODUCT OFF-SITE.~~

FURTHER DETAILS ARE PROVIDED WITHIN THE RECOMMENDATIONS OF THE ACOUSTIC ASSESSMENT REPORT (REFER TO TECHNICAL REPORT RECOMMENDATIONS).

RESPONSES TO EMERGENCIES AND REQUIRED MAINTENANCE IS NOT LIMITED BY THE HOURS OF OPERATION LISTED IN THE ACOUSTIC ASSESSMENT REPORT.

53 TREES AND STUMPS

WITHIN THE AREA TO BE EXTRACTED, ALL TREES WITHIN 5 METRES OF THE EXCAVATION FACE WILL BE REMOVED, ANY TREES PRESENT WITHIN THE EXTRACTION AREA ARE TO BE HARVESTED AND UTILIZED IN THE MOST APPROPRIATE MANNER. SMALL TREES AND STUMPS REMAINING ONSITE WILL BE GROUND UP OR BROKEN DOWN USING AN EXCAVATOR AND MIXED WITH TOPSOIL TO BE UTILIZED DURING REHABILITATION OF THE SITE. LARGE PIECES OF WOOD MATERIAL MAY BE LEFT IN THE REHABILITATED AREAS AS HABITAT STRUCTURE AND COVER FOR SMALL MAMMALS AS WELL AS BASKING AREAS FOR REPTILES AND PERCHING AREAS FOR WATERFOWL.

54 VARIATIONS FROM OPERATIONAL REQUIREMENTS

REFER TO VARIATIONS FROM OPERATIONAL REQUIREMENTS TABLE ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5).

55 MAXIMUM ANNUAL TONNAGE

THE NUMBER OF TONNES TO BE REMOVED FROM THE SITE IN A CALENDAR YEAR WILL NOT EXCEED 500,000.

56 OPERATIONS CROSS-SECTIONS

69 LOCATION OF CROSS-SECTIONS

REFER TO OPERATIONS PLAN (PAGE 3 OF 5) FOR LOCATION OF OPERATIONS CROSS-SECTIONS.

70 HORIZONTAL AND VERTICAL SCALES

APPROPRIATE HORIZONTAL AND VERTICAL SCALES ARE MARKED ON THE CROSS-SECTIONS.

71 OPERATIONS CROSS-SECTIONS

THREE OPERATIONS CROSS-SECTIONS ARE PROVIDED ON THE OPERATIONS SITE PLAN (PAGE 3 OF 5). DURING OPERATIONS, THE WATER TABLE SURROUNDING THE PIT'S WILL MATCH THE WATER LEVEL IN THE PIT LAKE (186 METRES ABOVE SEA LEVEL). THE PREDICTED WATER TABLE DURING OPERATIONS IS SHOWN ON THE OPERATIONS CROSS-SECTIONS ON ~~THE~~ **THE OPERATIONS SITE PLAN** (PAGE 3 OF 5).

73 TYPICAL BERM DESIGN

A CROSS-SECTION OF A TYPICAL BERM DESIGN IS SHOWN ADJACENT TO THE OPERATIONS CROSS-SECTIONS (PAGE 3 OF 5).

TECHNICAL REPORT RECOMMENDATIONS AND/OR MONITORING

LIST OF REFERENCES WHICH APPLY SPECIFICALLY TO THE SITE PLAN:

1. **FREEFIELD LTD., 2025, ACOUSTIC ASSESSMENT FOR THE HIGHLAND LINE PIT, LANARK HIGHLAND TOWNSHIP, LANARK COUNTY, ONTARIO. PREPARED FOR THOMAS CAVANAGH CONSTRUCTION LIMITED, SEPTEMBER 5, 2025.**
2. **GOLDER ASSOCIATES LTD., 2022, NATURAL ENVIRONMENT REPORT, PROPOSED HIGHLAND LINE PIT, LANARK COUNTY, ONTARIO. PREPARED FOR THOMAS CAVANAGH CONSTRUCTION LIMITED, DECEMBER 2022.**
3. **GOLDER ASSOCIATES LTD., 2022, LEVEL 1 AND LEVEL 2 WATER REPORT, PROPOSED HIGHLAND LINE PIT, TOWNSHIP OF LANARK HIGHLANDS, ONTARIO. PREPARED FOR THOMAS CAVANAGH CONSTRUCTION LIMITED, DECEMBER 2022.**
4. **GOLDER ASSOCIATES LTD., 2020, STAGE 1 AND 2 ARCHAEOLOGICAL ASSESSMENT, DUNCAN PIT PROPERTY, PART OF LOT 5, CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY, ONTARIO. PREPARED FOR THOMAS CAVANAGH CONSTRUCTION LIMITED, OCTOBER 5, 2020.**
5. **GOLDER ASSOCIATES LTD., 2021, STAGE 3 ARCHAEOLOGICAL ASSESSMENT, DUNCAN SITE (BIG4-9), PART OF LOT 5, CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY, ONTARIO. PREPARED FOR THOMAS CAVANAGH CONSTRUCTION LIMITED, FEBRUARY 2021.**
6. **GOLDER ASSOCIATES LTD., 2021, STAGE 1 ARCHAEOLOGICAL ASSESSMENT, HIGHLAND LINE PIT, PART OF LOTS 4 AND 5, CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY, ONTARIO. PREPARED FOR THOMAS CAVANAGH CONSTRUCTION LIMITED, APRIL 14, 2021.**
7. **GOLDER ASSOCIATES LTD., 2021, STAGE 4 ARCHAEOLOGICAL MITIGATION, TURNBULL SITE (BIG4-8), PART OF LOT 5, CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY, ONTARIO. PREPARED FOR THOMAS CAVANAGH CONSTRUCTION LIMITED, MAY 14, 2021.**
8. **GOLDER ASSOCIATES LTD., 2021, STAGE 3 ARCHAEOLOGICAL ASSESSMENT, TURNBULL SITE (BIG4-8), PART OF LOT 5, CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY, ONTARIO. PREPARED FOR THOMAS CAVANAGH CONSTRUCTION LIMITED, MAY 17, 2021.**
9. **GOLDER ASSOCIATES LTD., 2021, STAGE 4 ARCHAEOLOGICAL MITIGATION, DUNCAN SITE (BIG4-9), PART OF LOT 5, CONCESSION 10, DALHOUSIE TOWNSHIP, LANARK COUNTY, ONTARIO. PREPARED FOR THOMAS CAVANAGH CONSTRUCTION LIMITED, JUNE 8, 2021.**
10. **MATRIX HERITAGE INC., 2024, STAGE 1 AND 2 ARCHAEOLOGICAL ASSESSMENT, HIGHLAND LINE PIT, PART OF LOT 5, CONCESSION 10, GEOGRAPHIC TOWNSHIP OF DALHOUSIE, TOWNSHIP OF LANARK HIGHLANDS, LANARK COUNTY, ONTARIO, NOVEMBER 5, 2024.**
11. **FISHERIES AND OCEANS CANADA, 2024, AGGREGATE PIT, BARBERS LAKE, LONG SAULT CREEK, TOWNSHIP OF LANARK HIGHLANDS - IMPLEMENTATION OF MEASURES TO AVOID AND MITIGATE THE POTENTIAL FOR PROHIBITED EFFECTS TO FISH AND FISH HABITAT, MARCH 12, 2024.**

STUDY RECOMMENDATIONS AND MONITORING REQUIREMENTS HAVE BEEN INCORPORATED INTO THE SITE PLAN NOTES, AS APPROPRIATE, AND ARE SUMMARIZED BELOW.

NATURAL ENVIRONMENT:

1. NO CLEARING OR GRUBBING OF VEGETATION WILL TAKE PLACE WITHIN THE CORE BREEDING BIRD SEASON OR ACTIVE SEASON FOR BATS (APRIL 1 - SEPTEMBER 30) UNLESS A NESTING SURVEY HAS BEEN COMPLETED BY A QUALIFIED BIOLOGIST WITHIN 48 HOURS OF VEGETATION REMOVAL, AND NO ACTIVE NESTS WERE OBSERVED.
2. FENCE AND PROTECT THE AREA IDENTIFIED AS MATERNITY ROOST HABITAT FOR TRI-COLOURED BAT TO PREVENT INTRUSION INTO THIS AREA. AVOID PLACING LIGHTING IN THE VICINITY OF THIS AREA.
3. AN AWARENESS PACKAGE, SPECIES AT RISK ENCOUNTER PROTOCOL AND SPECIES AT RISK TRAINING PROGRAM IS TO BE PREPARED THAT LISTS THE SPECIES AT RISK AND THE LOCATION OF THE SITE OR IN THE LOCAL LANDSCAPE, AND IDENTIFIES WHAT TO DO IF ONE IS OBSERVED ON THE SITE. THE AWARENESS PACKAGE WILL INCLUDE:
 - A. INFORMATION / TRAINING ON IDENTIFYING SPECIES AT RISK;
 - B. WHAT TO DO IF A SPECIES AT RISK IS OBSERVED (MOVING, INJURED, DEAD OR NESTING);
 - C. HOW TO PROTECT A TURTLE OR BIRD NEST;
 - D. INFORMATION ON HOW TO REPORT A SPECIES AT RISK SIGHTING TO THE NATURAL HERITAGE INFORMATION CENTRE; AND,
 - E. A REQUIREMENT THAT IF A SPECIES AT RISK IS FOUND ON THE SITE, ALL WORK MUST STOP AND THE SPECIES SHALL BE PROTECTED FROM HARM.**MEP THE MINISTRY OF ENVIRONMENT CONSERVATION AND PARKS SHALL BE NOTIFIED IMMEDIATELY TO SEEK GUIDANCE ON WAYS TO AVOID IMPACTS UNDER THE ENDANGERED SPECIES ACT (E.G., MITIGATION, CONDITIONAL EXEMPTION) PRIOR TO RESUMING WORK.**
4. STANDARD BEST MANAGEMENT PRACTICES FOR NOISE AND DUST MITIGATION AT PIT OPERATIONS WILL BE EMPLOYED TO REDUCE IMPACTS ON ADJACENT LANDS, AND THE HABITATS THEY PROVIDE.
5. PRIOR TO SITE OPERATIONS, ALL WETLAND BOUNDARIES SHALL BE MARKED AND SURVEYED IN THE FIELD UNDER THE DIRECTION OF A QUALIFIED AND CERTIFIED OWES WETLAND EVALUATOR, USING OWES PROTOCOLS. THIS SHALL INCLUDE THE DEMARCACTION OF 30 M SETBACKS FROM THE WETLAND BOUNDARIES.
6. ANY LIGHTING REQUIRED FOR THE PIT WILL BE MINIMAL AND ADHERE TO DARK SKY PRINCIPLES.
7. IF ANY WATER QUALITY ISSUES ARE NOTED AT ANY TIME, WORK IS TO STOP IMMEDIATELY AND MEASURES TAKEN TO IMPROVE WATER QUALITY. PRIOR TO WORK CONTINUING, FISHERIES AND OCEANS CANADA WILL BE CONTACTED IF ISSUES AFFECTING FISH HABITAT ARE IDENTIFIED.
8. NO WORKS ARE PROPOSED WITHIN 30 M OF A WATERBODY; HOWEVER, TO AVOID AND MITIGATE THE POTENTIAL FOR PROHIBITED EFFECTS TO FISH AND FISH HABITAT, WHEREVER SITE WORKS MAY IMPACT A NATURAL WATERBODY, THE FOLLOWING MITIGATION MEASURES WILL BE IMPLEMENTED:
 - A. LIMIT IMPACTS ON RIPARIAN VEGETATION TO THOSE APPROVED FOR THE WORK:
 - I. LIMIT ACCESS TO BANKS OR AREAS ADJACENT TO WATERBODIES.
 - II. PRUNE OR TOP VEGETATION INSTEAD OF GRUBBING OR UPROOTING, WHERE FEASIBLE.
 - III. LIMIT GRUBBING ON WATERCOURSE BANKS TO THE AREA REQUIRED FOR THE FOOTPRINT OF WORKS.
 - IV. CONSTRUCT ACCESS POINTS AND APPROACHES PERPENDICULAR TO THE WATERCOURSE OR WATERBODY.
 - V. REMOVE VEGETATION SELECTIVELY AND IN PHASES.
 - VI. RE-VEGETATE THE DISTURBED AREA WITH NATIVE SPECIES SUITABLE FOR THE SITE.
 - B. OPERATE MACHINERY IN A MANNER THAT MINIMIZES DISTURBANCE TO THE WATERCOURSE BED AND BANKS.
 - C. DEVELOP AND IMPLEMENT A SEDIMENT CONTROL PLAN TO MINIMIZE SEDIMENTATION OF THE WATERBODY DURING ALL PHASES OF THE WORK:
 - I. SCHEDULE WORK TO AVOID WET, WINDY AND RAINY PERIODS (AND HEED WEATHER ADVISORIES).
 - II. REGULARLY INSPECT AND MAINTAIN THE EROSION AND SEDIMENT CONTROL MEASURES AND STRUCTURES DURING ALL PHASES OF THE PROJECT.
 - III. USE BIODEGRADABLE SEDIMENT CONTROL MATERIALS WHENEVER POSSIBLE.
 - IV. REMOVE ALL EXPOSED NON-BIODEGRADABLE SEDIMENT CONTROL MATERIALS ONCE SITE HAS BEEN STABILIZED.
 - V. OPERATE MACHINERY ON LAND, OR FROM BARGES OR ON ICE.
 - VI. USE METHODS TO PREVENT SUBSTRATE COMPACTION (E.G., SWAMP MATS, PADS).
 - VII. MONITOR THE WATERBODY TO OBSERVE SIGNS OF SEDIMENTATION DURING ALL PHASES OF THE WORK AND TAKE CORRECTIVE ACTION.
 - VIII. DISPOSE AND STABILIZE ALL DREDGED MATERIAL ABOVE THE HIGH WATER MARK OF NEARBY WATERBODIES TO PREVENT ENTRY IN THE WATER.
- D. DEVELOP AND IMMEDIATELY IMPLEMENT A RESPONSE PLAN TO PREVENT DELETERIOUS SUBSTANCES FROM ENTERING A WATER BODY:
 - I. STOP WORKS IN THE EVENT OF A SPILL OF A DELETERIOUS SUBSTANCE.
 - II. IMMEDIATELY REPORT ANY SPILLS (E.G., SEWAGE, OIL, FUEL OR OTHER DELETERIOUS MATERIAL), WHETHER NEAR OR DIRECTLY INTO A WATER BODY.
 - III. KEEP AN EMERGENCY SPILL KIT ON SITE DURING THE WORKS.
 - IV. CONTAIN ANY WATER WITH DELETERIOUS SUBSTANCES.
 - V. ENSURE CLEAN-UP MEASURES ARE SUITABLY APPLIED SO AS NOT TO RESULT IN FURTHER ALTERATION OF THE BED AND/OR BANKS OF THE WATERBODY.
 - VI. CLEAN-UP AND APPROPRIATELY DISPOSE OF THE SEDIMENT-LADEN WATER AND WATER CONTAMINATED WITH DELETERIOUS SUBSTANCES.
 - VII. MAINTAIN ALL MACHINERY ON SITE IN A CLEAN CONDITION AND FREE OF FLUID LEAKS.
 - VIII. WASH, REFUEL AND SERVICE MACHINERY AND STORE FUEL AND OTHER MATERIALS FOR THE MACHINERY IN SUCH A WAY AS TO PREVENT ANY DELETERIOUS SUBSTANCES FROM ENTERING THE WATER.
 - IX. DISPOSE OF ALL WASTE MATERIALS (E.G., CONSTRUCTION, DEMOLITION, COMMERCIAL LOGGING) ABOVE THE ORDINARY HIGH WATER MARK TO PREVENT ENTRY INTO THE WATERBODY.
 - X. PLAN ACTIVITIES NEAR WATER SUCH THAT MATERIALS SUCH AS PAINT, PRIMERS, BLASTING ABRASIVES, RUST SOLVENTS, DEGREASERS, GROUT, POURED CONCRETE OR OTHER CHEMICALS DO NOT ENTER THE WATERBODY.
- E. AQUATIC INVASIVE SPECIES ARE INTRODUCED AND SPREAD THROUGH TRANSPORTING SANDS AND SEDIMENTS AND USING CONTAMINATED CONSTRUCTION EQUIPMENT, TO PREVENT THE SPREAD OF AQUATIC INVASIVE SPECIES DURING CONSTRUCTION IN AQUATIC ENVIRONMENTS:
 - I. CLEAN, DRAIN AND DRY ANY EQUIPMENT USED IN THE WATER.
 - II. NEVER MOVE ORGANISMS OR WATER FROM ONE BODY OF WATER TO ANOTHER.

~~IF THE PROPOSED WORKS CAUSE, OR ARE ABOUT TO CAUSE, THE DEATH OF FISH AND/OR THE HARMFUL ALTERATION, DISRUPTION OR DESTRUCTION OF FISH HABITAT, CAVANAGH WILL NOTIFY FISHERIES AND OCEANS CANADA IMMEDIATELY IN FULFILLMENT OF THEIR DUTY TO NOTIFY UNDER THE FISHERIES ACT.~~

~~A. LIMIT IMPACTS ON RIPARIAN VEGETATION TO THOSE APPROVED FOR THE WORK:

- I. LIMIT ACCESS TO BANKS OR AREAS ADJACENT TO WATERBODIES.
- II. PRUNE OR TOP VEGETATION INSTEAD OF GRUBBING OR UPROOTING, WHERE FEASIBLE.
- III. LIMIT GRUBBING ON WATERCOURSE BANKS TO THE AREA REQUIRED FOR THE FOOTPRINT OF WORKS.
- IV. CONSTRUCT ACCESS POINTS AND APPROACHES PERPENDICULAR TO THE WATERCOURSE OR WATERBODY.
- V. REMOVE VEGETATION SELECTIVELY AND IN PHASES.
- VI. RE-VEGETATE THE DISTURBED AREA WITH NATIVE SPECIES SUITABLE FOR THE SITE.~~

~~B. OPERATE MACHINERY IN A MANNER THAT MINIMIZES DISTURBANCE TO THE WATERCOURSE BED AND BANKS.~~

~~C. DEVELOP AND IMPLEMENT A SEDIMENT CONTROL PLAN TO MINIMIZE SEDIMENTATION OF THE WATERBODY DURING ALL PHASES OF THE WORK:

- I. SCHEDULE WORK TO AVOID WET, WINDY AND RAINY PERIODS (AND HEED WEATHER ADVISORIES).
- II. REGULARLY INSPECT AND MAINTAIN THE EROSION AND SEDIMENT CONTROL MEASURES AND STRUCTURES DURING ALL PHASES OF THE PROJECT.
- III. USE BIODEGRADABLE SEDIMENT CONTROL MATERIALS WHENEVER POSSIBLE.
- IV. REMOVE ALL EXPOSED NON-BIODEGRADABLE SEDIMENT CONTROL MATERIALS ONCE SITE HAS BEEN STABILIZED.
- V. OPERATE MACHINERY ON LAND, OR FROM BARGES OR ON ICE.
- VI. USE METHODS TO PREVENT SUBSTRATE COMPACTION (E.G., SWAMP MATS, PADS).
- VII. MONITOR THE WATERBODY TO OBSERVE SIGNS OF SEDIMENTATION DURING ALL PHASES OF THE WORK AND TAKE CORRECTIVE ACTION.
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- III. KEEP AN EMERGENCY SPILL KIT ON SITE DURING THE WORKS.
- IV. CONTAIN ANY WATER WITH DELETERIOUS SUBSTANCES.
- V. ENSURE CLEAN-UP MEASURES ARE SUITABLY APPLIED SO AS NOT TO RESULT IN FURTHER ALTERATION OF THE BED AND/OR BANKS OF THE WATERBODY.
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- X. PLAN ACTIVITIES NEAR WATER SUCH THAT MATERIALS SUCH AS PAINT, PRIMERS, BLASTING ABRASIVES, RUST SOLVENTS, DEGREASERS, GROUT, POURED CONCRETE OR OTHER CHEMICALS DO NOT ENTER THE WATERBODY.~~

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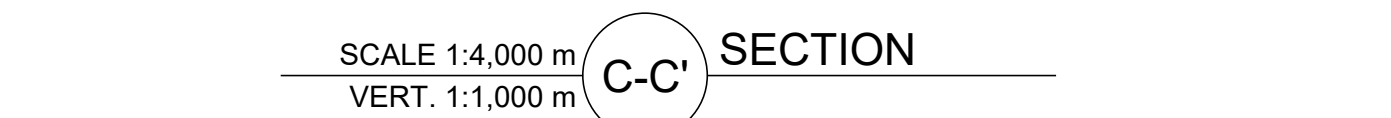
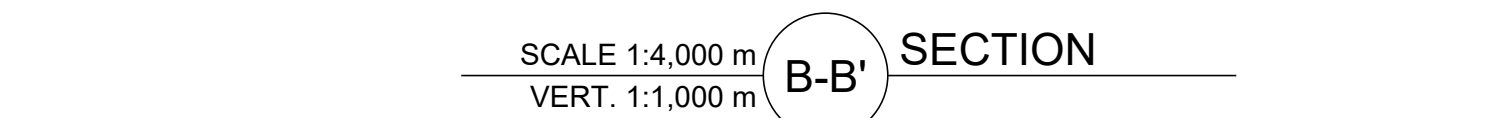
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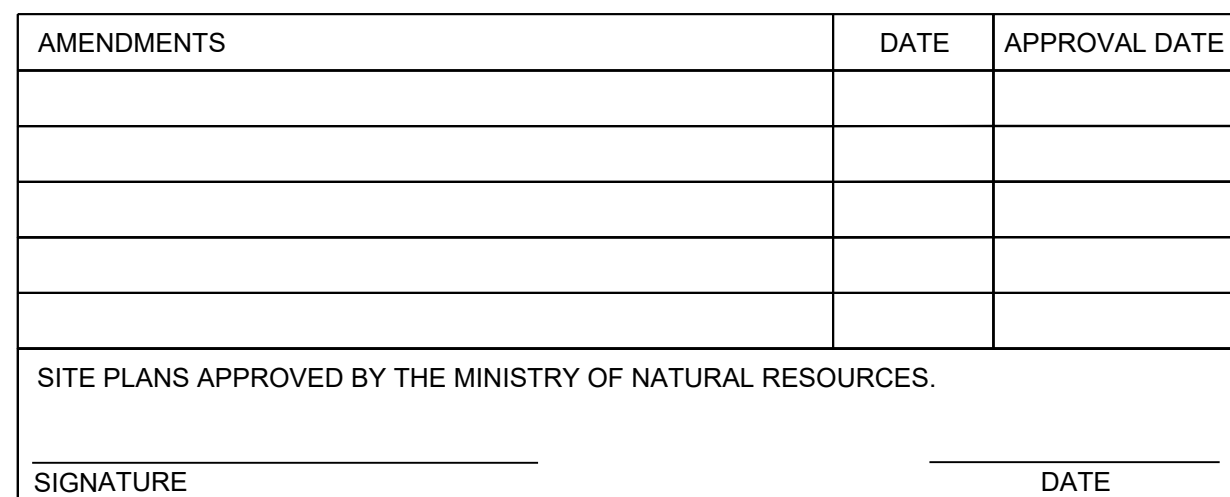
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SCALE 1:4,000 m
VERT. 1:1,000 m

A-A' PROFILE



 SIGNATURE DATE



PROJECT NO.	CONTROL	REV.	DRAWING
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