PLANNING REPORT & AGGREGATE RESOURCES ACT SUMMARY STATEMENT

PREPARED FOR:

CBM Aggregates, a Division of St. Marys Cement Inc. (Canada)
Township of Puslinch
County of Wellington

File no. Y321AU

May 2026

ANTHONY PIT

4454 Victoria Road South

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1.0 Executive Summary

CBM Aggregates, a division of St. Marys Cement Inc. (Canada) ("CBM") is applying for a Class 'A' Licence under the *Aggregate Resources Act* ("ARA") for a pit below the water table. In addition, CBM is applying for a County of Wellington Official Plan Amendment ("OPA") and a Township of Puslinch Zoning By-law Amendment ("ZBA") under the *Planning Act* to permit aggregate extraction on lands located at 4454 Victoria Road South. The proposed aggregate extraction operation is referred to as the "Anthony Pit". In this report, "subject lands" refers to the area proposed to be licenced under the ARA.

The area which is proposed to be licenced under the ARA is 18.0 hectares (44.5 acres) with a proposed extraction area of 8.7 hectares (21.5 acres). The subject lands contain approximately 1 million tonnes of high-quality sand and gravel resources within the proposed extraction area. The proposed maximum annual tonnage is 1,000,000 tonnes. The proposed operation will occur through four (4) extraction phases.

The subject lands are legally described as Part of Lot 22, Concession 8, Township of Puslinch, in the County of Wellington. The proposed pit is located approximately 6.0 km, by road, to the CBM Aberfoyle Pit (ARA Licence #5520) at 4350 Concession Road 7 where processing is proposed to occur along with other nearby CBM processing plants. There will be no on-site processing of aggregate at the Anthony Pit.

The subject lands are currently used for agricultural uses and contain an occupied residential dwelling, a detached garage and a shed. The buildings on the site are located outside of the extraction area. Agricultural production on the lands consists of corn production. Two small ponds (wetlands) are located outside of the extraction area of the proposed pit.

The subject lands are designated 'Secondary Agricultural' and 'Greenlands' on Schedule B7 of the County of Wellington Official Plan. The majority of the subject lands are identified as Sand and Gravel Resources of Primary and Secondary Significance within the 'Mineral Aggregate Resource Overlay' on Schedule D of the Official Plan. The subject lands are zoned Agricultural (A), with a portion within the Environmental Protection Overlay on Schedule A of the Township of Puslinch Zoning By-law 23/2018.

There is one active pit (Dufferin Aggregates' Aberfoyle Pit 2) and CBM's surrendered Tikal Pit located to the east of the subject lands across Victoria Road South. Rural residential uses and commercial uses are also located to the east of the proposed pit. Environmental areas, rural residential and agricultural uses are located to the north and south of the subject lands. To the west are environmental areas and a residential subdivision. The existing Aberfoyle Settlement Area is located approximately 316 metres west of the subject lands.

The subject lands are surrounded by the Mill Creek Provincially Significant Wetland ("PSW") Complex and associated woodlands. No extraction or disturbance is proposed in any portion of the PSW. Potential impacts of the proposed pit on the Mill Creek PSW complex and nearby natural heritage features have been thoroughly examined through the technical studies undertaken with the application to demonstrate no negative impacts.

Applications to amend the County of Wellington Official Plan and Township of Puslinch Zoning By-law have been submitted in conjunction with the ARA Class 'A' licence application.

The proposed Anthony Pit requires a combination of technical studies and reports for the submission of the ARA Licence and *Planning Act* applications. Potential adverse impacts have been assessed through the Natural Environment Report and Environmental Impact Study, Level 1 and 2 Water Report, Maximum Predicted Water Table Report, Cultural Heritage Report, Best Management Plan for Fugitive Dust, Noise Impact Assessment, Agricultural Considerations Review, Archaeological Assessment and Traffic Impact Assessment. ARA Site Plans for the proposed pit have also been submitted as part of the applications.

The proposed Anthony Pit will be progressively rehabilitated to enhance the natural and ecological area of the site. Proposed rehabilitation activities will include tree planting within the setbacks, naturalized ponds, a new wetland and an agricultural area.

The Official Plan Amendment and Zoning By-law Amendment are consistent with the Provincial Planning Statement (2024) and conforms to the County of Wellington Official Plan based on the following:

- Stantec prepared a Natural Environment Report (Stantec, 2026) which confirmed that there are no significant valleylands, fish habitat, or significant areas of natural and scientific interest located within the proposed Licence Boundary or the 120 metres adjacent lands of the pit. The proposed pit is located adjacent to the Mill Creek PSW, Species at Risk ("SAR") habitat (bats, Eastern meadowlark), significant woodlands and significant wildlife habitat. Mitigation measures have been implemented on the site plan including setbacks, environmental monitoring and rehabilitation activities to restore, enhance and offset potential impacts of the pit. The Natural Environment Report concluded that, through the implementation of the recommended mitigation measures, there will be no negative impacts on the Mill Creek PSW, surrounding SAR habitat, significant woodlands, or significant wildlife habitat.
- Stantec prepared a Level 1 and 2 Water Report (Stantec, 2026) which concluded that the method of aggregate extraction at the Anthony Pit is designed to minimize potential effects on local water resources, subject to the recommended mitigation measures including: groundwater level monitoring, water quality testing, designated fueling locations and implementation of spills management response plans, completion of a private well survey prior to below water extraction.
- Stantec prepared a Noise Impact Assessment (Stantec, 2026) which concluded that the proposed Anthony Pit operation is predicted to satisfy Ministry of Environment, Conservation and Parks ("MECP") sound level limits at nearby receptors based on the recommendations and mitigation measures provided in the assessment and implemented on the ARA Site Plan. These mitigation measures include the construction of acoustic berms and operational restrictions that will be implemented to mitigate noise to acceptable levels.
- Stantec prepared a Stage 1-2 Archaeological Assessment (Stantec, 2024) for the subject lands which was accepted by the Ministry of Citizenship and Multiculturalism ("MCM") and entered into the Ontario Public Register of Archaeological Reports. The assessment resulted in the identification of one archeological location within the proposed extraction area which has been sufficiently documented and does not fulfill the criteria for further archaeological investigation (i.e., Stage 3).
- CIMA+ prepared a Transportation Impact Assessment (CIMA+, 2025) which concluded that studied intersections are projected to operate at an LOS B, with little delay and reasonable

queues with the addition of future truck traffic. No operational roadway improvements, such as exclusive turn lanes at the site accesses, would be required to accommodate the projected pit traffic at the study intersections. The assessment recommended two safety-related activities to be included as part of the Site Plan, namely the removal of excess vegetation to meet required stopping site distance standards, and the installation of "slippery when wet" road signs at key locations prone to weather effects.

- The operational design of the proposed Anthony Pit incorporates the recommendations of the technical reports prepared for the application to ensure that the pit can operate within the Provincial guidelines and minimize social, economic and environmental impacts.

The *Aggregate Resources Act* Licence application for the proposed Anthony Pit has been prepared to meet all the Provincial Standard requirements for a Class 'A,' pit below the water table. The *Planning Act* applications have been prepared in accordance with the County of Wellington Official Plan requirements.

2.0 Proposal

2.1 CBM Aggregates

CBM Aggregates is a division of St. Marys Cement Inc. (Canada) ("CBM") and is a full-service provider and distributor of high-quality aggregate materials for all construction needs. CBM has licensed pits and quarries across southern Ontario, including several other pits in the Township of Puslinch that are both active and rehabilitated. Over the last 10 years, CBM has rehabilitated and surrendered approximately 40 hectares of land within the Township of Puslinch which includes areas subject to redevelopment for industrial and rural uses. This total does not account for lands that are currently being progressively rehabilitated that are still licenced under the *Aggregate Resources Act*.

2.2 Subject Lands

The subject lands, which is the area proposed to be licenced – approximately 18.0 ha (44.5 acres), are located at 4454 Victoria Road South, and are legally described as Part of Lot 22, Concession 8, Township of Puslinch in the County of Wellington (**Figure 1**). The subject lands are currently in agricultural use and contain an occupied house, detached garage and shed. The proposed operation does not propose to remove any of the existing buildings on the subject lands.

A former (unlicensed) gravel pit and two small ponds (wetlands) are within the proposed licenced area of the subject lands. The subject lands are currently used for agricultural uses, i.e. corn production.

The subject lands are located within a larger property that is approximately 23.4 hectares in size. As shown on **Figure 4**, the proposed licensed area has been delineated to avoid significant natural heritage features. The extraction limit has been delineated to avoid the developed area located along the front portion of the site. Further, the proposed extraction area is setback at least 30 metres from the adjacent Mill Creek PSW.

The subject lands are located in a rural area of the County of Wellington. The Aberfoyle Settlement Area is located over 300 metres west of the subject lands.

The property owner is leasing the subject lands to CBM to establish and operate the Anthony Pit.

2.3 Project Description

CBM is applying for a Class 'A' Licence under the *Aggregate Resources Act* to permit a below water pit. The proposed area to be licenced is 18.0 hectares (44.5 acres) with a proposed extraction area of 8.7 hectares (21.5 acres). The proposed Anthony Pit will haul extracted aggregate materials to the CBM Aberfoyle Pit (Licence #5520) located 6.0 km southwest of the subject lands or other nearby CBM processing facilities. The proposed Anthony Pit will not contain any processing, washing, or recycling on the site. There will be no water taking (e.g. dewatering or pumping) on site.

The proposed Anthony Pit will be accessed via the existing entrance located at the east end of the subject lands onto Victoria Road South (**Figure 2**). Noise mitigation measures such as noise barriers and acoustic berms along the paved driveway will be implemented to minimize adverse impacts on the on-site dwelling and nearby dwellings. Internal road upgrades will follow existing driveway, consider overhanging

trees and avoid compression of critical root zones of natural features. In addition, the footprint of the proposed paved driveway will be reduced to the greatest extent possible to avoid further encroachment to the adjacent natural features as provided on the site plan.

Trucks will ship materials to the existing CBM Aberfoyle Pit and other nearby operations.

Lands that are not located within the proposed extraction area will be used for setbacks from environmental features, access roads, and for landscaped visual and acoustic berms. The existing vegetation in these setbacks will be maintained, except where berms are required to be constructed. There will be a 30 metre setback from the PSW and a 15 metre setback from the remaining portions of the proposed licence limit.

There are approximately 1.0 million tonnes of high-quality sand and gravel resources available within the proposed extraction area. The proposed maximum annual tonnage for the pit is 1,000,000 tonnes. The resources are identified as sand and gravel resources of primary significance in the Aggregate Resources Inventory Paper ("ARIP") 162 (**Figure 3**). Approximately 1.87 ha of the proposed extraction area is not identified as a sand and gravel deposit in the ARIP 162. Site specific testing was conducted for these areas and verified that marketable material is present.

Based on the available reserves on the subject lands, CBM anticipates that extraction would be completed within a few years at the Anthony Pit thereby limiting the duration of the pit operation and accelerating progressive rehabilitation accordingly.

Materials will be extracted via excavators, loaders and a dragline for below water extraction; stockpiled within the extraction area; and then shipped, via highway trucks, for processing to the CBM Aberfoyle Pit or other nearby CBM processing plants. Highway trucks will ship materials from the subject lands along Victoria Road South, Wellington Road 34 and Concession Road 7 to the main processing plant at the Aberfoyle Pit (**Figure 2**). The proposed haul route is currently used for heavy truck traffic from nearby operations. This is a travel distance of 6.0 km. Trucks will not be permitted to travel south on Victoria Road South or use Gilmour Road.

The processed aggregate from the Aberfoyle Pit will then be shipped to market using the existing truck entrance/exit on Concession Road 7, east along McLean Road and then primarily east to Highway 6. This is the existing truck haul route for the Aberfoyle Pit.

Hauling extracted aggregate materials to existing CBM processing sites makes efficient use of existing infrastructure and does not require new processing facilities to be established at this site which would otherwise result in additional noise and operational activities. The existing CBM processing facilities at the licenced pits are located in areas with limited sensitive uses in close proximity to Highway 401.

The proposed hours of operation for the Anthony Pit are 7 am to 7 pm Monday to Friday, and 8 am to 4 pm on Saturdays.

The lands will be extracted to a maximum depth of 304 masl. The removal of aggregate resources from below the water table will result in the creation of two ponds that together total approximately 3.9 ha in area. Shallow shoreline areas are proposed around the perimeter of the created ponds.

A new wetland habitat of approximately 0.09 ha will be created in the area in between the two ponds. Agricultural lands will be restored in the eastern portion of the extraction area, not proposed for below water extraction. The total area of land to be rehabilitated to an agricultural condition is 3.9 ha.

In addition, approximately 1.8 ha of new forest cover will be created within the 30 metre setbacks adjacent to the Mill Creek PSW and along areas with acoustic berms.

The ARA Site Plans (Rehabilitation Plan) include additional details regarding progressive and final rehabilitation. The rehabilitated landform will be compatible with the surrounding area.

2.4 Required Applications

The following approvals are required to permit the proposed Anthony Pit:

- An amendment to Schedules B7 and Schedule D of the County of Wellington Official Plan to permit an aggregate operation;
- An amendment to the Township of Puslinch Zoning By-law to rezone the lands from the Agricultural (A) zone to Extractive Industrial (EXI) zone and Agricultural (A) zone with site specific provisions; and
- A Class 'A' licence for a below water pit under the *Aggregate Resources Act*.

The Technical Reports prepared by CBM for the ARA licence and planning applications include the following:

- Planning Report & Aggregate Resources Act Summary Statement, Agricultural Considerations Review (Appendix A), MHBC, March 2026;
- Aggregate Resources Act Site Plans, MHBC, March 2026;
- Level 1 and 2 Water Report, Stantec, February 2026;
- Maximum Predicted Water Table Report, Stantec, February 2026;
- Natural Environment Report, Stantec, March 2026;
- Transportation Impact Assessment, CIMA+, October 2025;
- Cultural Heritage Report, Stantec, September 2025;
- Stage 1 and 2 Archaeological Assessment, Stantec, December 2024;
- Noise Assessment Report, Stantec, January 2026; and
- Best Management Plan for Fugitive Dust, Stantec, January 2026.

3.0 Background

3.1 Surrounding Land Uses and Features

The subject lands are located within a rural area of the Township of Puslinch, in proximity to Aberfoyle. The following is a description of the land uses surrounding the proposed Anthony Pit (**Figure 1**).

NORTH: The former CBM Tikal Pit and Victoria Road South to are north of the subject lands. There are rural residential dwellings, the Mini Lakes Condominium Community, a Christmas tree farm, and natural heritage features located to the north.

EAST: To the east of the subject lands is Dufferin Aggregates' Aberfoyle Pit 2 (an active below water mineral aggregate operation), rural commercial uses, and three (3) houses located along Victoria Road South.

SOUTH: Wooded areas and agricultural operations are immediately south of the subject lands. Two (2) houses and Gilmour Road are located further south.

WEST: To the west of the subject lands are wooded areas and agricultural fields. Further west is the community of Aberfoyle.

Generally, the subject lands are surrounded by a mix of land uses including mineral aggregate extraction, natural areas, residential uses and rural commercial uses.

The proposed extraction limit is setback from the surrounding sensitive land uses and natural features. The closest off-site house which is located within the Mini Lakes Condominium Community is approximately 112 metres from the proposed extraction limit. Setbacks will be applied from the adjacent provincially significant wetland. Additional mitigation measures will be implemented with respect to the significant woodlands.

3.2 Aggregate Resources

The majority of the subject lands are mapped as a gravel resource of primary significance in the Wellington County ARIP 162 (**Figure 3**). Approximately 1.87 ha of the proposed extraction area is not identified as a sand and gravel deposit in the ARIP 162. Site-specific resource testing was undertaken to assess on-site resource quality and quantity, and to confirm the primary significance identification in the ARIP mapping. Grain size analysis data indicate the gravel size generally ranged from fine to coarse, while the sand size generally ranged from medium to coarse. These sand and gravel soils are typically well graded (i.e., uniformity coefficient greater than 10%) and contain trace amounts of fines (i.e., silt and clay).

Based on the on-site resource testing, there are approximately 1.0 million tonnes of high-quality sand and gravel resources available within the proposed extraction area. The majority of resources are located below the water table. The sand and gravel thickness ranges from 15 to 22 metres. CBM is applying for an annual maximum extraction limit of 1,000,000 tonnes.

Resources extracted from the proposed Anthony Pit lands will be processed at CBM's Aberfoyle Pit and other nearby CBM processing plants. This location is close to market, and the proposed pit will supply a source of high-quality materials. Making additional resources available from the subject lands for processing at the existing pit would allow CBM to continue to serve local infrastructure and construction projects including areas that have been designated for a significant amount of growth and development within the County.

3.3 Natural Heritage Features

The Natural Environment Report was prepared to fulfill the ARA technical standards (MNR, 2020) for a Natural Environment Report, as well as the requirement for an Environmental Impact Assessment as per the County's Official Plan (Wellington County, 2025).

The Natural Environment Report ("NER") assessed the potential impacts of the proposed pit on the natural features identified on, or within 120 metres of, the proposed licence area. The NER included the following components: a background data review to identify natural heritage features, including habitat of endangered or threatened species within the Study Area; field surveys which assessed suitable habitat and signs of SAR, vegetation communities, botanical inventories and targeted studies such as: black ash survey, wetland delineation, amphibian call count surveys, salamander surveys, turtle basking surveys, bird surveys, bat surveys, terrestrial insect surveys and headwater drainage feature assessment.

The proposed Anthony Pit is located adjacent to the Mill Creek PSW, SAR habitat, significant woodlands and significant wildlife habitat. The NER included a field assessment of the mapped PSW to delineate wetland boundaries. The proposed licenced boundary has been designed to avoid the boundaries of the PSW and includes a 30 metre setback to the extraction limit. The NER concluded that there are no anticipated impacts to the Mill Creek PSW's features or functions subject to the implementation of the recommended mitigation measures.

The NER confirmed there are no significant wetlands, fish habitat, significant valleylands, or significant areas of natural and scientific interest located within the proposed licence area of the pit.

The NER concludes that significant wildlife habitat for amphibian breeding habitat will be temporarily displaced to accommodate extraction which will be mitigated through site rehabilitation and creation of natural features.

In addition, an area of exposed gravel/sand identified as potentially supporting turtle nesting will be removed during extraction activities. To offset this loss, the construction of a nesting mound is proposed prior to the removal of the existing nesting site.

The report concludes that there will be a loss of 1.56 ha of potential bat species at risk maternity roost habitat and eighteen candidate roost trees. The NER recommends that indirect impacts such as onsite light use, be limited as work is undertaken during daylight hours during the bat active period. Compensation and mitigation measures are recommended for bat species at risk, including: the installation of artificial roosting structures; the inclusion of oak and maple in the replanting plan; and the reduction of illumination and light spill through design. Consultation with MECP is recommended to confirm appropriate mitigation and compensation for bat SAR.

The Anthony Pit will be progressively rehabilitated to a naturalized area that enhances the ecological value of the lands. A wooded

area, a wetland, two naturalized ponds and an agricultural area will be created.

The NER concluded that through the implementation of the recommended mitigation measures, there will be no negative impacts to the wetlands, significant woodland, significant wildlife habitat or SAR habitat on or within 120 metres of the proposed Anthony Pit.

3.4 Water Resources

Stantec prepared a Level 1 and 2 Water Report and Maximum Predicted Water Table Report for the proposed Anthony Pit to fulfill the ARA technical standards when proposing to extract below the maximum predicted water table. The reports were also prepared to fulfill the requirement of water resources impact studies as required in the Wellington County Official Plan.

The Maximum Predicted Water Table Report estimated that the maximum predicted groundwater table within the limit of extraction at the Site is about 322.7 masl in the northeastern corner to 320.3 masl in the southwestern corner.

The Water Report identified and assessed the potential impacts that the proposed below water pit could have on groundwater and surface water features located within the zone of influence. For the proposed Anthony Pit, the Water Report estimated the zone of influence to extend no further than 200 metres from the edge of the north and south below water table pit ponds. The hydrogeological assessment includes a review of Source Protection Plans, field investigations including borehole drilling and baseline groundwater monitoring, a review of local groundwater users, the development of a water budget, the construction of a three-dimensional numerical groundwater flow model, the development of a thermal transport model to predict thermal impacts, and the development of a monitoring program for groundwater.

Geological borehole drilling was carried out at five locations between November 1 and 8, 2021, with monitoring commencing in November 2021, and continuing on a quarterly basis through November 2024.

The technical analysis undertaken for the Water Report determined that there are seven overburden groundwater users within the 120 metres of the subject lands which are completed within the underlying limestone bedrock aquifer. The Water Report concludes that subject to implementation of recommended contingency plans and mitigation measures, the proposed pit ponds do not reflect a source protection threat to local groundwater supply wells.

Water budget calculations have been completed to approximate changes to on-site infiltration volumes, in response to the proposed aggregate pit which concluded that the proposed pit ponds should have no effect on local surface water or groundwater flow conditions.

Long term monitoring of local water resources is recommended to confirm that surface water flow rates do not vary from their observed norms

The Water Report concluded that in response to extraction below the groundwater table, the actual effects of short-term aggregate extraction are not likely to be distinguishable from typical seasonal fluctuations; and over the long term, groundwater baseflow to Aberfoyle Creek should remain consistent with pre-development conditions.

3.5 Agricultural Resources

Approximately 7.0 ha of the subject lands are actively farmed for corn crops and contain a

house, detached garage and shed, which are outside the proposed extraction limit.

An Agricultural Considerations Review was completed by MHBC which included a soil survey (**Appendix A**) to evaluate the agricultural resources both on the subject lands and within the surrounding area (1 km). The review included a survey of the subject lands and surrounding agricultural land uses to understand potential impacts that the proposed operation could have on the agricultural system.

The Soil Survey identified that the proposed licence area contains Class 2, 3, 4 and 5 soils. The soil series were identified as Dumfries Loam, Burford Loam, Gilford Loam, and Muck Soils. Dumfries Loam is the well-drained member of the Dumfries Soil catena and developed on stony soil material derived from limestone. Burford Loam is the well-drained member of the Burford Soil catena and are well drained loam materials occurring over coarse gravels. Gilford Loam is the poorly drained member of the Burford Soil Catena and are located in depressional areas and are typically seasonally wet areas, with shallow water tables. The surface soils generally comprise high organic matter content, while the lower layers comprise gleyed materials and gravels within 50 cm of the surface. Muck soils are very poorly drained organic deposits that have accumulated in shallow lakes, ponds, and undrained depressional areas.

Class 1 to 3 soils are considered prime agricultural lands (OMAFA, 2025).

The County of Wellington Official Plan designates the subject lands as 'Secondary Agricultural' (**Figure 5**). The subject lands do not contain prime agricultural areas based on the County Official Plan.

The review concluded that, subject to the implementation of the proposed mitigation measures regarding water quality and quantity, noise, dust, and traffic, and agricultural rehabilitation, there are no anticipated impacts to the agricultural system as a result of the proposed Anthony Pit.

3.6 Cultural Heritage Resources

The Cultural Heritage Report and Heritage Impact Assessment were prepared to fulfill the ARA technical standards for a Cultural Heritage Report, as well as to satisfy the Heritage Impact Assessment requirements of the County of Wellington Official Plan. The Cultural Heritage Report was prepared to identify the presence of built heritage resources ("BHR") and cultural heritage landscapes ("CHL") within the Study Area, to understand the potential impacts of the Project on these resources, and to prepare mitigation strategies to reduce these impacts. The Study Area includes a 50-metre boundary around the property.

Historical research, municipal and agency data requests, and field investigations conducted for this report identified one potential BHR located at 4436 Victoria Road South, south of the subject lands. The report concluded that based on the location of the BHR which is more than 150 metres away from the pit, and separation by another property parcel and Provincially Significant Wetland, no direct or indirect impacts are anticipated, and no mitigation measures are required and there are no further recommended cultural heritage reporting requirements.

3.7 Transportation System

The proposed Anthony Pit is located on Victoria Road South, approximately 6.0 km from the processing plant at the CBM Aberfoyle Pit. The proposed haul route accesses the subject lands through Victoria Road South and travels north

onto Wellington Road 34 until trucks reach Concession Road 7. The proposed haul route utilizes roads that can accommodate heavy truck traffic. Specifically, approximately 420 meters of the haul route stretch on Victoria Road South contains existing truck traffic from the Dufferin Aggregates Aberfoyle Pit 2 (Licence #5609). No truck traffic is proposed south onto Victoria Road South or Gilmore Road.

Access to the Anthony Pit will be from the existing property entrance (**Figure 2**). Approximately 230 metres of the internal driveway will be paves to mitigate potential dust and noise impacts while considering footprints of adjacent natural features.

There are active mineral aggregate operations along the proposed haul route. All other uses along the haul route are residential, agricultural and commercial.

CIMA+ prepared a Traffic Impact Study ("TIS") to evaluate impacts that the proposed Anthony Pit could have on the transportation systems in the area and identify any required infrastructure improvements to accommodate future traffic volumes. The TIS evaluated the potential impacts from the future truck traffic that will be generated from the proposed pit along the proposed haul route. The proposed operation would generate a total of 12 trips during the AM and PM peak hours (6 in, 6 out). Travel demand is not anticipated to increase on surrounding road networks.

The report reviewed the historic turning movement count data at the intersections of Victoria Road South and Wellington County Road 34 and future traffic modeling to determine that intersections are projected to operate at an LOS B, with little delay and reasonable queues.

Sightline assessments revealed one area of concern due to obstructive foliage at the site access on Victoria Road South. Mitigating this issue through vegetation clearance is recommended to meet required stopping sight distance standards, particularly for heavy vehicles.

The TIS concluded that the proposed pit can be accommodated by the existing and future road network without the need for major infrastructure improvements. With mitigative measures in place, notably the installation of "slippery when wet" road signs at key locations, the pit traffic is expected to integrate safely and efficiently within the existing transportation system.

4.0 Policy Review

The following is an assessment of the proposed Anthony Pit relative to the policies and provisions of the following documents:

- Provincial Planning Statement (2024);
- County of Wellington Official Plan 1999 (Office Consolidation May 2025); and
- Township of Puslinch Zoning By-law No. 023-18.

4.1 Provincial Planning Statement (2024)

The Provincial Planning Statement ("PPS") is issued under the authority of Section 3 of the *Planning Act* and came into effect October 20, 2024, replacing the Provincial Policy Statement issued May 1, 2020. The 2024 PPS applies to all decisions regarding the exercise that affects a land use planning matter made on or after October 20, 2024.

The PPS provides policy direction on matters of provincial interest related to land use planning and development. The intent of the PPS is to provide a vision for land use planning in Ontario that encourages the efficient use of land, resources and public investment in infrastructure. A mix of land uses are encouraged to provide choice and diversity to create complete communities. The PPS strongly encourages development that will provide long-term prosperity, environmental health and social well-being. One of the key considerations of the PPS is that planning decisions 'shall be consistent' with the Planning Statement.

The PPS recognizes the key Provincial interest in natural heritage, water, agricultural, mineral, and cultural heritage and archaeological resources as they provide important economic, environmental, and social benefits. The wise use and management of these resources over the long term is a key provincial interest.

The following is an analysis of the proposed Anthony Pit in the context of the policies in the PPS.

Rural Areas in Municipalities

Section 2.5.1 *Healthy, integrated and viable rural areas should be supported by:*

e) promoting diversification of the economic base and employment opportunities through goods and services, including value-added products and the sustainable management or use of resources;

g) conserving biodiversity and considering the ecological benefits provided by nature.

The proposed Anthony Pit promotes a diversification of economic base and employment opportunities through the use and management of natural resources.

The proposed Anthony Pit has been designed according to the technical studies prepared which conclude that subject to the recommended mitigation measures, the proposed pit will not create negative impacts to the rural area and natural heritage features. The proposed licence area has been delineated to avoid natural features and conserve biodiversity.

Rural Lands in Municipalities

Section 2.6.1 *On rural lands located in municipalities, permitted uses are:*

a) the management or use of resources;

The use and management of mineral aggregate resources and their extraction is permitted within the rural lands of municipalities.

Transportation and Infrastructure Corridors

Section 3.3.2 *Major goods movement facilities and corridors shall be protected for the long term.*

Victoria Road South, Wellington Road 34 and Concession Road 7 are existing haul routes and major goods movement corridors for the surrounding mineral aggregate operations. The proposed pit makes use of existing road infrastructure that accommodates heavy truck traffic.

Land Use Compatibility

Section 3.5.1 *Major facilities and sensitive land uses shall be planned and developed to avoid, or if avoidance is not possible, minimize and mitigate any potential adverse effects from odour, noise and other contaminants, minimize risk to public health and safety, and to ensure the long-term operational and economic viability of major facilities in accordance with provincial guidelines, standards and procedures.*

The proposed Anthony Pit has been designed and buffered to mitigate potential adverse effects on surrounding sensitive land uses. The Mini Lake Condominium Community is located approximately 110 metres from the extraction limit of the Anthony Pit, with the closest dwelling at 112 metres away. An acoustic berm will be implemented in the nearest licence limit to buffer the pit from the community. The condominium community is a common elements community with freehold title of the homes in the subdivision. The area closest to the subject lands is zone Open Space (sp-70), where *uses, buildings or structures not directly related to the sewage disposal system* are prohibited.

Acoustic and visual berms will be constructed in accordance with the Noise Report and as included on the ARA Site Plans to mitigate noise impacts in compliance with Provincial regulations. The berms will also screen pit operations from adjacent roads and residences, including the on-site dwelling. The Best Management Plan for Fugitive Dust for the Anthony Pit provides recommendations of regular monitoring and inspection to mitigate potential dust impacts.

The majority of the internal access road of the pit will be paved (approximately 230 metres) to limit noise of truck traffic, potential dust impacts on the on-site dwelling and surrounding sensitive uses; and while considering impacts on natural heritage features.

The proposed extraction area of the pit is situated in the rear / southern portion of the property, furthest from surrounding residential uses.

Rehabilitation will be progressive following the direction of extraction and involve the creation of two ponds, a wetland and an agricultural area. Based on the amount of available reserves on the subject lands, the operation of the Anthony Pit is expected to be completed within a few years, limiting the duration of the pit operation and accelerating progressive rehabilitation.

Natural Heritage

Section 4.1.1 *Natural features and areas shall be protected for the long term.*

Natural features and areas will be protected for the long term by avoiding natural features and implementing mitigation measures to protect adjacent natural features.

Section 4.1.2 *The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained,*

restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.

The diversity and connectivity of natural features in the area, and the long-term ecological function and biodiversity of natural heritage systems will be maintained and enhanced during operations by establishing a minimum 30 metre buffer from significant wetlands and mitigation measures to consider woodlands adjacent to the proposed extraction area. This will ensure that the form and ecological functions of these features will be maintained. Progressive rehabilitation of the pit will increase the area of natural features including wooded areas (1.8 ha), wetland (0.09 ha), open water (3.9 ha) and improve the overall diversity of naturalized habitats on the landscape post-rehabilitation.

The NER concluded that through the implementation of the recommended mitigation measures, there will be no negative impacts to the significant wetland and other natural features on or within 120 metres of the proposed Anthony Pit.

Section 4.1.4 *Development and site alteration shall not be permitted in:*

a) significant wetlands in Ecoregions 5E, 6E and 7E[1]; and

There are no significant wetlands within the proposed licence area of the Anthony Pit.

Section 4.1.5 *Development and site alteration shall not be permitted in:*

a) significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E;

b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);

c) significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);

d) significant wildlife habitat;

e) significant areas of natural and scientific interest; and

unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

There are no significant wetlands, significant valleylands, or significant areas of natural and scientific interest within the proposed extraction area of the pit. A 30-metre setback will be applied from the significant wetland. Setbacks, environmental monitoring, and restoration of the 0.02 hectares of significant woodlands proposed for removal are proposed to ensure no negative impacts to the natural feature.

The proposed pit contains significant wildlife habitat where impacts will be mitigated based on recommendations from the NER. Notably, the creation of a turtle nesting mound, and the implementation of shoreline aquatic vegetation as part of progressive rehabilitation.

The NER concluded that there will be no negative impacts to the significant natural features on or within 120m of the proposed license area.

Section 4.1.6 *Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.*

There is no fish habitat on the subject lands.

Section 4.1.7 *Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.*

The NER concluded that permitting under the *Endangered Species Act* ("ESA") may be required to address potential impacts to bat SAR habitat, although consideration will be given to the policy in place at the time of SAR habitat removal (*Species Conservation Act*). The Ministry of Environment, Conservation and Parks ("MECP") will be consulted through the licence application process.

Section 4.1.8 *Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 4.1.4, 4.1.5, and 4.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions*

The NER evaluated the ecological function of the adjacent significant wetland and significant woodland. While the existing gravel internal access road is within 2 metres of adjacent natural features, planned road upgrades will consider overhanging trees and avoid compression of critical root zones of adjacent wetlands and woodlands; and the footprint be reduced to the greatest extent possible. The use of heavy trucks on this road would only occur during pit operation which is expected to be completed within a few years. As such, there will be no direct negative impacts on the natural features. The extraction area is appropriately setback from these features.

Mitigation measures have been implemented on the ARA Site Plan to the natural features and their ecological functions.

Water

Section 4.2.2 *Development and site alteration shall be restricted in or near sensitive surface water features and sensitive ground water features such that these features and their related hydrologic functions will be protected, improved or restored, which may require mitigative measures and/or alternative development approaches.*

The Level 1 and Level 2 Water Report was completed to evaluate any potential impacts of the proposed pit on the quality and quantity of groundwater resources and surface water features. The Water Report concludes that long-term groundwater and surface water quality impacts are not anticipated as a result of the proposed pit. Further, recommendations outlined in the Water Report will be contained within the ARA Site Plan to mitigate potential impacts.

4.3 Agriculture

Section 4.3.1.2 *As part of the agricultural land base, prime agricultural areas, including specialty crop areas, shall be designated and protected for long-term use for agriculture.*

While the subject lands contain prime agricultural lands (Class 2 and 3) according to the Soil Survey, the lands are not designated as a Prime Agricultural Area in the County's Official Plan or Provincial Agricultural Systems mapping. Therefore, there are no prime agricultural areas located on the subject lands per the PPS and County Official Plan.

4.5 Mineral Aggregate Resources

4.5.1 General Policies for Mineral Aggregate Resources

1. Mineral aggregate resources shall be protected for long-term use and, where provincial information is available, deposits of mineral aggregate resources shall be identified.

The majority of the subject lands are identified to contain Sand and Gravel of Primary Significance based on the County Official Plan and provincial mapping. Mineral aggregate resources are to be protected for long-term use.

Section 4.5.2.1 *As much of the mineral aggregate resources as is realistically possible shall be made available as close to markets as possible.*

The proposed Anthony Pit makes significant, high quality aggregate resources available from a close to market location.

Section 4.5.2.2 *Extraction shall be undertaken in a manner which minimizes social, economic and environmental impacts.*

The Anthony Pit has been carefully designed so that extraction occurs in a way which minimizes social, economic and environmental impacts.

Section 4.5.2.5 *In known deposits of mineral aggregate resources and on adjacent lands, development and activities which would preclude or hinder the establishment of new operations or access to the resources shall only be permitted if:*

a) resource use would not be feasible; or

b) the proposed land use or development serves a greater long-term public interest; and

c) issues of public health, public safety and environmental impact are addressed.

The subject lands are located within a known deposit of mineral aggregate resources which is to be protected from development and activities which would preclude or hinder access to resources.

Section 4.5.3.1 *Progressive and final rehabilitation shall be required to accommodate subsequent land uses, to promote land use compatibility, to recognize the interim nature of extraction, and to mitigate negative impacts to the extent possible. Final rehabilitation shall take surrounding land use and approved land use designations into consideration.*

The proposed licence area will be progressively rehabilitated to an agricultural landform, natural heritage features including new woodlands, a wetland and ponds. Final rehabilitation will be compatible with surrounding land uses and approved land use designations.

Section 4.5.3.2 *Comprehensive rehabilitation planning is encouraged where there is a concentration of mineral aggregate operations.*

There is one active mineral aggregate operation in proximity to the Anthony Pit located across Victoria Road South. The proposed extraction area of the Anthony Pit is setback over 300 metres from the road.

The rehabilitation plan of the pit has taken into consideration adjacent land uses including agricultural uses and natural features.

4.6 Cultural Heritage and Archaeology

1. Protected heritage property, which may contain built heritage resources or cultural heritage landscapes, shall be conserved.

The Cultural Heritage Report identified one potential heritage resource at 4436 Victoria Road South. As the location of the resource is more than 150 metres away from planned extraction activities, is separated from the proposed Anthony Pit by another property parcel and a Provincially Significant Wetland, no direct or indirect impacts are anticipated to result, and no mitigation measures are required.

2. Planning authorities shall not permit development and site alteration on lands containing archaeological resources or areas of archaeological potential unless the significant archaeological resources have been conserved.

The Stage 1 and 2 Archaeological Assessment for the subject lands resulted in the identification of one location within the proposed extraction area which has been

sufficiently documented and does not fulfill the criteria for further archaeological investigation (i.e., Stage 3). The assessment was accepted by the Ministry of Citizenship and Multiculturalism ("MCM") and entered into the Ontario Public Register of Archaeological Reports.

In conclusion, the proposed Anthony Pit applications are consistent with the policies of the PPS.

4.2 County of Wellington Official Plan

The County of Wellington Official Plan provides direction over the next 20 years to the physical development of the County, its local municipalities, and to the long-term protection of County Resources.

The subject lands are part of the Rural System of the County of Wellington. The County of Wellington Official Plan recognizes that the Rural System will provide opportunities for employment and that the main employment generator in the rural system will be resource-based industries, including aggregate operations (Policy 4.2.5).

The subject lands are designated 'Secondary Agricultural' and 'Greenlands' in Schedule B7, Land Use Puslinch, of the County Official Plan (**Figure 5**). Section 4.3.2 identifies that 'Secondary Agricultural' areas are those "with agricultural capability, but determined not to be prime agricultural areas." The County Official Plan permits a range of other uses within the designation following the dominant agricultural use.

Areas within the subject lands are mapped in the Greenlands System identified on Schedule B7, including 'Greenlands'.

At the time of writing this Report, the County of Wellington plans adopted an Official Plan Amendment ("OPA 131") to expand the Aberfoyle settlement area boundary within the Township of Puslinch and designate additional residential lands to meet projected population growth in the County. The proposed Aberfoyle settlement boundary expansion is located adjacent to the west, south and north boundaries of the Anthony Pit (**Figure 7**).

The proposed land use designations nearest to the subject lands include 'Core Greenlands' and 'Greenlands' to remain; and new 'Residential' designation. It is our understanding that no development applications are currently proposed on these lands to be redesignated to 'Residential.'

A small part of the Mini Lake Condominium Community is proposed to be redesignated to 'Residential,' where the community's sewage disposal system is located and the applicable zone is Open Space (sp-70), where *uses, buildings or structures not directly related to the sewage disposal system* are prohibited. Nevertheless, the anticipated duration of the proposed Anthony Pit would likely conclude prior to any development occurring on adjacent lands.

It should be noted that surrounding natural features, such as the Mill Creek PSW, are located between the proposed pit and the lands included within the urban expansion area. At the time of the Anthony Pit application, OPA 131 is not in full force and effect as a final decision has not been made by the Province as approval authority.

4.6 Impact Assessment

Section 4.6.1 of the Official Plan states that the County or local municipality may require studies to be undertaken to measure various impacts and to propose methods of reducing or

eliminating impacts. The Official Plan states that studies completed as part of a licensing procedure (e.g. *Aggregate Resources Act*) may fulfill all or part of the requirements of this section.

In accordance, the following studies have been submitted with the proposed Anthony Pit Application:

- *Aggregate Resources Act* (ARA) Site Plans;
- Planning Report and ARA Summary Statement, Agricultural Considerations Review (Appendix A);
- Natural Environment Report / Environmental Impact Study;
- Level 1 and 2 Water Report;
- Maximum Predicted Water Table Report;
- Stage 1 and 2 Archaeological Assessments;
- Noise Impact Assessment Report;
- Transportation Impact Assessment; and
- Best Management Plan for Fugitive Dust.

4.6.5.1 Rural Development in Prime or Secondary Agricultural Areas

Where development is proposed in prime or secondary agricultural areas, a Council may require an assessment of the impacts the development may have on agricultural activities in the area. An assessment may include any or all of the following:

a) the opportunity to use lands of lower agricultural potential;

Provincial policy, including the PPS, does not require the assessment of alternative lands of lower agricultural potential for the development of a mineral aggregate operation.

b) compliance with the minimum distance separation formulae for livestock operations;

As provided in Section 4, Implementation Guidelines, of *The Minimum Distance Separation (MDS) Document* (OMAFA, 2016), a minimum distance separation setback is not required for the extraction of mineral aggregate resources.

c) the degree to which agricultural expansion may be constrained;

According to the Agricultural Considerations Review (**Appendix A**), the surrounding agricultural system is highly fragmented by nature of surrounding residential and aggregate uses; natural features and settlement areas. The proposed pit provides lands to be rehabilitated to an agricultural condition and the remainder proposed to be rehabilitated to ponds and natural features which can provide ecosystem services that support agriculture.

d) potential interference with normal agricultural activities and practices;

The proposed pit will be buffered from adjacent agricultural land uses through the provision of setbacks, berms, and existing vegetation.

e) potential interference with the movement of agricultural machinery on roads;

Impacts on traffic will be mitigated through recommendations of the Traffic Impact Study, notably, removing excess vegetation along the shoulder of the roadway; and installing "slippery when wet" road signs at locations prone to adverse weather effects.

f) such other concerns as a Council may consider relevant.

The Agricultural Considerations Review provides additional mitigation measures and rehabilitation recommendations for the site to restore 3.9 hectares of agricultural land to an average soil capability of CLI Class 2.

4.9.5 Source Water Protection

4.9.5.12 Communal Well Policy Areas

Schedule C7, Sourcewater Protection Puslinch, of the Official Plan identifies portions of the subject lands within the 'Private Communal System Policy Area' (**Figure 6**). These policy areas are not subject to the *Clean Water Act*, 2006, but require a level of protection as they serve as drinking water for residential communities.

a) *The following land uses shall be prohibited within 100 metres of the well under the circumstances outlined in the Ontario Ministry of the Environment and Climate Change's Table of Drinking Water Threats, November 2009 and as may be amended.*

- *Agricultural uses that involve the storage of agricultural source material;*
- *The storage of non-agricultural source material;*
- *The storage of commercial fertilizer as defined in O.Reg 267/03 under the Nutrient Management Act;*
- *The storage of pesticides;*
- *The storage of road salt and/or snow;*
- *The storage of liquid fuel above grade and below grade, except where the handling and storage of liquid fuel is required for emergency back-up generators; and*
- *The storage of dense non-aqueous phase liquids and/or organic solvents.*

The proposed Anthony Pit does not include any of the above uses. Mineral aggregate operations are not a prescribed drinking water threat according to O. Reg. 287/07 under the *Clean Water Act*.

b) *The submission of a Disclosure Report shall be required as part of a complete application under the Planning Act for development, redevelopment, or site alteration. The report shall disclose the nature of the proposed use and whether the handling and storage of any chemicals is expected to occur, including related volumes, types, storage, handling, disposal, etc. The report shall also disclose the proposed management programs associated with the use of chemicals at the site, including risk management/reduction measures, emergency response plans, spill response/prevention plans, employee awareness training, and best management practices and monitoring programs.*

The ARA Site Plans and the Level 1 and 2 Water Report outline the proposed operation and the proposed best management practices and response plans for potential spills.

c) *Development proposals may be subject to additional study requirements, including but not limited to, the preparation of a risk assessment report, hydrogeological analysis, and/or geotechnical investigation as deemed reasonable by the local municipality in consultation with the County's Risk Management Official.*

Risk assessments and hydrogeological analyses shall identify the existing groundwater quality and local hydrogeological setting, the nature of any predicted adverse impacts, the ability to eliminate or effectively mitigate these impacts and the measures that will be taken to achieve mitigation objectives. The County's Risk Management Official may further determine the scope of risk assessments and hydrogeological analyses on a site-specific basis, taking into consideration the proposed use.

No new uses shall be permitted unless it can be demonstrated that the proposed uses can be established within an acceptable level of risk to groundwater and surface water quality and without any adverse impact on ground water and surface water

quality, as determined by the Risk Management Official.

A Level 1 and 2 Water Report was prepared to assess potential impacts of the proposed pit on groundwater and surface water quality and quantity. The report concludes that no negative impacts are anticipated subject to the recommended mitigation measures as a result of the proposed pit.

4.10.1 Mill Creek Watershed

The proposed Anthony Pit is located within the Mill Creek Watershed. To ensure the protection of Mill Creek and its watershed, the County Official Plan outlines policies to be followed, which include:

a) *the natural heritage features identified by the Mill Creek Watershed Study will be included within Wellington County's Greenland System and will be protected;*

The proposed extraction area of the Anthony Pit was designed to avoid, protect and mitigate potential impacts to the natural features located adjacent to the subject lands. Final rehabilitation activities of the pit will include enhancements to the natural area.

b) *infiltration levels will be maintained by:*

- *Limiting impervious cover (buildings & pavement) in a subcatchment area(s) to 20% requiring storm water best management practices to encourage infiltration and maintain water quality and quantity.*

There are no proposed structures as part of the proposed pit. The entrance of the site will be paved to limit dust and noise impacts on the surrounding sensitive land uses.

d) *encourage stream rehabilitation and restoration efforts that result in improved bank stability, increased vegetative cover, pond discharge controls and improved aquatic habitat.*

The proposed rehabilitation will increase natural vegetative cover on the subject lands and provide for improved aquatic habitat through the creation of a new wetland and two ponds.

5.0 Greenlands System

The Greenlands System is divided into two categories, Core Greenlands and Greenlands. The Greenlands System will be maintained or enhanced. Activities which diminish or degrade the essential functions of the Greenlands System will be prohibited.

5.4 Core Greenlands

The Core Greenlands designation includes lands which have greater sensitivity or significance. This includes all wetlands, habitat of endangered or threatened species and fish habitat, and hazard lands.

All areas proximal to the Anthony Pit designated 'Core Greenlands' are located outside of the extraction limit and will be buffered by a 30-metre setback. The rehabilitation plan for the proposed pit will incorporate the development of additional wetland areas and habitat of endangered or threatened species within the extraction limit. The final pit ponds will be structured to support fish habitat.

Approximately 230 metres of the existing gravel driveway on the site will be paved to serve as an internal haul road for the operation. The paved portion of the access road will act as a mitigation to limit potential dust, noise, and sediment impacts on the adjacent wetland and wooded area.

Policy 5.4.1 of the County Official Plan requires that "*the appropriate Conservation Authority should be contacted when development is proposed in or adjacent to a wetland.*"

The Grand River Conservation Authority will be circulated as a commenting agency for the ARA and *Planning Act* applications of the Anthony Pit.

5.5 Greenlands

The Greenlands designation includes other significant natural heritage features including habitat, areas of natural and scientific interest (ANSI), streams and valley lands, woodlands, environmentally sensitive areas, ponds, lakes and reservoirs and natural links.

The proposed licence area includes approximately 3.68 hectares of lands designated 'Greenlands' in Schedule B7 of the Official Plan (**Figure 5**). There are no significant features within the proposed extraction limit. As outlined in the NER, the 10-30 metre setbacks as measured from the adjacent features are expected to be sufficient to protect the root zones of the woodlands and treed components of the wetlands.

The NER provides an assessment of the acoustic berms proposed within the setback areas where a limited area of significant woodland will be removed. The NER concludes that the proposed removal will not impact the form or function of the woodland. In addition, these setback areas will be reforested as part of the rehabilitation plan of the pit. Therefore, the proposed pit is not anticipated to negatively impact the adjacent natural features or their ecological functions (Policy 5.5.4).

5.6 Development Control in Core Greenlands & Greenlands

Within the Core Greenlands designation, development and site alteration shall not be permitted in Provincially Significant Wetlands or in significant habitat of threatened or endangered species, except in accordance with provincial and federal requirements (5.6.1).

There is no development proposed within the adjacent PSWs. The NER assessed the potential impacts of the proposed pit on significant habitat of threatened or endangered species. The report provided mitigation measures to offset impacts to wildlife habitat, including the provision of a new wetland and natural features.

5.7 Restoration and Enhancement

Section 5.7 of the Official Plan recognizes that while the majority of the County policy framework is focused on protecting natural heritage features from development and site alteration, the County also supports restoration and enhancement of the natural heritage system. This section acknowledges that the development control process can provide a means to identify opportunities for restoration and enhancement where development activities are taking place.

The proposed pit application represents an opportunity to enhance the County's Greenlands system by creating new aquatic and terrestrial habitat while also making available high-quality aggregate resources close to market.

6.5 Secondary Agricultural Areas

Section 6.5 states that uses permitted within the 'Secondary Agricultural' area designation include those permitted in Prime Agricultural Areas. Licenced Aggregate Operations are permitted within Prime Agricultural Areas (6.4.3).

6.6 Mineral Aggregate Areas

Mineral aggregate areas are part of the County's Rural System which is primarily natural resource land and other uses typically found in non-urban areas. The Rural System, for the most part, is a relatively stable part of the County landscape devoted to economic activities based on natural resources. The County's policies are intended to maintain the essential character of these areas to ensure that the economic activities and employment opportunities which depend on Wellington's natural resources are maintained and enhanced.

6.6.1 Mineral Aggregate Resource Overlay

Policy 6.6.1 states that lands within the Mineral Aggregate Resource Overlay are areas of high potential for mineral aggregate extraction and are shown as an overlay on Schedule D. These lands have been identified by the Province in the Aggregate Resource Inventory Paper (ARIP) 162 which generally consist of sand and gravel deposits and selected bedrock resources that the Province has identified as being of primary, or secondary significance.

Section 6.6.1 also states that there are sites in the Mineral Aggregate Resource Overlay where there is an existing or approved mineral aggregate operation that lies outside of the sand and gravel resource areas of Primary or Secondary Significance and selected bedrock resources.

The majority of the subject lands are identified as 'Sand and gravel resources of Primary and Secondary Significance' in Schedule D, Mineral Aggregate Resource Overlay, of the County Official Plan (**Figure 8**). Approximately 1.87 hectares of the proposed extraction area is not identified as a mineral aggregate deposit. However, according to on-site testing, marketable aggregate material is located in this area.

The Mineral Aggregate Resource Overlay only indicates that aggregate deposits are likely to be available, it does not presume that all conditions are appropriate to allow extraction to proceed. Similarly, the Mineral Aggregate Resource Overlay does not limit applications for new or expanding aggregate operations only to these areas in the County as specifically recognized in Section 6.6.1. The intention is to make as much aggregate resources available as close to markets as is realistically possible, consistent with the direction provided in the PPS.

6.6.5 New Mineral Aggregate Operations

Aggregate operations are identified as a permitted use in the 'Secondary Agricultural' and 'Greenlands' designation, subject to the policies of the Official Plan. Section 6.5.5 states that new or expanding mineral aggregate operations require an amendment to the Mineral Aggregate Area shown on Schedule B of the Official Plan. CBM is applying for an amendment to the County's Official Plan to permit the proposed pit by establishing the Mineral Aggregate Area on the subject lands as expanding the Mineral Aggregate Resource Overlay by approximately 4.0 hectares. A draft Official Plan Amendment is included as **Appendix B**.

Section 6.6.5 of the Official Plan outlines the policies to be satisfied when establishing a new or expanding mineral aggregate operation. The following policies are considered:

Official Plan Section 6.6.5	Proposed Application
a) the impact on adjacent land uses and residents and public health and safety;	There will be no adverse impacts to public health and safety related to this proposal as demonstrated by the technical studies and reports submitted with the applications.
b) the impact on the physical (including natural) environment;	According to the technical reports, the proposed Anthony Pit is not anticipated to have a negative impact on the natural environment, water resources or transportation network.
c) the capabilities for agriculture and other land uses;	The subject lands are not designated as a prime agricultural area in the County's Official Plan. An

	Agricultural Considerations review, attached as **Appendix A**, was completed to assess agricultural resources on the subject lands and within the surrounding area. Prime agricultural lands, including Class 2, 3 Soils are found on the subject lands as determined through the Soil Survey. It was determined that there will be no negative impacts on agricultural resources as a result of the proposed pit.
d) the impact on the transportation system;	The Traffic Impact Study concluded that the existing transportation infrastructure can accommodate the projected increase in traffic due to the pit's operation. Two safety-related activities are implemented on the site plan in accordance with the recommendations of the study. Those include (1) the removal of excess vegetation to satisfy stopping distance standards, and (2) the installation of a "slippery when wet" road signed at locations prone to weather impacts. Additionally, both current and future traffic conditions, including the added site-generated traffic, are anticipated to not result in significant impacts on the surrounding road network.
e) existing and potential municipal water supply resources are protected in accordance with Sections 4.9.5 and 4.9.5.9 of this Plan and the applicable Source Protection Plan;	Existing and potential municipal water supply resources will be protected. The subject lands are not located within a Wellhead Protection Area, or Issue Contributing Area based on the Grand River Source Protection Plan (**Figure 10**). However, the subject lands are located within a Wellhead Water Quantity Zone, Intake Protection Zone, and Significant Groundwater Recharge Area. Fuel storage, equipment filling and equipment maintenance will be carried out in accordance with best management practises and implementation of spill management response plans, as recommended in the Level 1 and 2 Water Report.
f) the possible effect on the water table or surface drainage patterns;	The Level 1 and 2 Water Report concluded that the implementation of the proposed recommended mitigation measures is anticipated to create no negative impacts to the water table or surface drainage patterns.

g) the manner in which the operation will be carried out;	Extraction will occur in four phases generally in a southwest direction. Extracted materials will be shipped to the CBM Aberfoyle Pit for processing using highway trucks. Based on the available reserves on the subject lands, CBM anticipates that extraction would be completed within a few years at the Anthony Pit thereby limiting the duration of the pit operation and accelerating progressive rehabilitation accordingly. Details of the operation including phasing and progressive rehabilitation are provided in Section 2.3 of this Report.
h) the nature of rehabilitation work that is proposed; and	The subject lands will be rehabilitated through the creation of two naturalized ponds, with an approximate total area of 3.9 ha. In addition, a new wetland area (0.09 ha), vegetated areas (1.8 ha) and agricultural lands (3.0 ha) will be created. Details of the rehabilitation plan are provided on the ARA Site Plans.
i) the effect on cultural heritage resources and other matters deemed relevant by Council.	The Cultural Heritage Report identified a built heritage resource located 205 metres from the proposed extraction and appropriately buffered by natural features. The report concluded that no direct impacts are anticipated and thus, no further mitigation measures are recommended.

6.6.6 Public Information

When approvals are being considered for mineral aggregate operations, the following information shall be made available to the public:

a) Detailed site plans
b) Estimated quality and quantity of the resource
c) Description of the surrounding lands
d) Any related reports prepared by the proponent
e) Any other information deemed relevant by Council

This information will be made available to the public including the ARA Site Plan. This Report and the Site Plan contain information on the surrounding lands. Further, the related reports and other information required under the *Planning Act* and *Aggregate Resources Act* have been submitted with the proposed pit application. CBM will establish a project website where these studies and information will be available to the public.

6.6.7 Ancillary Uses

Section 6.6.7 identifies criteria for establishing ancillary uses. The ancillary uses specifically identified in Section 6.6.4 which include "asphalt

plants, concrete plants, aggregate transfer stations, stockpiling and blending of aggregates with materials such as salt, sand-salt mixture and recycled road material," which are not proposed at the pit.

6.6.8 Rehabilitation

Section 6.6.8 of the County's Official Plan states that all proposals for new aggregate extraction shall include a plan for eventual rehabilitation. The plan shall:

a) provide for progressive rehabilitation whenever feasible;
b) be prepared in detail by a recognized expect;
c) be compatible with the long term uses permitted by the surrounding official plan designations;
d) on lands designated Prime Agricultural Areas, provide a detailed agricultural rehabilitation plan which restores substantially the same areas and average soil quality for agriculture as before extraction occurred; and
e) on lands designated Secondary Agricultural Areas, provide an agricultural rehabilitation plan which, whenever feasible, restores substantially the same areas and average soil quality for agriculture as before extraction occurred.

A progressive Rehabilitation Plan has been submitted for the proposed Anthony Pit which was prepared by a qualified expert authorized to prepare site plans under the *Aggregate Resources Act*. As the subject lands are designated 'Secondary Agricultural' and 'Greenlands', the lands will be progressively rehabilitated to agricultural lands with an average soil capability of Class 2 Soils, which is the same and better soil capability as current conditions.

Other rehabilitated features will include two naturalized ponds, new wetlands, and wooded areas. These features will provide aquatic, terrestrial and fish habitat and the final rehabilitation will be compatible with surrounding land uses and approved land use designations.

6.6.9 Mining Below the Water Table

Section 6.6.9 states that extraction below the water table may only be allowed and complete [agricultural] rehabilitation is not required if the following is demonstrated:

a) there is a substantial quantity of mineral aggregates below the water table warranting extraction or the depth of planned extraction in a quarry makes rehabilitation unfeasible;

The subject lands contain about 1 million tonnes of high-quality aggregate material. The majority of the sand and gravel resources located on the subject lands are located below the water table; therefore, there is a substantial quantity of mineral aggregates below the water table warranting extraction. Approximately 3.9 hectares of the extraction area will not be extracted below the water table and be rehabilitated back to an agricultural condition.

b) on lands designated Prime Agricultural Areas, other alternatives have been considered by the applicant and found unsuitable, and rehabilitation in remaining areas will be maximized;

The subject lands are not designated Prime Agricultural Area in the County's Official Plan based on Schedule B7.

c) impacts on the environment, including quality and quantity of surface and groundwater resources, will be minimal; and

Impacts on the environment will be minimized in accordance with provincial and municipal

standards as detailed in the Level 1 & 2 Water Report and Natural Environment Report.

d) *the intended after use will be compatible with the long term uses of adjacent areas*.

The proposed extraction area will be rehabilitated to agricultural land and natural heritage features compatible with the long-term uses of adjacent areas.

Mitigation measures have been developed and the operation has been carefully designed to ensure the proposed pit minimizes social, economic and environmental impacts.

The proposed amendment and pit application conform to the County's Official Plan.

4.3 Township of Puslinch Zoning By-law

The subject lands are zoned Agricultural (A), in the Township of Puslinch Zoning By-law 23/2018 (**Figure 9**). Portions of the subject lands also contain the Environmental Protection (EP) Overlay. This is not a separate zone but an overlay that represents natural heritage features included in the 'Greenlands' designation in the County's Official Plan as well as lands regulated by the Grand River Conservation Authority.

Section 13.2 outlines the special provisions that may apply to proposed development within the EP Overlay. It must be demonstrated that there will be no negative impacts on the specified natural features or their ecological functions. The Natural Environment Report concludes that there are no natural features in the extraction limit within the EP Overlay. Sufficient setbacks from adjacent natural features have been implemented on the ARA site plan.

Surrounding lands are zoned Agricultural (A), Open Space (OS) and Extractive Industrial (EXI).

CBM is applying to amend the Zoning By-law from the Agricultural (A) Zone to the Extractive Industrial (EXI) Zone for the area within the extraction area. The remaining area of the licence, where the visual and acoustic berms; and internal access road are proposed, will be rezoned to Agricultural with site specific provisions (A-sp##).

No changes are proposed to the Environmental Protection Overlay.

A draft Zoning By-law amendment is included as **Appendix C** of this report.

5.0 Aggregate Resources Act Summary Statement

The following information is provided to address the requirements for a Summary Statement for a Class A Licence as set out in the Aggregate Resources of Ontario Standards (2020).

The CVs for the Report Authors are included in **Appendix D**.

5.1 Standard 1.1: Agricultural Classification of the Site

According to Soil Survey and Agricultural Considerations Review (**Appendix A**), the subject lands contain Class 2, 3 4 and 5 soils in which Class 1 to 3 soils are considered prime agricultural lands. The soil series were identified as Dumfries Loam, Burford Loam, Gilford Loam, and Muck Soils. The Burford Loam is described as the well-drained member of the Burford Soil catena occurring over coarse gravels. The Dumfries Sandy Loam is described as the well-drained member of the Burford Soil catena and developed on stony soil derived from limestone. Gilford Loam is the poorly drained member of the Burford Soil Catena and are located in depressional areas and are typically seasonally wet areas, with shallow water tables. Muck soils are very poorly drained organic deposits that have accumulated in shallow lakes, ponds, and undrained depressional areas.

The County of Wellington's Official Plan designates the subject lands as 'Secondary Agricultural' (**Figure 5**). The subject lands are not located within a Prime Agricultural Area based on the County's Official Plan.

Approximately 3.9 ha of the eastern portion of the extraction area are proposed to be returned to an agricultural condition as part of rehabilitation of the Anthony Pit with the same average soil capability as current conditions.

Proposed rehabilitation techniques for agricultural rehabilitation are included on the ARA Site Plan in accordance with the recommendations of the Agricultural Considerations Review.

Please refer to Section 3.5 and **Appendix A** of this Report for further information on agricultural resources.

5.2 Standard 1.2: Applicable Planning and Land Use Considerations

The lands surrounding the proposed Anthony Pit include a licenced aggregate operation, natural heritage features, residential uses, agricultural and rural commercial uses. The closest house is approximately 112 metres from the extraction area. At the time of writing this Report, the County adopted an Official Plan amendment ("OPA 131") to expand the 'Aberfoyle Secondary Settlement Area' adjacent to the boundary of the proposed pit (**Figure 7**).

The subject lands are designated 'Secondary Agricultural' and 'Greenlands' in the County's Official Plan according to Schedule B7 (**Figure 5**). The majority of the subject lands are located within the Mineral Aggregate Resource Overlay on Schedule D of the County's Official Plan (**Figure 8**). The subject lands are zoned Agricultural with an Environmental Protection overlay in the Township's Zoning By-law (**Figure 9**).

In addition to the ARA Licence Application, a County of Wellington Official Plan Amendment and Township of Puslinch Zoning By-Law Amendment are also required to permit the proposed pit.

Please refer to Sections 3.0 and 4.0 of this Report for a further discussion on Planning and Land Use Considerations.

5.3 Standard 1.3: Source Protection Area Considerations

The subject lands are not located within a Wellhead Protection Area, or Issue Contributing Area as identified in the Grand River Source Protection Plan (**Figure 10**). The subject lands are mapped in an Intake Protection Zone 3, Wellhead Water Quantity Zone, and Significant Groundwater Recharge Area.

The Level 1 and 2 Water Report identified the following two conditions that will affect the water table locally as a response to aggregate extraction:

- Water replacement of extracted aggregate; and
- Adjustment of the water table gradient in response to the new pit ponds.

To ensure no adverse impacts to the water resources as a result of the Anthony Pit, the recommendations of the Water Report consist of groundwater level monitoring; groundwater quality testing; equipment fuel filling and maintenance be carried out in accordance with best management practices; and a private well survey be conducted prior to below water extraction to identify private water supply wells in use. The Water Report confirms that the proposed pit will not affect the groundwater recharge potential of the local overburden soils.

5.4 Standard 1.4: Quality and Quantity of Aggregate

The majority of the subject lands are identified as having sand and gravel resources of primary significance according to ARIP 162 (**Figure 3**). Approximately 1.87 ha of the proposed extraction area is not identified as a sand and gravel deposit in the ARIP 162 or the County Official Plan. Site-specific resource testing was undertaken to assess on-site resource quality and quantity, and to confirm the primary material significance throughout the subject lands. Grain size analysis data indicate the gravel size generally ranged from fine to coarse, while the sand size generally ranged from medium to coarse. These sand and gravel soils are typically well graded (i.e., uniformity coefficient greater than 10%) and contain trace amounts of fines (i.e., silt and clay).

Based on the on-site resource testing, there are approximately 1 million tonnes of high-quality sand and gravel resources available within the proposed extraction area. The majority of the sand and gravel resources located on the subject land are located below the water table. The sand and gravel deposit on site has an average thickness of approximately 15 to 22 metres. Resources extracted from the subject lands are capable of producing concrete, crushed stone, granular and sand products.

Resources extracted from the subject lands will be transferred via highway trucks and processed at the CBM Aberfoyle Pit (Licence #5520) or other nearby CBM processing facilities.

Please refer to Section 3.2 of this Report for further information on aggregate quantity and quality.

5.5 Standard 1.5: Main Haulage Routes

Materials extracted from the subject lands are proposed to be processed at the CBM Aberfoyle Pit or other nearby CBM processing facilities and then shipped to market. Extracted material will be hauled using highway trucks from the subject lands approximately 6.0 km to the existing pit, along Victoria Road South, Wellington Road 34 and Concession Road 7. There will be no truck traffic heading south on Victoria Road South.

The Traffic Impact Study found that during there would be 12 trips during both the AM and PM peak hours (6 inbound, 6 outbound).

A single truck entrance/exit is proposed along the eastern terminus of the subject lands along Victoria Road South. An access permit will be obtained from the Township as the applicable road authority.

Please refer to Section 3.6 of this Report for further information on haul routes and truck traffic.

5.6 Standard 1.6: Progressive and Final Rehabilitation

The lands will be extracted to a maximum depth of approximately 304 masl. Two ponds will result from the extraction activity. The two ponds will be positioned in the southwestern portions of the subject lands and be separated by a small wetland (0.09 ha) pocket created as part of the rehabilitation process. The pond located on the western edge of the property will be approximately 1.7 hectares in size. The pond to the east of the western pond will be approximately 2.2 hectares in size. Below water, the rehabilitated side slopes will be 2:1 or the natural angle of repose, while the above water side slopes will be 3:1. Shallow and undulating shoreline areas are proposed around the perimeter of the ponds to create varying topography and pond depths.

Approximately 1.8 hectares of new forest cover will be created which is proposed to occur within the 30 metres setback areas adjacent to the Mill Creek PSW primarily along the northern, southern and western setback areas. An agricultural area of 3.9 hectares will be created in the eastern portion of the extraction limit where no below water extraction is proposed. These features will be created progressively as extraction proceeds through the site as outlined on the phasing plans of the ARA Site Plans.

The rehabilitated landform will be compatible with the surrounding area.

Refer to Section 2.3 of this Report and the ARA site Plans (Rehabilitation Plan) for additional details regarding progressive and final rehabilitation.

6.0 Conclusions

CBM is applying for a Class 'A' Licence under the *Aggregate Resources Act*, a County of Wellington Official Plan Amendment and a Township of Puslinch Zoning By-law Amendment to permit aggregate extraction below the water table on lands located at 4454 Victoria Road South, legally described as Part of Lot 22, Concession 8, Township of Puslinch, County of Wellington.

The subject lands contain about 1 million tonnes of high-quality sand and gravel resources in a location that is close to market with ongoing aggregate extraction and approved facilities to process the materials extracted from the subject lands. Resources extracted from the subject lands will help support the timely provision of infrastructure.

The operational design of the pit incorporates the recommendations of the technical reports prepared for the application in order that the pit can operate within Provincial guidelines and minimize social, economic and environmental impacts.

The proposed Anthony Pit represents the wise use and management of significant aggregate resources and is in the public interest in consideration of the economic, social and environmental factors that apply to this application. The proposal is consistent with the PPS and conforms to the Wellington County Official Plan.

Respectfully submitted,

MHBC

[redacted]

Neal DeRuyter, BES, MCIP, RPP
Partner

Vince Deschamps, M.Sc, MCIP, RPP
Associate

[redacted]

Yara Elmahdy, BES
Planner

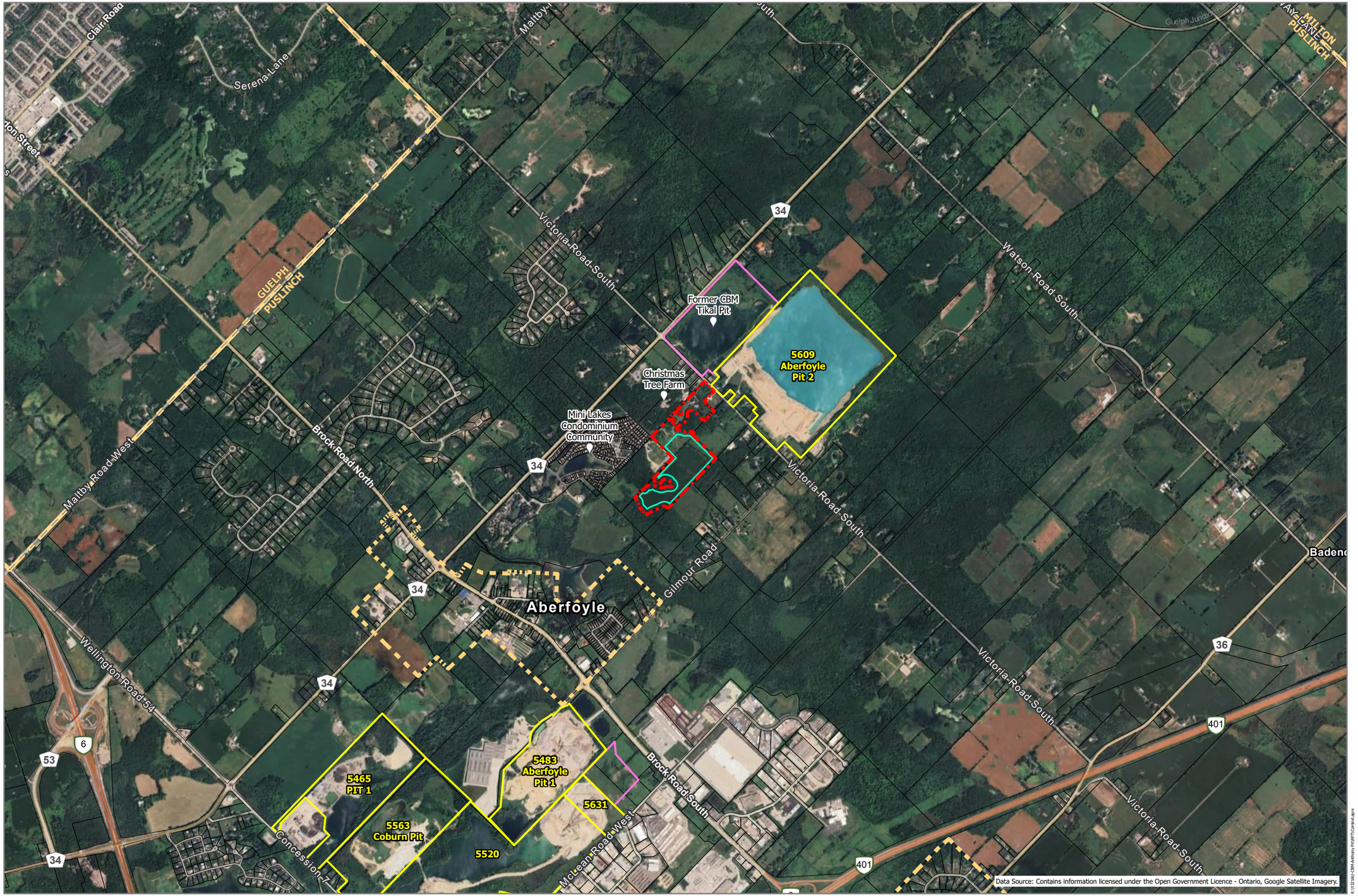


Figure 1 - Context Plan

- Boundary of Area to be Licensed
- Limit of Excavation
- Aggregate Site Authorized Active
- Innactive Aggregate Site
- Municipal Boundary
- Settlement Area

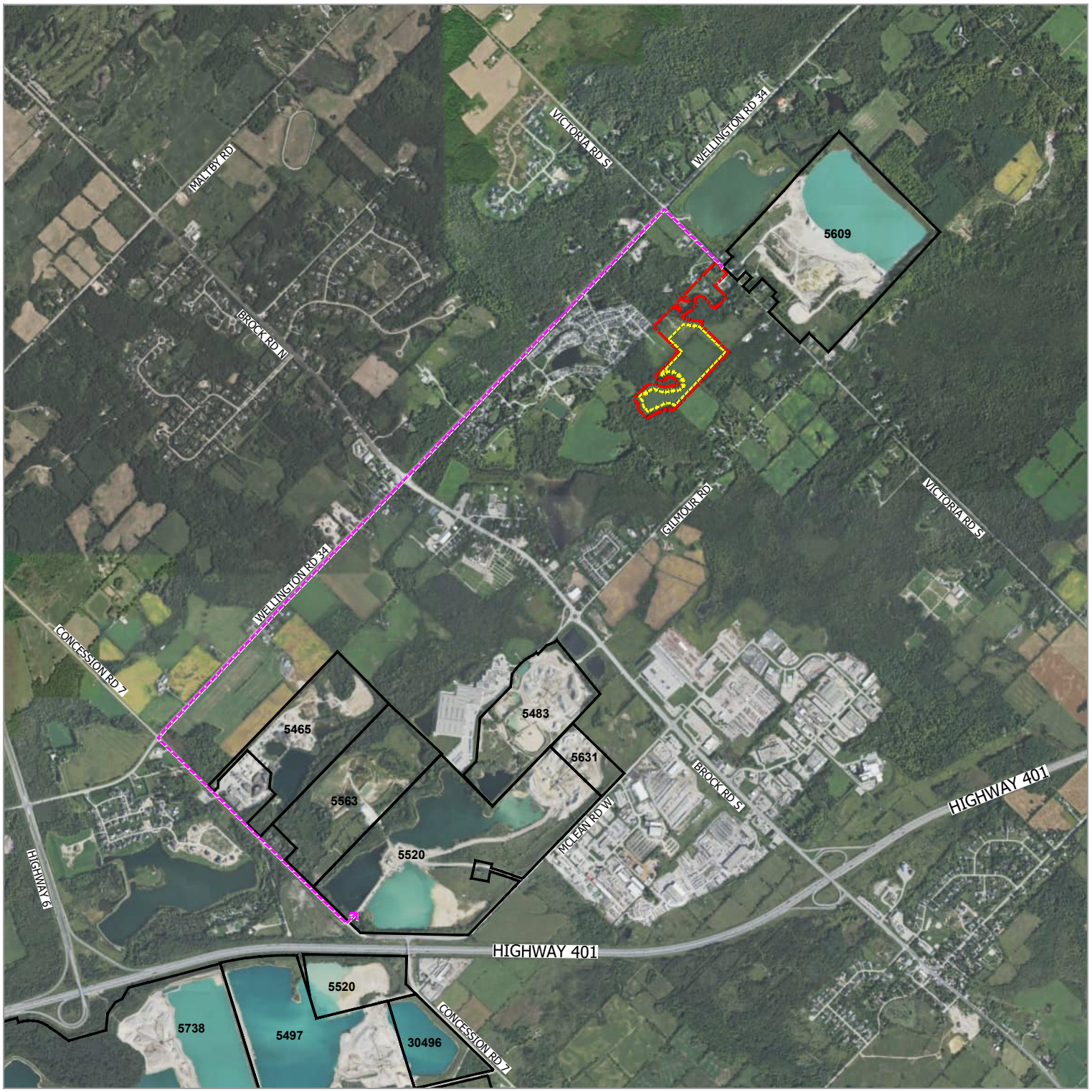


Figure 2 - Proposed Haul Route to Aberfoyle Pit (Licence # 5520)

Boundary of Area to be Licensed

Proposed Limit of Excavation

Aggregate Site Authorized Active

Proposed Haul Route

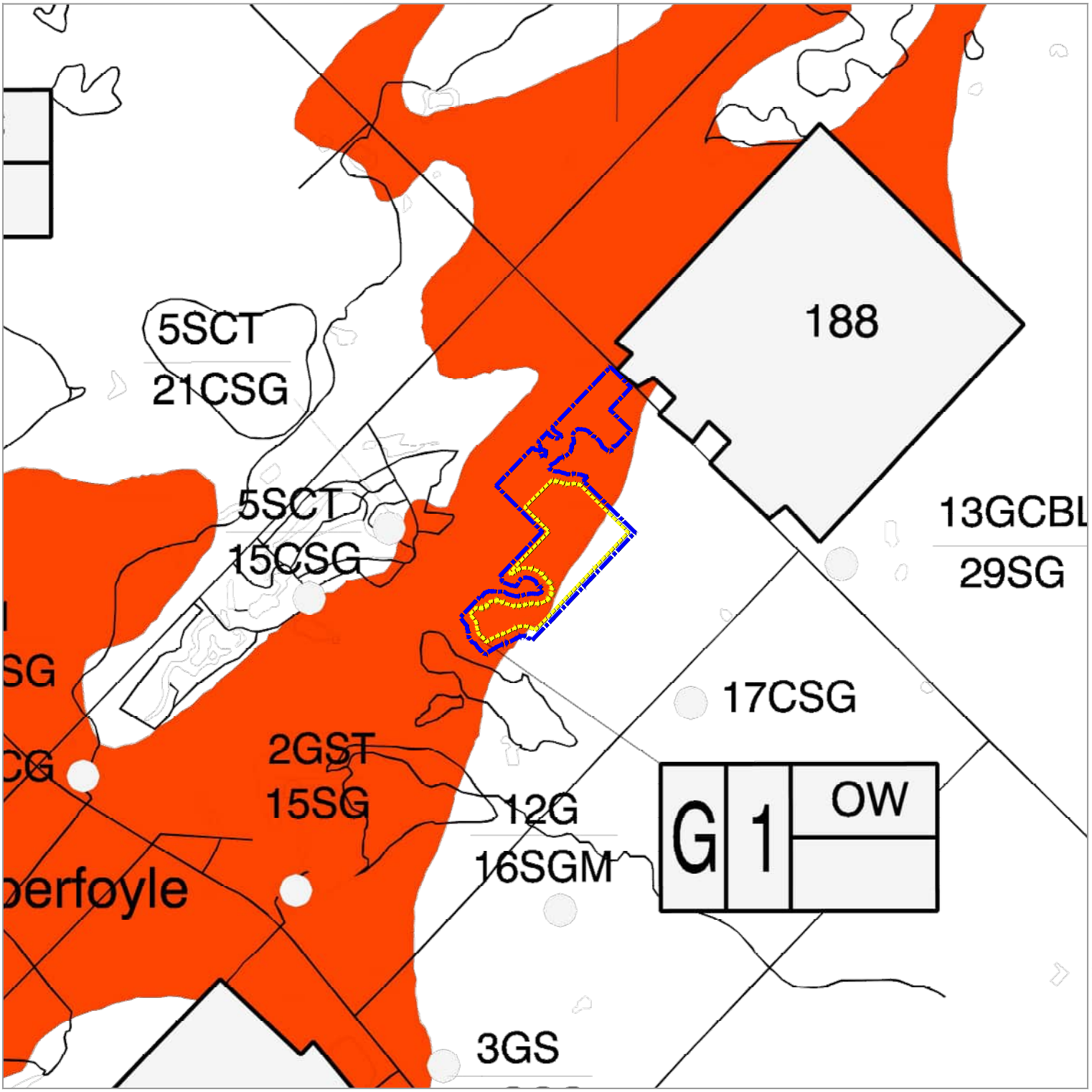


Figure 3 - Wellington County Aggregate Resources Inventory Paper 162 Sand and Gravel Resources

Boundary of Area to be Licensed

Limit of Excavation

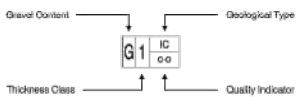
Selected sand and gravel resource area, primary significance; deposit number; see Table 3.

Selected sand and gravel resource area, secondary significance.

Sand and gravel deposit, tertiary significance.

Other surficial deposits or exposed bedrock.

DEPOSIT SYMBOL



Deposits are identified by Gravel Content, Thickness Class, Geological Type and Quality Indicator. Gravel Content is expressed as a percentage of gravel-sized material (i.e., material retained on the 4.75 mm sieve). Thickness Class is based on potential aggregate tonnage per hectare. Geological Type refers to geological origin. Quality Indicator describes objectionable grain size and lithology.

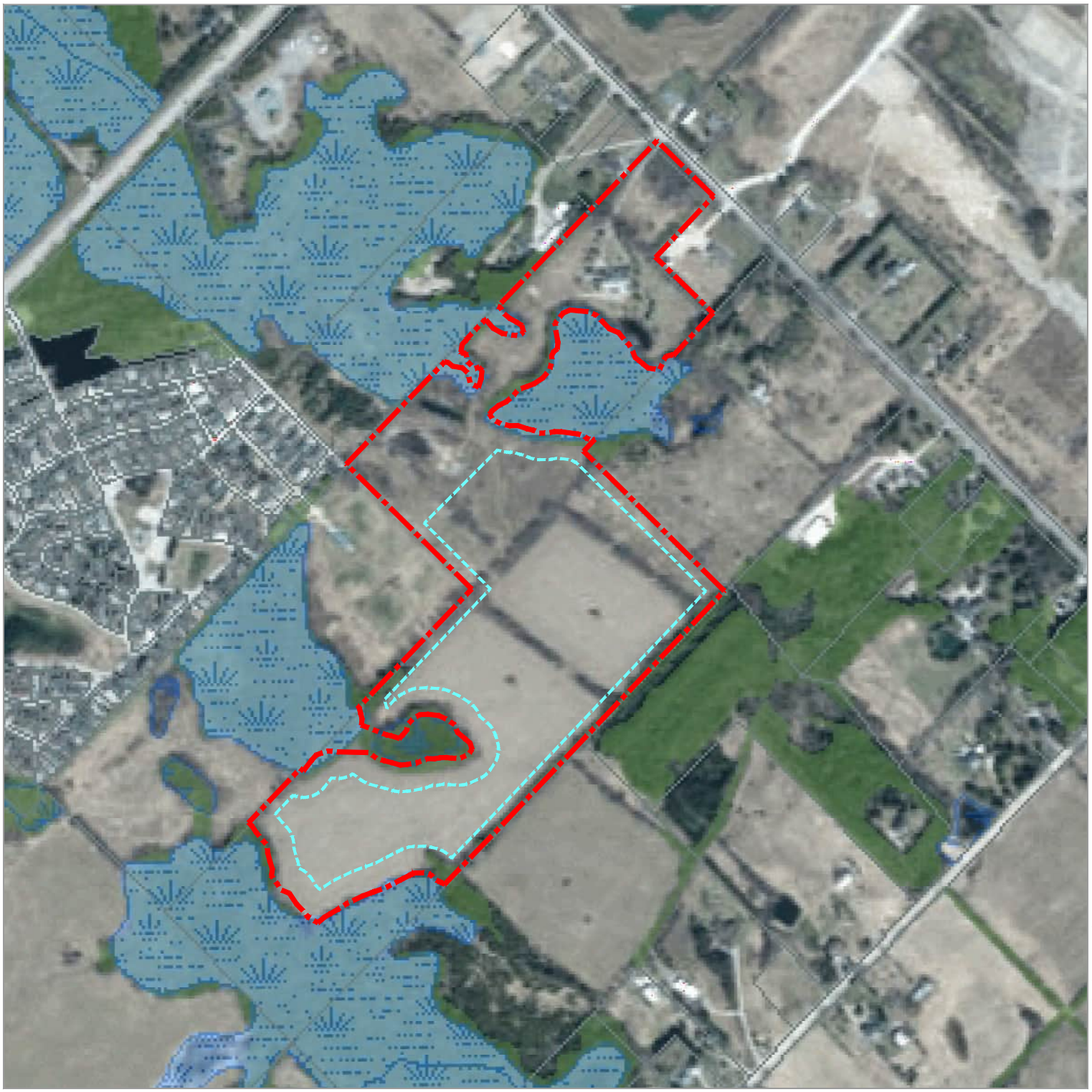


Figure 4 - Natural Heritage System

- Boundary of Area to be Licensed
- Proposed Limit of Excavation
- Unevaluated Wetland
- Provincially Significant Wetland
- Woodland

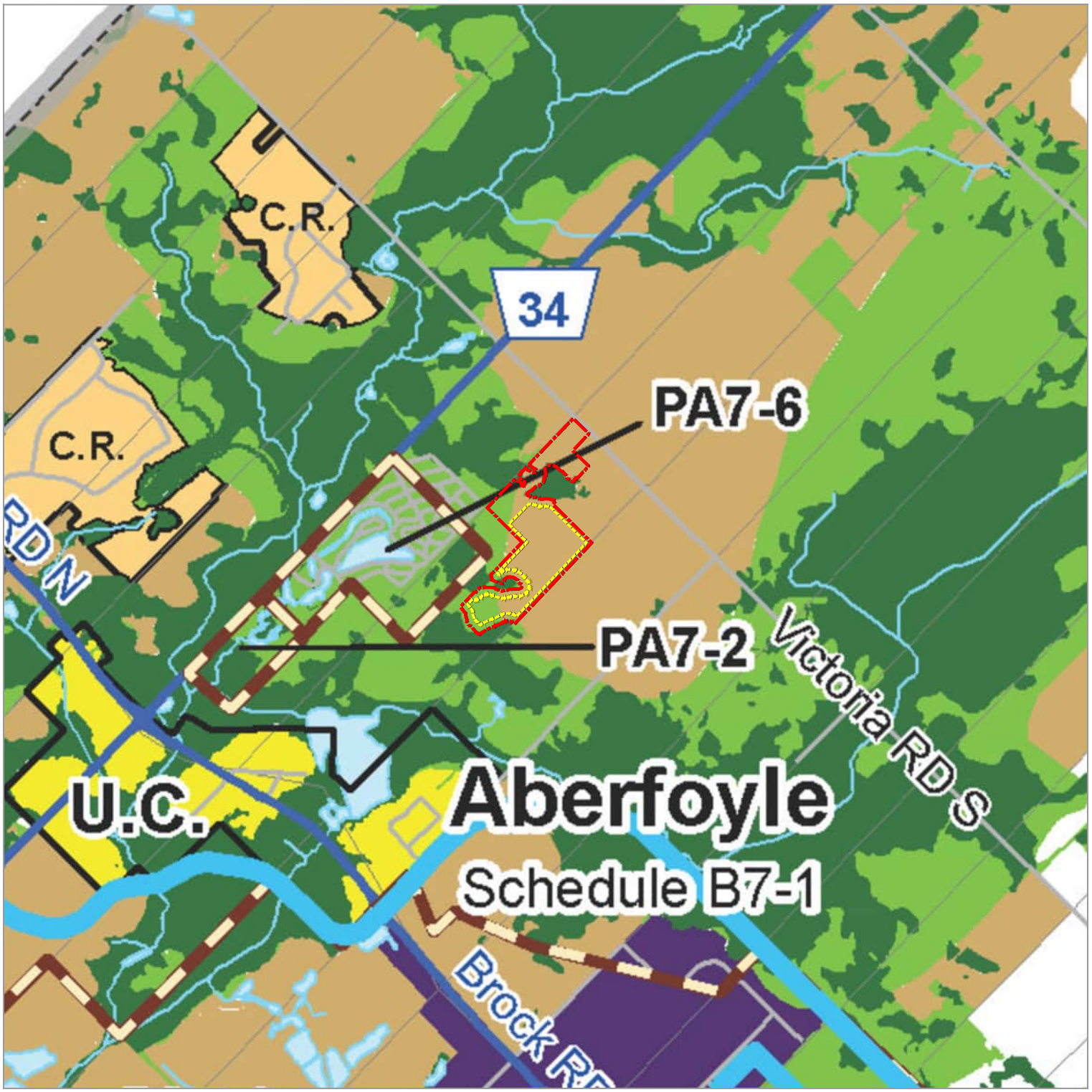


Figure 5 - County of Wellington Official Plan, Schedule B7 Land Use

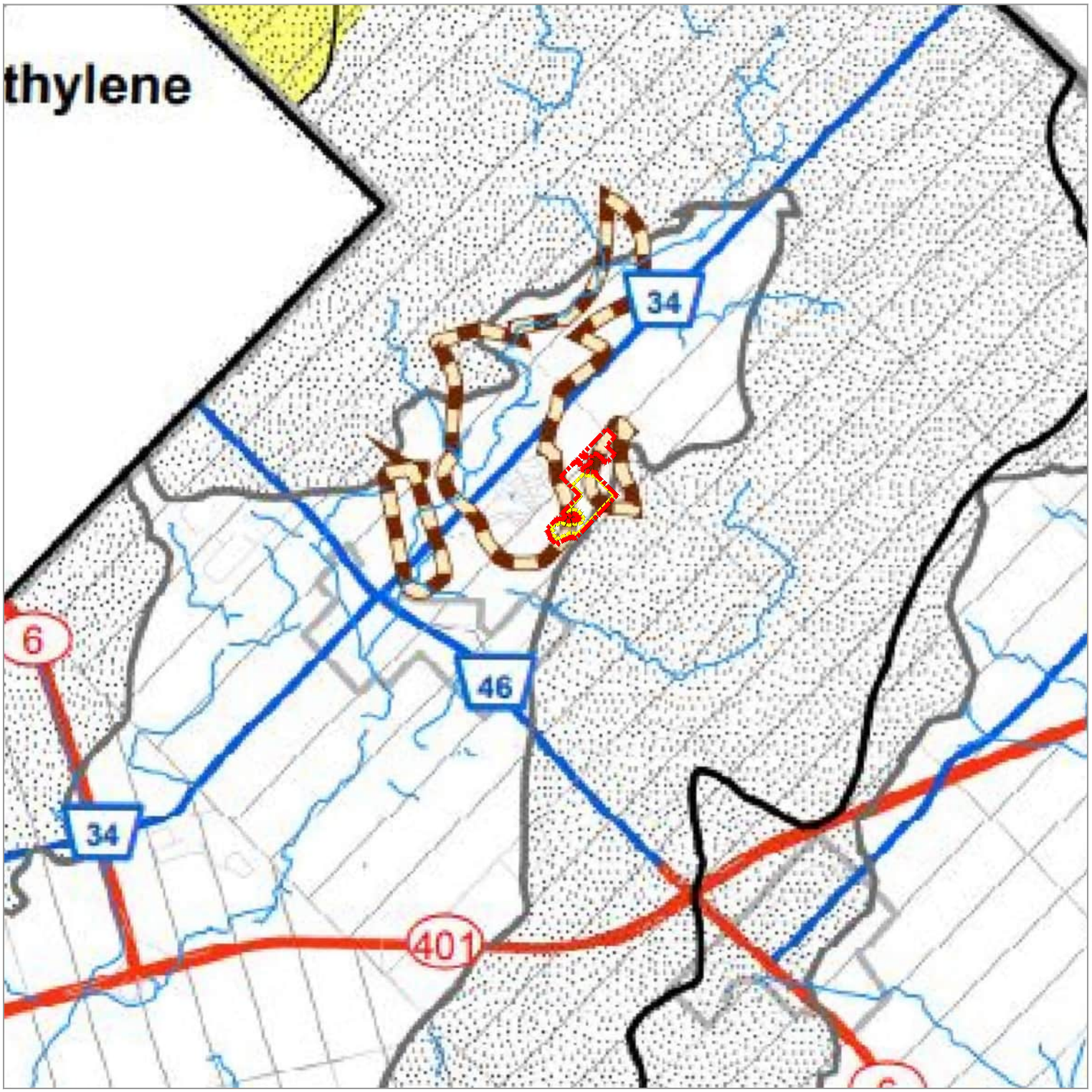


Figure 6 - County of Wellington Official Plan, Schedule C7 Sourcewater Protection Puslinch

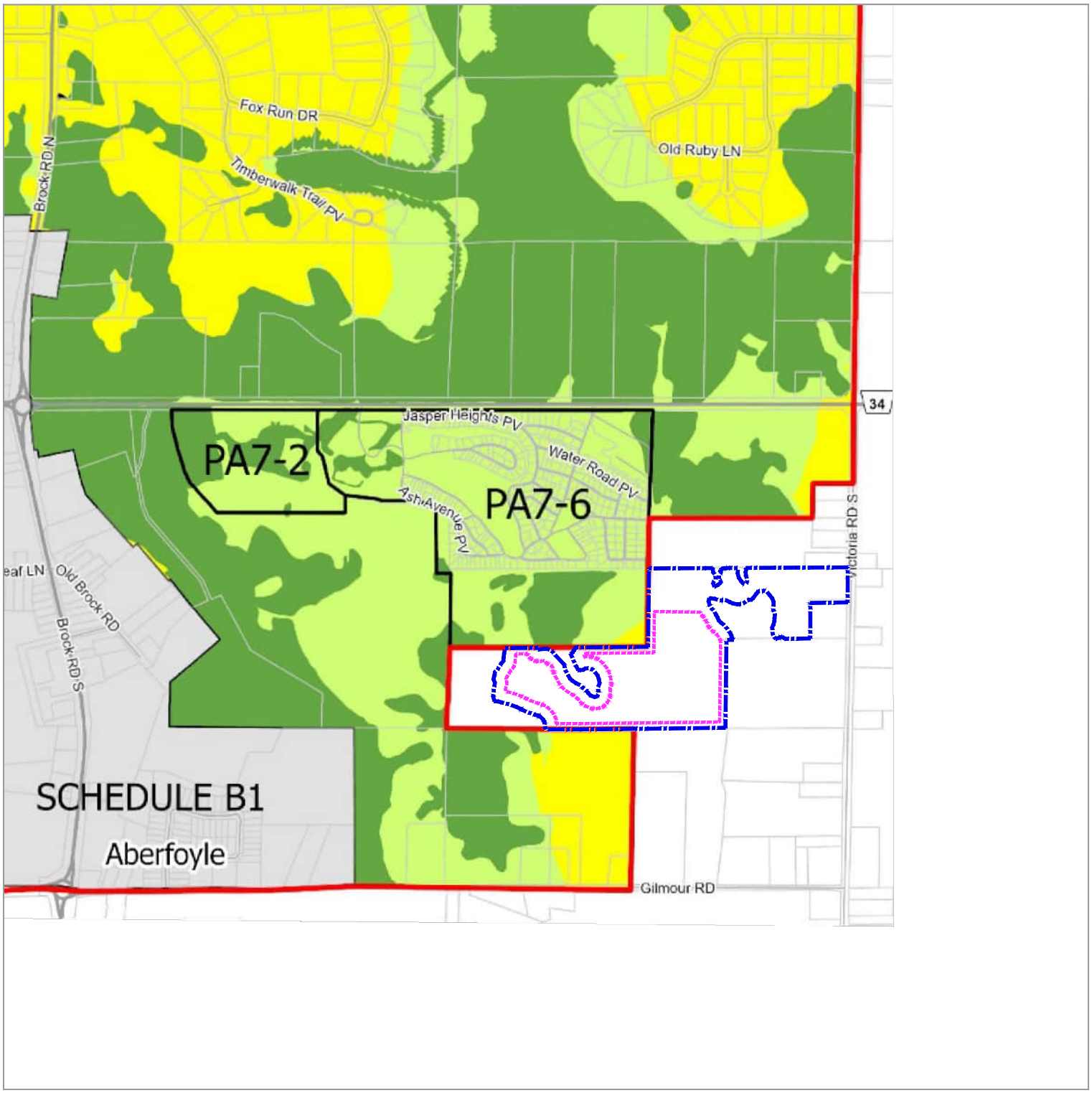


Figure 7 - County of Wellington Official Plan Amendment No. 131, Schedule A-5

- Boundary of Area to be Licensed
- Proposed Limit of Excavation
- Expanded Aberfoyle Boundary
- Lands to be redesignated Residential
- Lands to be redesignated Highway Commercial
- Lands to be redesignated Residential Transition
- Lands to be redesignated Industrial
- Lands to be redesignated Greenlands
- Lands to be redesignated Core Greenlands
- Core Greenlands and Greenlands to remain
- Current Aberfoyle Boundary
- Existing Policy Area
- Lands to be subject to New Policy Area

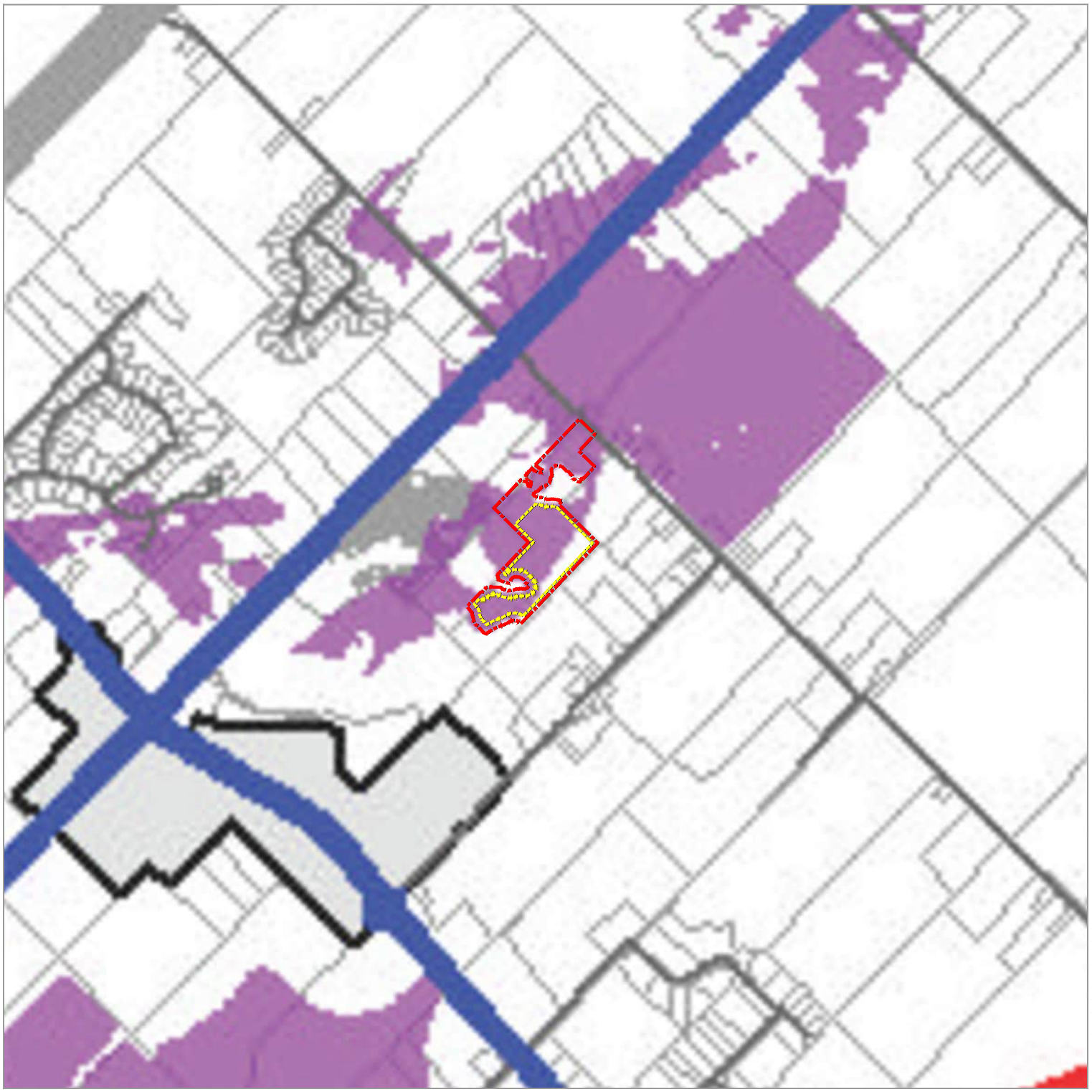


Figure 8 - County of Wellington Official Plan, Schedule D Mineral Aggregate Resource Overlay

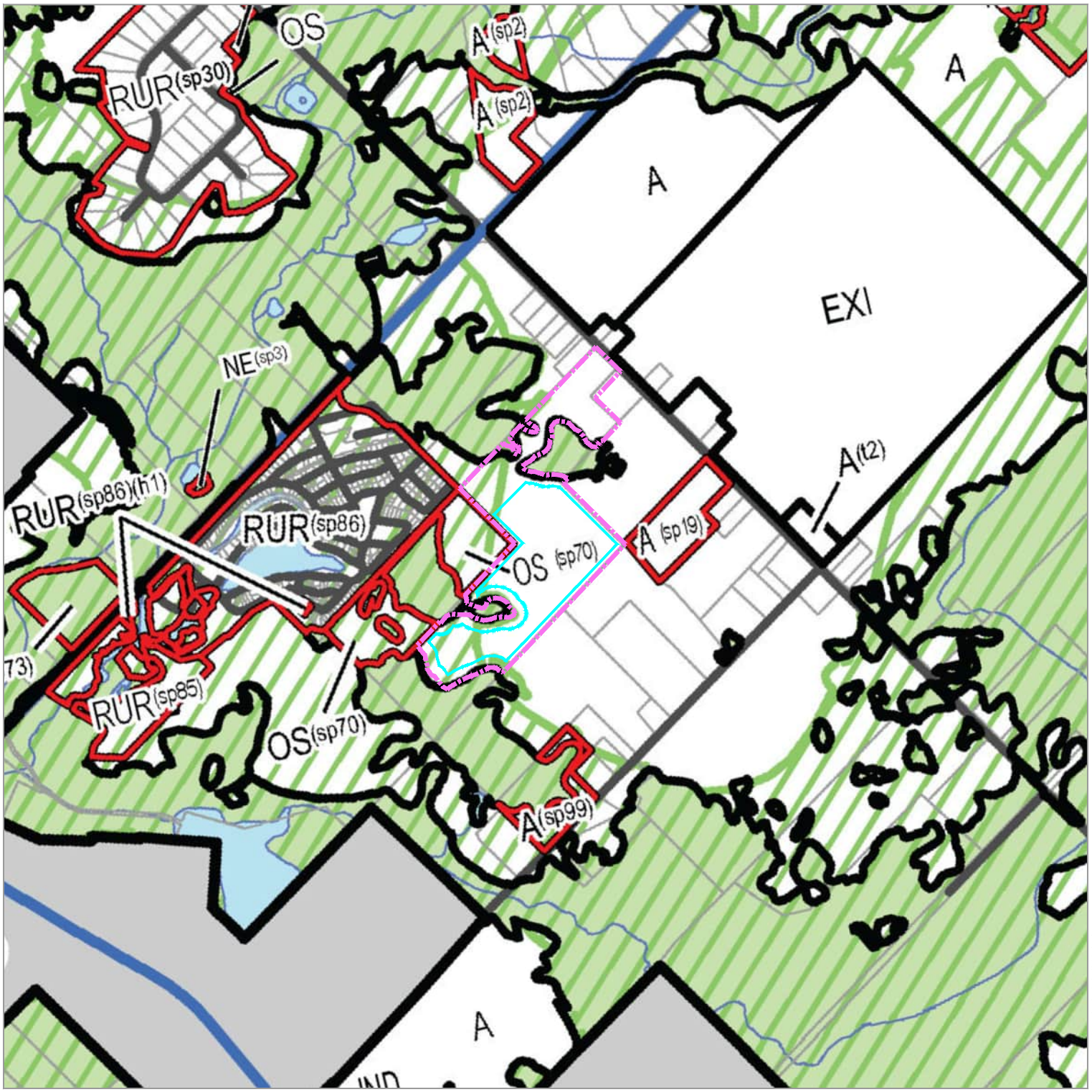


Figure 9 - Township of Puslinch Zoning By-law No. 023-18, Schedule 'A'

Boundary of Area to be Licensed

Proposed Limit of Excavation

Site Specific Exemption

Zoning Limits

Environmental Protection Overlay

Natural Environment

Zone Descriptions

A	Agricultural	HC	Highway Commercial	RR	Resort Residential
AC	Agricultural Commercial	HR	Hamlet Residential	RUR	Rural Residential
C	Commercial	I	Institutional	UR	Urban Residential
CMU	Core Mixed Use	IND	Industrial	f-	Aberfoyle Flood Plain Overlay
DI	Disposal Industrial	NE	Natural Environment	(sp#)	Site Specific Exemption
EXI	Extractive Industrial	OS	Open Space	(h#)	Holding Provision
FD	Future Development	RC	Resort Commercial	(t#)	Temporary Zone

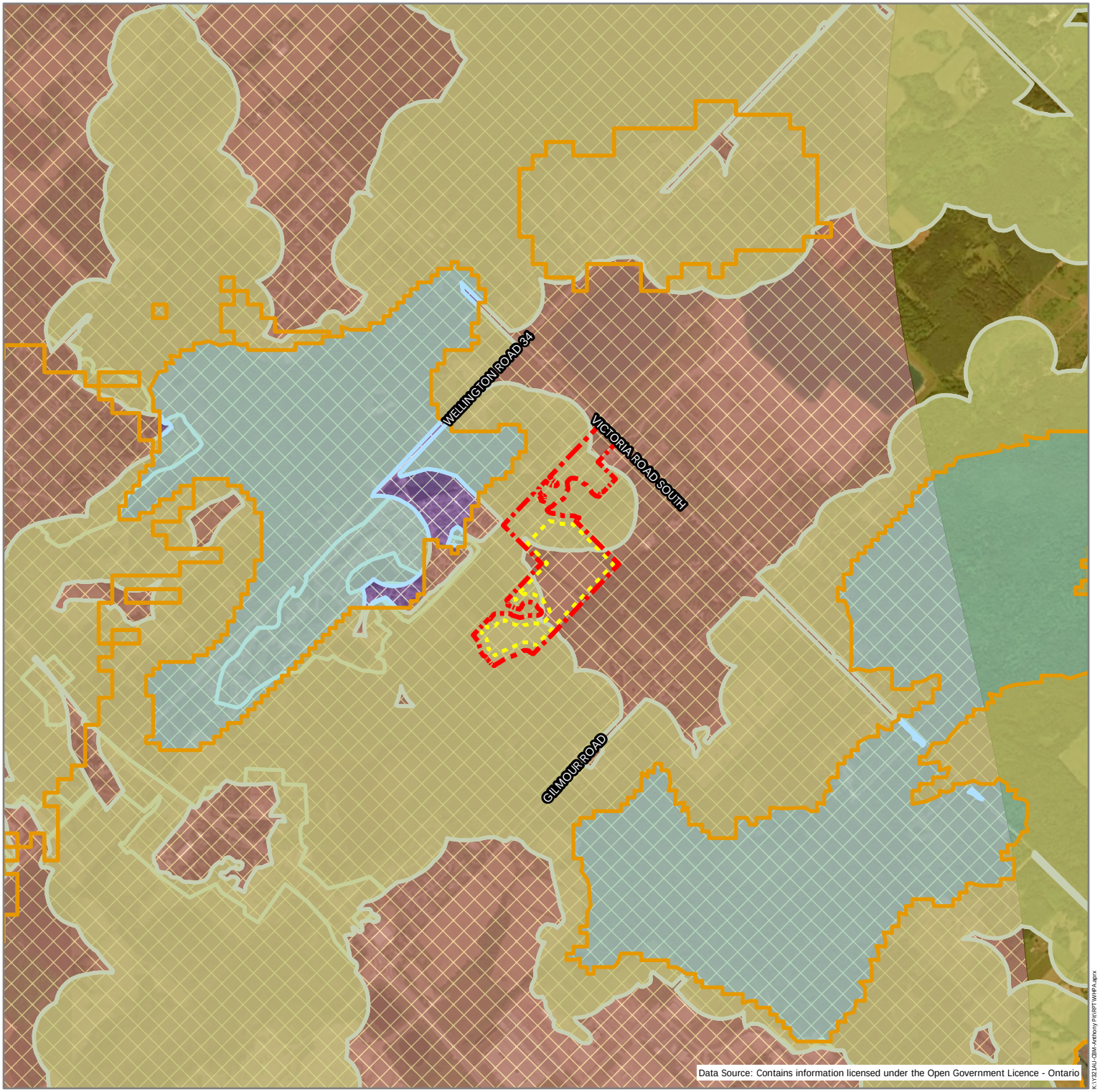


Figure 10 - Grand River Source Water Protection Plan

Boundary of Area to be Licensed

Limit of Excavation

Significant Ground Water Recharge Area (GRCA) - NA

IPZ (Intake Protection Zone) - 3 (GRCA)

Wellhead Water Quantity Zone (GRCA)
Significant Risk (Draft)

A

Appendix A: Agricultural Considerations Review

MHBC | PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

January 5, 2026

CBM Aggregates, a division of St. Marys Cement Inc. (Canada)
55 Industrial Street
Toronto, ON
M4G 3W9

RE: Proposed Anthony Pit: Agricultural Considerations Review
OUR FILE Y321AU

MacNaughton Hermsen Britton Clarkson Planning Ltd. ("MHBC") has been retained by CBM Aggregates, a division of St. Mary's Cement Inc. (Canada) ("CBM"), to complete an Agricultural Review in support of their application to permit the Anthony Pit on lands located at 4454 Victoria Road South, legally described as Part of Lot 22, Concession 8, Geographic Township of Puslinch (**Figure 1**). The proposed pit is a below water, Class A licence pit application.

The purpose of this letter is to outline any potential impacts that the proposed pit may have on the agricultural system, and the agricultural operations in the surrounding area. The subject lands are designated 'Secondary Agricultural Area' within the Wellington County Official Plan (**Figure 2**). The Plan defines Agricultural Impact Assessment as "*means a study that evaluates the potential impacts of non-agricultural development on agricultural operations and the Agricultural System and recommends ways to avoid or, if avoidance is not possible, minimize and mitigate adverse impacts*".

It also defines Agricultural System as:

> "*the system mapped and issued by the Province, comprised of a group of inter-connected elements that collectively create a viable, thriving agricultural sector. It has two components:*
>
> 1. *An agricultural land base comprised of prime agricultural areas, including specialty crop areas and rural lands that together create a continuous productive land base for agriculture;*
> 2. *An agri-food network which includes infrastructure, services, and assets important to the viability of the agri-food sector."*

Key Findings & Summary:

- Northeast of the subject lands are buffered from surrounding agricultural operations and rural residential uses via the Natural Heritage System (NHS) Area.
- The majority of the subject lands are designated Secondary Agricultural by the County. Northeast of the subject lands is within Core Greenlands and Greenlands designation.
- The subject lands are not designated as Prime Agricultural Area in the County's Official Plan.

- The subject lands contain CLI Class 2,3,4 and 5 soils, with Class 2 being the most abundant. They are not identified as a Specialty Crop Area by Provincial Mapping.
- The secondary study area consists primarily of aggregate pits, and rural residential lots, with some cash cropping/hay production.
- The proposed pit extension is not anticipated to have any negative impacts on the agricultural system in the area, subject to the implementation of recommended mitigation measures.

Introduction & Project Description:

The Anthony Pit lands are located at 4454 Victoria Road South, legally described as Part of Lot 22, Concession 8, in the Geographic Township of Puslinch. The application is for a Class A below water pit, with an annual extraction limit of 1,000,000 tonnes. Based on studies completed by CBM, there is an estimated 1 million tonnes of high-quality sand and gravel resources available within the proposed extraction area.

The proposed application is for extraction of a below water pit on the subject lands with a proposed licenced area of 18.0 hectares (44.5 acres). The proposed extraction area of the pit is approximately 8.7 hectares (21.5 acres). The proposed pit will not contain any processing, washing, or recycling on the site. There will be no water taking (pumping or dewatering) on site. Materials will be extracted via excavators and dragline, stockpiled within the extraction area and then shipped via highway trucks, for processing at the Aberfoyle Pit (Licence #5520) and other nearby CBM processing facilities. The proposed Anthony Pit will be accessed via the existing entrance located at the east end of the subject lands. Truck travel will not be permitted to head south from the subject lands on Victoria Road South. Trucks will use the existing access for pit access.

The Anthony Pit is proposed to be extracted to a maximum depth of 304.0 masl; the depth varies between 2 metres and 21 metres. The removal of aggregate resources from below the water table will result in the creation of two ponds that (together) will total approximately 3.9 hectares in area. Shallow shoreline areas are proposed around the perimeter of the ponds.

The project is required to apply for an Aggregate Resources Act licence. This application requires several technical studies which have been reviewed as part of this letter. These include:

- Aggregate Resources Act Site Plans, MHBC Planning Ltd.
- Planning Report and Aggregate Resources Act Summary Statement, MHBC Planning Ltd.
- Water Report (Level 1 & 2), Stantec.
- Maximum Predicted Water Table Report,
- Natural Environment Report (EIS), Stantec.
- Transportation Impact Assessment, CIMA+.
- Cultural Heritage Report, Stantec.
- Stage 1 & 2 Archaeological Assessment, Stantec.
- Noise Assessment Report, Stantec.
- Best Management Plan for Fugitive Dust, Stantec.

As part of this review, the following documents and resources were also reviewed:

- Site plans including Existing Features Plan, Operational Plan, and Rehabilitation Plan;
- Soil data resource information, which should include Ontario Soil Survey reports and mapping, the provincial digital soil resource database, Canada Land Inventory Agricultural Capability mapping, and Soil Suitability information and mapping;

- Aerial Photography (historic and recent) with an effective user scale of 1:10,000 or smaller;
- OMAFRA's constructed and agricultural Artificial Drainage Mapping;
- Agricultural Systems data form OMAFRA's Agricultural Systems Portal;
- Parcel mapping/fabric of the area.
- Soil Survey and Canada Land Inventory Classification was prepared by DBH Soil Services Inc.;
- Agronomy Guide for Field Crops – Publication 811;
- Statistics Canada (2021 and 2011)

An agricultural land use assessment was conducted with additional information gathered from Google Satellite imagery used to gain a better understanding of agricultural operations in the primary and secondary study areas that were inaccessible or unobservable. A summary of the land use assessment is included in this report. The potential for impacts will vary based on the type, concentration, and sensitivity of agricultural activities identified in the Primary and Secondary Study Areas.

The purpose of this Agricultural Considerations Letter is to provide a high-level evaluation of the potential impacts of the proposed aggregate extraction operation on surrounding agricultural operations as well as the greater Agricultural System. This letter will identify any potential mitigation measures to minimize and mitigate any potential impacts to the extent feasible.

As previously discussed, the subject lands are designated 'Secondary Agricultural Area' within the Wellington County Official Plan, according to Schedule B7. The Official Plan does not consider Secondary Agricultural Areas as Prime Agricultural Areas. As such, the PPS does not require an Agricultural Impact Assessment in support of the proposed applications.

The Wellington County Official Plan requires consideration of capabilities of the lands for agriculture (Policy 6.6.5c) and agricultural rehabilitation where feasible (Policy 6.6.8e) for applications to permit mineral aggregate operations, including in Secondary Agricultural Areas. As such, this section provides a review of soil capability for agriculture and surrounding agricultural land uses, an assessment of any potential impact to surrounding agricultural uses and resources, and recommendations for the area of the site proposed to be rehabilitated to agriculture.

Description of Soils

The Canada Land Inventory (CLI) system uses soil attributes to create a seven-class system of land use capabilities. Class 1, 2 and 3 soils are capable of sustained common field crop production. Class 4 soils are limited for sustained agriculture while Class 5 is capable for use of permanent pasture and hay. The sixth class is best utilized for wild pasture and Class 7 is for soils or landforms that are not capable for use for arable culture or permanent pasture. According to the Canada Land Inventory Soils Map produced by the province, (**Figure 3**), the subject lands are comprised of CLI Class 2, 3, and 5 soils. CLI Class 2 and 3 soils are considered prime agricultural soils (see Section 4.1 of this report for further discussion on this matter).

To confirm the soil type and classification and to help inform the rehabilitation plans, a Soil Survey and Canada Land Inventory Classification was prepared by DBH Soil Services Inc. (DBH). A copy of the Soil Survey is included as **Attachment B** of this letter. On-site soil surveys were conducted on May 3rd, 2024, to more accurately map and classify the soil resources of the soil materials on the subject lands. The soil survey included a number of tasks including:

- Completion of a review of published soil data;

- Review of published Canada Land Inventory (CLI) ratings for the soils in the area surrounding the subject lands;
- Review of aerial photography and interpretation of the soil polygons, disturbed soil areas and miscellaneous landscape units (i.e. streams, wayside pits);
- On-site soil survey; and
- Mapping to illustrate the location of the subject lands, the occurrence of soil polygons and appropriate CLI capability ratings.

A total of 19 soil inspection sites within the proposed licenced area were examined and the information was then correlated with soil descriptions in order to produce the soils map. A soil map identifying the soil series present on the subject lands is shown on **Figure 4**. The majority of the soil inspection sites were limited to shallow depths (topsoil, A horizon only) due to the stoniness of the soil materials.

The onsite soil survey identified four soil series, and one miscellaneous soil group. The soil series were identified as Dumfries Loam, Burford Loam, Gilford Loam, and Muck Soils. The miscellaneous soil group was identified as disturbed lands and include the residential unit area, the laneways, and any areas where the surface soil materials have been altered.

Dumfries Loam is the well-drained member of the Dumfries Soil catena and developed on stony soil material derived from limestone. Burford Loam is the well-drained member of the Burford Soil catena and are well drained loam materials occurring over coarse gravels. Gilford Loam is the poorly drained member of the Burford Soil Catena and are located in depressional areas and are typically seasonally wet areas, with shallow water tables. The surface soils generally comprise high organic matter content, while the lower layers comprise gleyed materials and gravels within 50 cm of the surface. Muck soils are very poorly drained organic deposits that have accumulated in shallow lakes, ponds, and undrained depressional areas.

The following tables summarize the relative percent area occupied by each capability class for the subject lands:

Table 1: Canada Land Inventory – Anthony Pit

Canada Land Inventory Class (CLI)	Licence Area		Limit of Extraction	
	Area (ha)	Percent Occurrence (%)	Area (ha)	Percent Occurrence (%)
Class 1	-	-	-	-
Class 2	12.5.	53.9	9.6	92.2
Class 3	1.3	5.6	0.1	1.2
Class 4	0.8	3.4	0.1	1.2
Class 5	0.7	3.0	-	-
Class 6	-	-	-	-
Class 7	-	-	-	-
Not Rated	7.9	34.1	0.6	5.5
Totals	23.5	100	10.4	100

The proposed licensed area is comprised of approximately 59.5 percent Canada Land Inventory (CLI) class 1 – 3 soils, with CLI class 2 representing approximately 53.9 percent, and CLI class 3 representing approximately 5.6 percent. The remaining mineral soils (CLI class 4 – 7) comprise approximately 6.4 percent of the licenced area. Unrated soils comprise 34.1 percent of the licenced area. The Extraction Area comprises approximately 93.4 percent CLI class 1 – 3 soils, with CLI class 2 representing approximately 92.2 percent and CLI class 3 representing approximately 1.2 percent. The remaining mineral soils (CLI class 4 – 7) comprise approximately 1.2 percent of the Limit of Extraction Area. The DBH analysis confirms that a large portion of the subject lands is comprised of Class 2 soils. The presence of the Class 2 and 3 soils mean that the subject lands are considered prime agricultural lands.

Concerning drainage on the properties, an evaluation was done by DBH through a correlation of observations noted during windshield surveys, aerial photographic interpretation, and a review of the OMAFRA's Artificial Drainage System Mapping. Based on the information available, it does not appear that drainage systems are registered to the subject lands. As well, observations noted during the surficial soil survey indicated that the lands are not irrigated, and that the property is not set up for the use of irrigation equipment. Therefore, no additional investment in agriculture is associated with these lands.

The Hoffman Productivity Index (HPI) is a tool that is used to relate the productivity of lands to the CLI soil capability. The value is derived from the sum of the percent occurrence of each CLI Soil Capability Class on the parcel multiplied by the productivity index corresponding to the soil class. Based on the findings from the Soil Survey prepared by DBH Soil Services Inc., the calculated Soil Productivity Rating is 0.49 or a CLI class 4 equivalent for the proposed licenced area, and 0.75 or a CLI Class 2 equivalent for the proposed extraction area.

Agricultural Uses on the Subject Lands and the Surrounding Area

The agricultural land use assessment completed as part of this review was based on a study area comprised of a 'Primary Study Area' and 'Secondary Study Area.' The Primary Study Area is comprised of the lands within 120 metres of the proposed area to be licenced that will be directly affected by aggregate extraction. The Secondary Study Area encompasses a radius of 1.5 kilometers from the subject lands that has the potential to be directly and/or indirectly impacted by the proposed aggregate extraction operations.

A plan identifying the adjacent properties, existing crops, and existing barns within the study area is included as **Figure 5** of this letter. The inventory of existing agricultural land uses, cropping practices and structures is based on observations made during a site visit, review of air photography and input from the current landowner. A review of 2021, 2016, and 2011 Census of Agriculture data was also undertaken to confirm if the agricultural uses in the Study Areas are representative of agricultural production patterns and livestock types in the broader region.

Primary Study Area

Based on the Ontario Ministry of Agriculture, Food, and Agribusiness (OMAFA) 'Draft Agricultural Impact Assessment (AIA) Guidance Document' (herein referred to as 'OMAFA AIA Guidelines'), the primary study area when conducting an Agricultural Impact Assessment for mineral aggregate

resource extraction consists of the proposed licence area and lands within 120 metres of the licenced area. As shown in **Figure 5**, land uses within the primary study area consist of agriculture and rural residential with natural heritage features (woodlands and wetlands) interspersed. Agricultural uses within the primary study area consist of typical cash crops (corn) with some fields visible only in aerial imagery (due to surrounding woodlots) making roadside crop identification impossible. Through a review of aerial imagery, these fields do not appear to have any established specialty cropping practices or perennial crops (ex. orchards) that stray from the characteristics of the surrounding agricultural area. At the time of the site visit, agricultural production on the lands consisted of corn production. No agricultural structures were present on the lands. There are no visible signs of extensive agricultural improvements to the lands proposed to be licenced (e.g. new fencing, tile drainage).

Secondary Study Area

According to the OMAFRA AIA Guidelines, the secondary study area should include lands that will be potentially impacted by the development and should, at a minimum, include lands adjacent to the primary study area. For mineral aggregate operations, the extent of the secondary study area varies depending on the scale and extent of the proposed mineral aggregate operation and on agriculture in the surrounding area. The secondary study area for this review includes lands within 1.5 kilometers of the proposed licenced boundary.

As shown on **Figure 5**, land uses within the secondary study area generally consist of a mixture of agriculture (cash crops), environmental features (wetlands and woodlands), and lands within the Aberfoyle Settlement Area. Surrounding crops (at the time of the site visit) included hay and soy (southeast), and corn (south). As well, a Christmas Tree farm (Ho Ho's Christmas Trees) is mapped northwest and adjacent to the subject lands; no plantation style coniferous tree plantings are observable from aerial imagery. Several fields within this area were observed as fallow at the time of the site visit. Four livestock operations were observed within the Secondary Study Area. A boarding kennel was observed just southeast of the subject lands off Victoria Road South.

Based on the site visit, the agricultural lands within the Primary and Secondary Study Areas reflect typical agricultural cropping practices that are predominant throughout southern Ontario (soybean and corn production). No extensive land improvement investment such as tile drainage, irrigation or other specialized cropping practices or equipment was observed or documented within the Primary or Secondary Study Areas.

The surrounding area (Secondary Study Area) also includes two aggregate pits: Aberfoyle Pit 2 (Licence No. 5609) and Aberfoyle Pit 1 (Licence No. 5483). More aggregate operations exist beyond the Secondary Study Area to the south-west of the site. A Rural Employment Area is also located just south of the Secondary Study Area.

There are also many rural residential lots within the Secondary Study Area, along Victoria Road South, Wellington Road 34, and Gilmour Road. A number of these lots were likely created through rural residential severances or by plan of subdivision.

Overall, the Secondary Study Area is representative of normal cropping practices for the County (typical crop patterns) and is highly fragmented by nature of numerous rural residential dwellings, rural estate subdivisions, the Aberfoyle Settlement Area, a Rural Employment Area, and existing aggregate operations.

Census of Agriculture & Ontario Business, Agri-Food, and Farm Data Profile for Township of Puslinch

The 2021, 2016, and 2011 Census of Agriculture and OMAFA's Ontario business, agri-food, and farm data profile for Township of Puslinch were reviewed to provide an overview of agricultural production patterns and parcel size in this census consolidated subdivision.

North American Industry Classification System (NAICS) data for 2011, 2016, and 2021 were also utilized to determine trends in farm types within the Township. In 2021, crop farming in the Township of Puslinch was dominated by oilseed and grain farming, which accounted for 22% of all farms in the Township. Within this category, soybean farming made up 37.9%, corn farming 34.5%, and other grain farming 17.2%[4]. Oilseed and grain farming has increased in the Township since 2011 (increase of 3.6% in number of oilseed and grain farms from 2011 to 2021). As of 2021, the next most common category of crop farming in Puslinch is other crop farming (15.2%), which primarily includes hay farming (65% of other crop farming). Other crop farming has decreased since 2011 (decrease of 23.1%). Oilseed and grain farming and corn farming are the most common crop type within the study area, which is generally reflective of agricultural patterns throughout Township of Puslinch.

In terms of livestock, other animal production comprised 26.5% of total farms (of which 65.7% of farms were horse and other equine production and 20% animal combination farming) in Puslinch. Other animal production has exhibited a 35.2% decrease in number of farms since 2011[5]. Cattle ranching and farming comprises 15.2% of total farms within the Township, of which primarily beef cattle (90%) and dairy cattle (10%). Four horse farms were observed within the Secondary Study Area, and no other occupied livestock facilities. This is consistent with the agricultural trends identified in the Township's census data.

In terms of parcel size, in 2021 the greatest number of farms (35.6%) were within the 10-69-acre farm size, followed by 27.3% of farms falling in the 70-129-acre range[1]. The area of lands in crop production has decreased since 2011 from 7,491[2] hectares to 3,925[3] hectares, representing a decrease of 47.6%.

Based on the site visit, the agricultural activities within the Primary Study Area appear to be consistent with of broader cropping trends in Township of Puslinch. The surrounding crops include typical cash crops such as soybeans and corn. Occupied livestock operations consisted only of four horse farms.

Overall, both the Primary and Secondary Study Areas are representative of normal agricultural production for this area and do not consist of specialized farming practices or specialty crops.

[1] Table 32-10-0232-01 Farms classified by total farm area, Census of Agriculture, 2021
[2] Table 32-10-0406-01 Land use, Census of Agriculture, 2011 and 2016, inactive
[3] Table 32-10-0249-01 Land use, Census of Agriculture, 2021
[4] Table 32-10-0231-01 Farms classified by farm type, Census of Agriculture, 2021
[5] Table 32-10-0403-01 Farms classified by farm type, Census of Agriculture, 2011 and 2016, inactive

Assessment of Impacts

This subsection provides an assessment of the potential impacts of the proposed pit on components of the Agricultural System.

Table 2 below is consistent with Table 3 (*Minimize and Mitigate Impacts*) found in section 3.2.2 of the Province's *Draft Agricultural Impact Assessment Guidelines*. The purpose of this table is to provide a summary of how the proposed pit minimizes or mitigates impacts on surrounding agricultural uses.

Table 2: Summary of Net Impacts

Objective	Mitigation Measure	Description
Minimize the loss of agricultural land	Select areas with less agricultural land and lower priority agricultural lands	The subject lands are not considered a part of the County's prime agricultural area and as such, constitute lower priority agricultural lands.
	Rehabilitate the land	The extent of the subject lands where above the water table extraction is proposed will be rehabilitated to an agricultural condition with the same average soil capability (i.e. Class 2).
	Phase Development	Development and rehabilitation will be phased to ensure that agricultural activities continue on the lands until it is needed to be extracted. Extraction phases 1 and 2 (portion of site proposed to be extracted above the water table and returned to an agricultural condition) shall undergo progressive rehabilitation in direct correlation to the development of the pit as the extraction limits in each phase are reached and enough area is available to ensure that rehabilitation activities will not interfere with the production and stockpiling of aggregate materials.
Minimize the fragmentation of agricultural land	Maintain farm parcels	The surrounding agricultural system is already highly fragmented by nature of surrounding rural residential, estate residential, and aggregate uses; natural features; and, settlement areas. The proposed pit will not serve to worsen fragmentation, with a portion proposed to be rehabilitated to an agricultural condition and the remainder proposed to be rehabilitated to ponds and natural features which can provide ecosystem services that support agriculture.
Minimize impacts on farmland and agricultural operations	Minimum Distance Separation	MDS I and II setbacks are not required for mineral aggregate resources.
	Select compatible land uses; put lower impact development adjacent	The proposed pit would be buffered from adjacent agricultural land uses through the provision of setbacks, berms, and existing vegetation.

	to farmland and operations	
	Design to support agriculture (e.g. help farms to continue to operate; help prevent and reduce trespassing and vandalism)	Conflicts between the proposed pit and the surrounding agricultural land uses will be minimized through the implementation of physical and visual barriers (vegetative berms) as required by the ARA site plans. Impacts to traffic will be mitigated based on the recommendations of the traffic report.
Minimize and mitigate changes in water quality or quantity	Implement a groundwater monitoring program	A groundwater monitoring program is included on the Site Plan.
Mitigating impacts during construction or operations (e.g. mitigate dust, noise)	Adjust operational procedures to accommodate agriculture in the area	This area of the County is characterized by higher levels of aggregate activities; surrounding agricultural uses are accustomed to the operational procedures associated with mineral resource extraction. Dust suppression will be applied as required by O. Reg. 244/97 under the Aggregate Resources Act.
	Vegetative berms	Proposed setbacks will create buffering between the proposed pit and surrounding land uses (including agricultural operations).
	Maintain, restore, or construct farm infrastructure	The subject lands do not include any farm infrastructure that is proposed to be removed.
Mitigate ongoing impacts from new development	Implement measures that can be in place post development to support compatibility with agriculture	All planting associated with the berms will be non-invasive species and will not impact agricultural rehabilitation or production when a portion of the lands are returned to an agricultural condition.
Education to achieve greater compatibility between agricultural and non-agricultural uses	Education and awareness	CBM will educate the public on rehabilitation efforts to demonstrate the importance and impact of agricultural rehabilitation. CBM plans to continue to build internal expertise and knowledge on agricultural rehabilitation, including through working closely with local farmers.

Agricultural Rehabilitation

4.6 hectares of the licenced area are proposed to be returned to an agricultural condition with an average soil capability of CLI Class 2.

The following recommendations are made for agricultural rehabilitation, where applicable:

1. Agricultural rehabilitation shall be in accordance with the agricultural rehabilitation sequence schematic on the Rehabilitation Plan to ensure best practices are followed throughout the progressive rehabilitation of the pit.
2. Progressive rehabilitation procedures that avoid substantial storage of topsoil and minimize the storage of subsoil shall be implemented. Stripped soils, not required for berm construction, shall be moved directly to depleted areas where they will be immediately used for agricultural rehabilitation. Stripping areas shall be limited to what is required for the season of operation.
3. During pit operations, access to the agricultural rehabilitation area and undisturbed areas used for agricultural purposes will be maintained.
4. Topsoil shall be replaced across the site at the same pre-extraction depths, as documented in the DBH Soil Report, 2024, which is approximately 15 centimeters for topsoil in accordance with the agricultural schematic on the plan. DBH's soil inspection sites were limited to shallow depths (topsoil, A horizon only) due to the stoniness of the soil materials.
5. Soil will be handled under suitable conditions. Travel over soils and rehabilitated areas shall be minimized to reduce compaction. Ripping / tilling the soil will occur, where necessary, to alleviate soil compaction and shall avoid the mixing of soil materials / layers during the process.
6. Once grading is completed, a vegetation cover (such as perennial crops) shall be immediately established within the agricultural rehabilitation area to reduce erosion, add organic matter to the soil and improve soil structure. A grass-legume cover crop shall be established throughout rehabilitation and maintained for up to five years and ploughed under annually to promote and increase organic matter. Alternatively, field crops (e.g. wheat, soy, corn, hay) shall be established immediately following rehabilitation grading.
7. After final rehabilitation, soil testing shall be completed by a qualified professional to analyze soil conditions to demonstrate that pre-extraction soil capability has been restored. Adjustments to cropping practices and/or soil amendments may be required based on the results of the soil testing and shall be undertaken in consultation with the property owner. A report shall be submitted by a qualified professional following final rehabilitation and provided to MNR prior to Licence surrender to demonstrate that the agricultural area has been rehabilitated back to the pre-extraction soil capability (CLI Class 2 soil capability).
8. Best management practices shall be implemented with respect to the storage and application of organic material, fertilizers, and pesticides.

Yours truly,

[redacted]

Pierre Chauvin, BSc (Agr), MA, MCIP, RPP
Partner

Chelsea Brooks, MA, MSc(Pl.), RPP, MCIP
Senior Planner

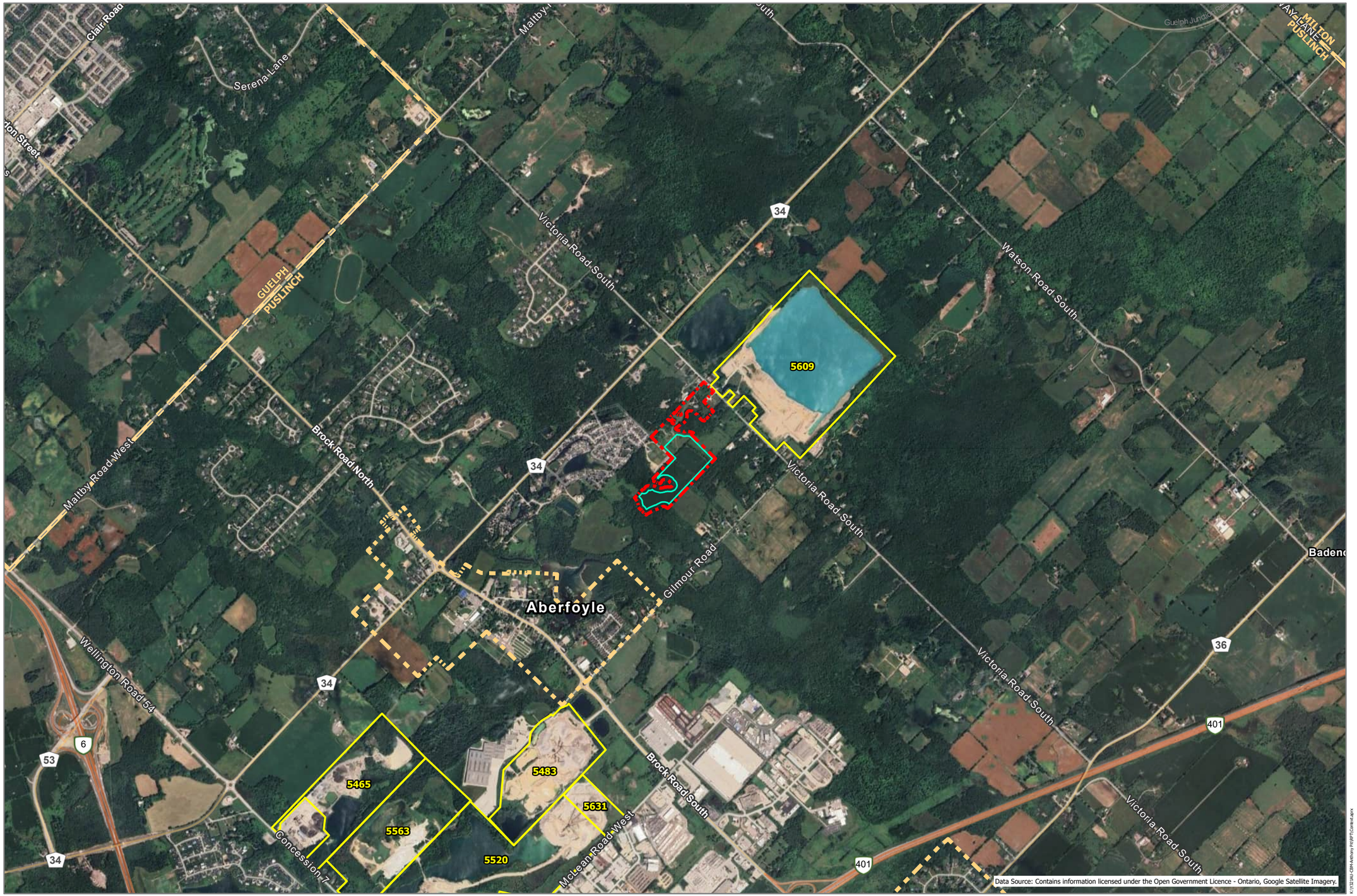
cc. *Yara Elmahdy, MHBC*
Neal DeRuyter, MHBC

Attach *Attachment 1 - Figures*
Attachment 2 - Soil Survey

A

Attachment 1: Figures

Figure 1 - Context Plan



Boundary of Area to be Licensed

Limit of Excavation

Aggregate Site Authorized Active

Municipal Boundary

Settlement Area

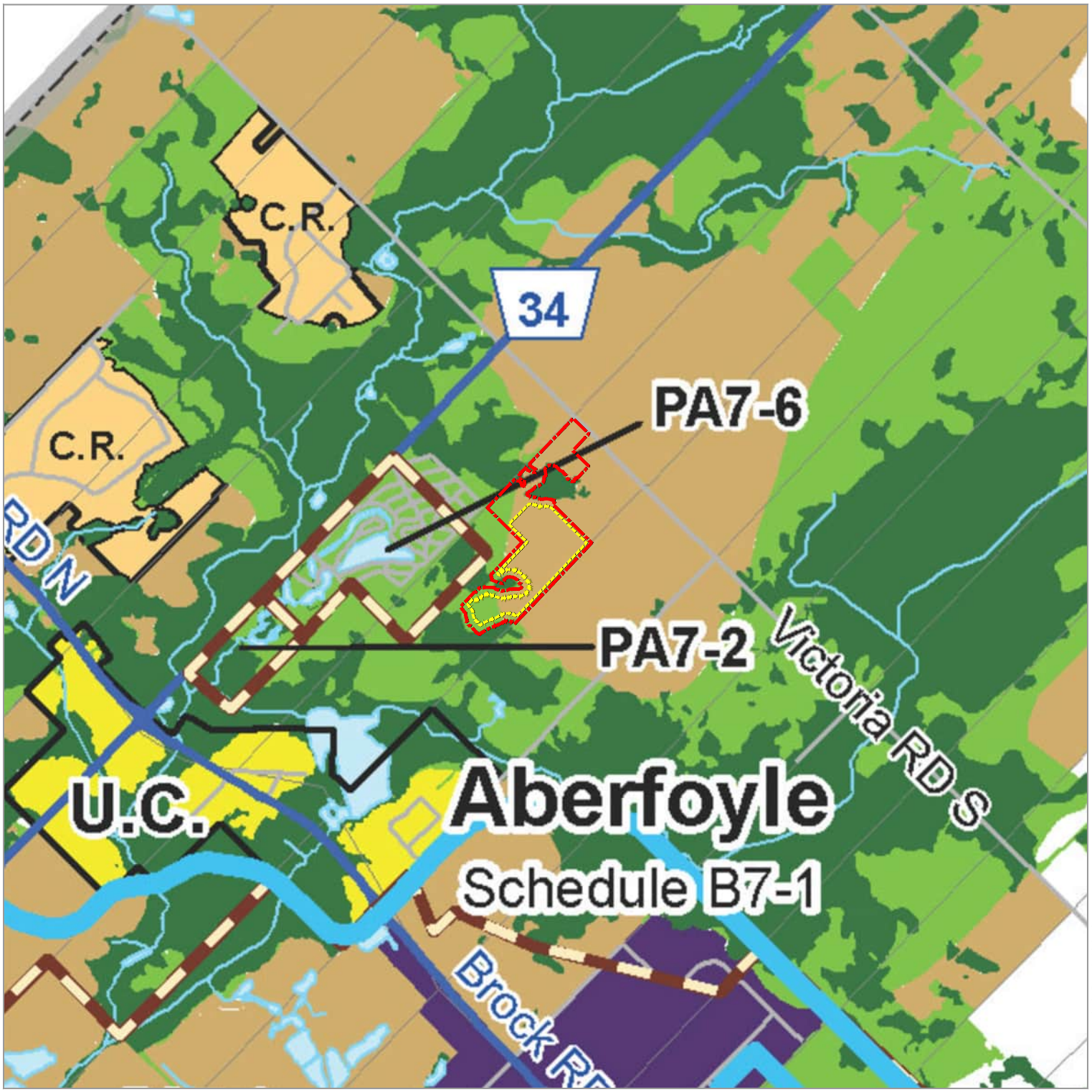


Figure 2 - County of Wellington Official Plan, Schedule B7 Land Use

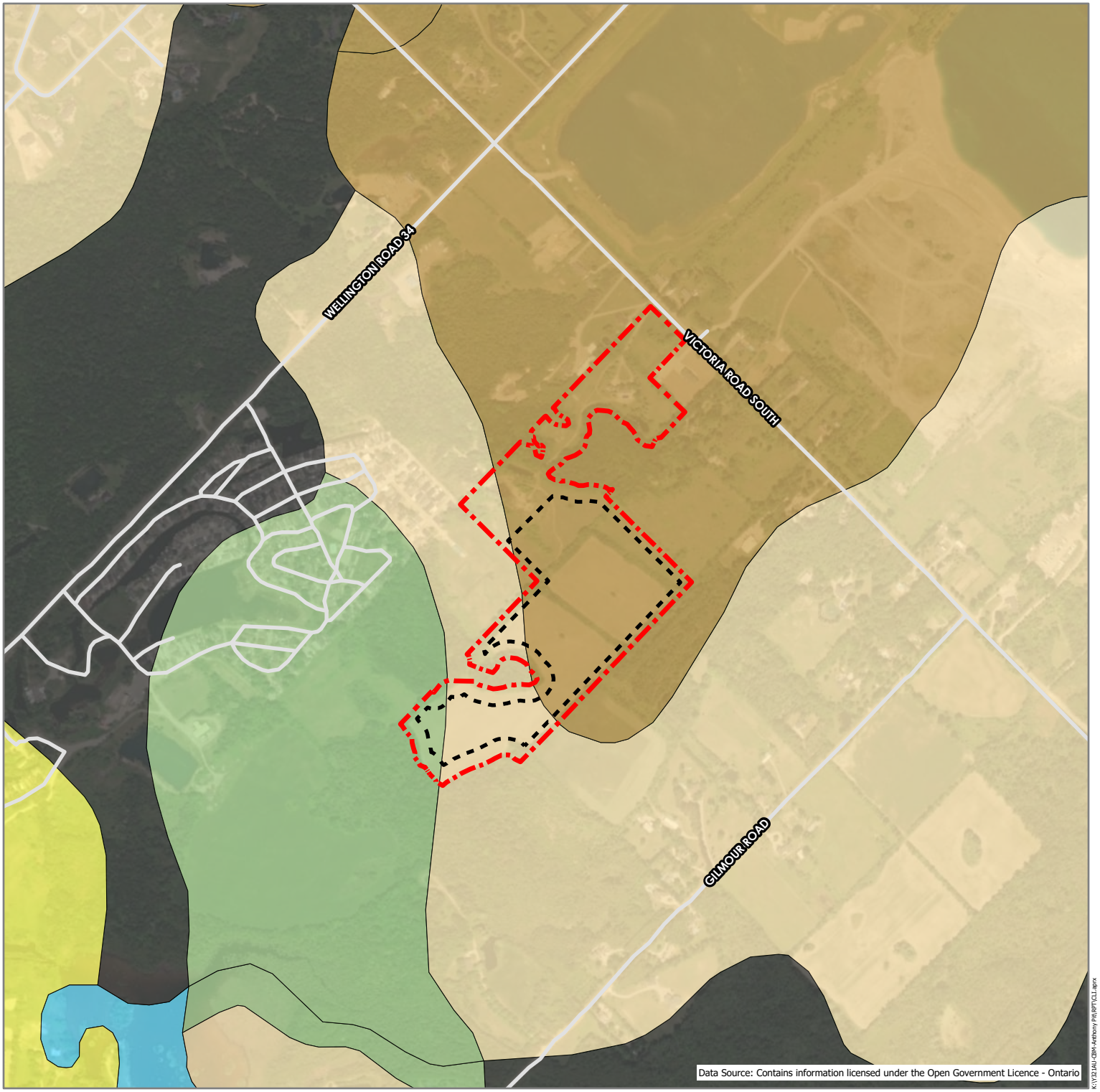


Figure 3 - Canada Land Inventory Soils

Boundary of Area to be Licensed
Limit of Excavation

Soil Class
Class 1
Class 2
Class 3
Class 4
Class 5
Class 6
Class 7
Organic
Water
Other

Figure 4: Detailed Soil Survey

LEGEND

Subject Lands

- Soil Inspection Location
- Maximum Extraction Limit
- Proposed License Boundary
- Parcels
- Soil Polygon Boundary
- Study Area

Roads

- Local Road - Rural
- County

Soil Code	Slope Class
Bg - Burford Loam	Aa = 0.0 - 0.5%
Dl - Dumfries Loam	Bb = 0.5 - 2.0%
Gf - Gilford Loam	Cc = 2.0 - 5.0%
Dist - Disturbed Soils	Dd = 5.0 - 9.0%
	Ee = 9.0 - 15.0%
CLI Subclass Limitation	Ff = 15.0 - 30.0%
F - Fertility	Gg = 30.0 - 45.0%
M - Moisture	Slope length < 50 m / Slope length > 50 m
S - Combined subclasses	
T - Topography	
W - Excess Moisture	

Soil Code / Slope Code — Dl / 2FM — CLI Class / CLI Subclass

DATE: May, 2024

SCALE: NTS

FILE: Y321BA

DRAWN: DGS

north

K:\Y321BA-CBM-TIKAL\RPT\DETAILED_SOIL.DWG

4454 Victoria Road South
Part of Lot 22, Concession 8
Township of Puslinch
County of Wellington

Source:
Detailed Soil Survey and Canada Land Inventory (CLI)
DBH Soil Services Inc. May 2024.

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR. KITCHENER, ON, N2B 3X9
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Figure 4: **Agricultural Land Uses**

4454 Victoria Road South, R.R. #1
Puslinch, ON

LEGEND

- Subject Lands
- 1.5km Buffer
- Settlement Boundary
- Municipal Boundary
- Rural Employment Area
- Active Pit
- Unoccupied Barn
- Horse and other equine production

Agricultural Land Use

- Corn
- Fallow
- Hay
- Soy
- Unknown

Sources:

- Land use information based on field observations July, 2022 & Aerial imagery interpretation
- Contains information licensed under the Open Government Licence – Ontario.

DATE: December, 2025

FILE: Y321AZ

SCALE: 1:20,000

DRAWN: GC

north

Document Path: K:\Y321BA-CBM-Tikal\AIA\Agricultural_Land_Use2.aprx

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B

Attachment 2: DBH Soil Survey

DOCUMENT TRANSMITTAL

Document:	**SOIL SURVEY AND CANADA LAND INVENTORY (CLI) EVALUATION** **TIKAL PIT** **4454 VICTORIA ROAD SOUTH** **TOWNSHIP OF PUSLINCH** **COUNTY OF WELLINGTON**		
Prepared for:	Ms. Chelsea Major MHBC – Urban Design & Landscape Architecture 540 Bingemans Centre Drive Suite 200 Kitchener, ON N2B 3X9	Date Our Ref. No. Your Ref. No.	May 17, 2024 2023 - 22
Attention:	Ms. Major	DRAFT ☑	FINAL

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COPIES	TO
1 pdf report	Ms. Major (via email)

Approved by:

[redacted]

Dave Hodgson, P. Ag.
President
DBH Soil Services Inc.

SOIL SURVEY AND CANADA LAND INVENTORY (CLI) EVALUATION
TIKAL PIT
4454 VICTORIA ROAD SOUTH
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON
DRAFT

Prepared for:

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DBH Soil Services Inc.

May 17, 2024

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APPENDIX B Grand River Conservation Authority Contour Mapping
APPENDIX C Soil Inspection Site Characteristics
APPENDIX D Curriculum Vitae

1.0 BACKGROUND

DBH Soil Services Inc. was retained to complete a Soil Survey and Canada Land Inventory (CLI) classification assessment for an area identified as:

4454 Victoria Road South
Township of Puslinch
County of Wellington

This area is comprised of one parcel identified by the Municipal Property Assessment Corporation (MPAC) Roll Number 230100000601950000. The Roll Number was identified in the County of Wellington online mapping (https://sgis.wellington.ca/Maps/index.html?viewer=WellingtonCountyExternal).

A visual representation of the property size, shape and relative location is presented as an image reproduced from Explore Wellington online mapping viewer. Image 1 (below) illustrates the relative location and shape of the parcel as provided in the Explore Wellington Imagery (https://sgis.wellington.ca/Maps/index.html?viewer=WellingtonCountyExternal) as a blue outline and fill.

Image 1 Explore Wellington Imagery

Source: Explore Wellington Imagery (https://sgis.wellington.ca/Maps/index.html?viewer=WellingtonCountyExternal)

For the purposes of this Soil Survey and CLI evaluation, this parcel is henceforth referred to as the Study Area.

The Study Area lands comprise approximately 23.5 ha (58.06 acres) of which much of the lands are used for agricultural crop production (common field crop, soybean in the 2023 growing season based on crop stubble). The non-cropped lands included woodland areas located in fence rows, large woodland areas near the residential unit (east) and in the western portion of the parcel. Additional woodland areas were noted in fence rows throughout the parcel. Scrub lands were noted west of the residential unit, and in the central area. Areas of surface water (ponding) were noted near the residential unit and in the central portions of the parcel.

A rural residential unit was observed on the eastern portion of the parcel fronting Victoria Road South. No livestock or livestock facilities were observed on the property during the onsite soil survey.

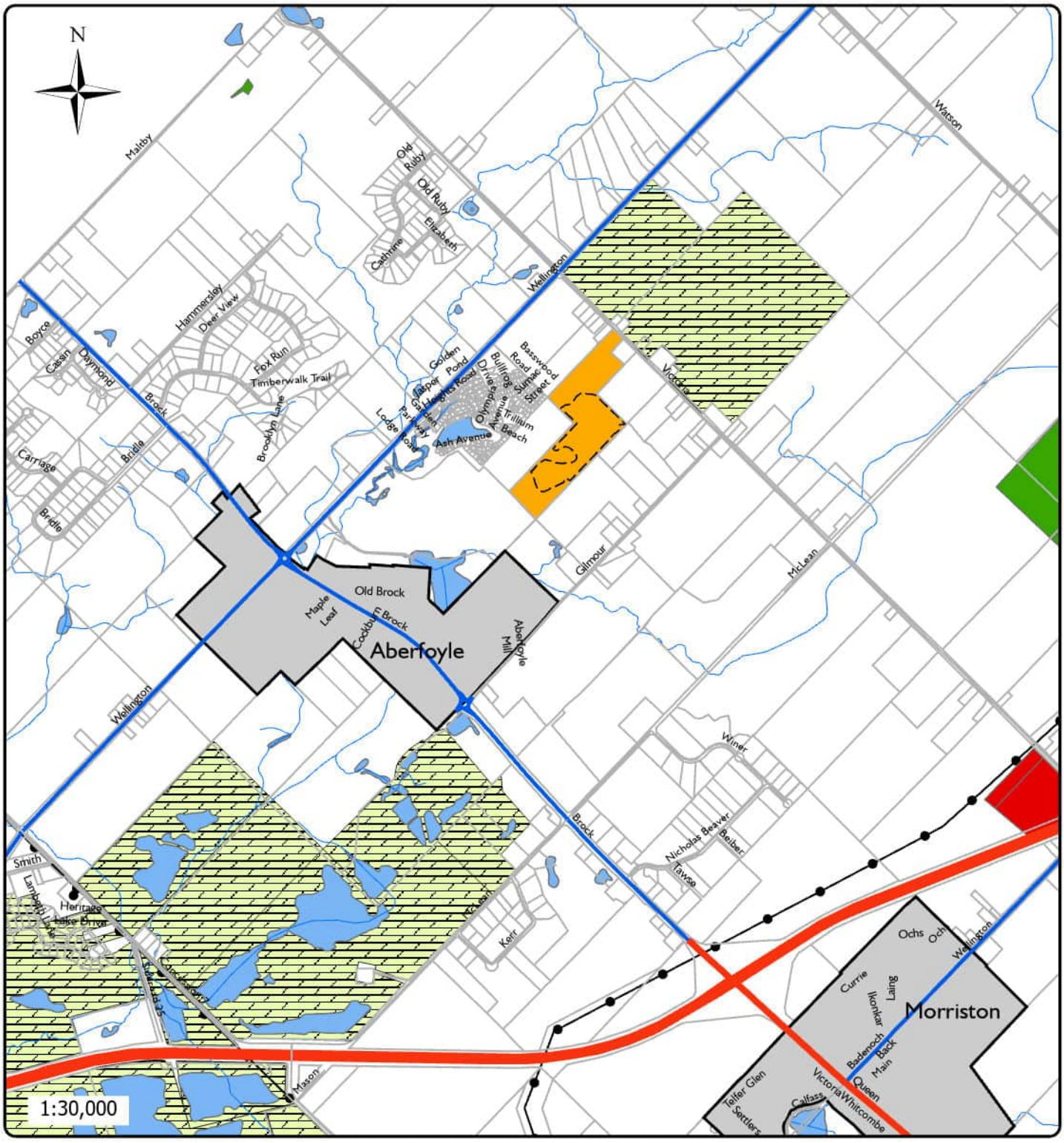
The Study Area is roughly bounded: on the east by Victoria Road South, rural residential units, and woodlands; on the south by woodlands, agricultural fields, and rural residential units; on the west by woodlands, agricultural fields; and on the north by agricultural fields, woodlands, and the Millcreek Country Club community.

The Study Area is located east of the urban area of Aberfoyle, approximately 2.7 km north of Highway 401, and approximately 4.2 km southeast of the urban area of Guelph.

This report was completed to document the existing soil conditions and to provide a more detailed assessment of the CLI classification of the soil resources onsite. This report documents the methodology, findings, conclusions, and mapping completed for this study.

Figure 1 illustrates the relative location of the Study Area with respect to the above-mentioned geographical and cultural features.

Figure 1 also illustrates the Maximum Extraction Area and the License Area (Study Area).



Legend

- Utility Line (MNRF)
- Watercourse (MNRF)
- Aggregate Authorized Active (MNRF)
- Maximum Extraction Area
- Parcels (Wellington County)
- Settlements (Wellington County)
- Study Area (License Area)

Tile Drainage (OMAFRA)

- Random
- Systematic

Roads (Wellington County)

- Local Road - Rural
- County
- Expressway
- Highway

Figure 1

Location

DBH Soil Services Inc.

May 2024

2.0 METHODOLOGY

2.1 FIELD DATA COLLECTION

2.1.1 SOIL INVESTIGATION

Basic soils (and CLI) information was provided in the OMAFRA soils and mapping report *Soil Survey of Wellington County (Report No. 35 of the Ontario Soil Survey, Hoffman, D.W, B.C. Matthews and R.E. Wicklund,1963),* Digital mapping was provided by OMAFRA through the Land Information Ontario (LIO) warehouse website. The digital mapping was provided at a scale of 1:50000. Mapping at this scale is of a general nature when referring to site-specific planning; therefore, detailed soils or soil verification assessments are often required for farm scale or lot size planning initiatives and applications for amendments to Official Plans and/or Zoning By-Laws.

In an effort to 'standardize' the approach or methodology used in detailed soil surveys, OMAFRA created guidelines for detailed soil surveys in a document titled *Guidelines for Detailed Soil Surveys for Agricultural Land Use Planning*. This OMAFRA document was available online until recently. Recent email conversations with staff from OMAFRA indicated that OMAFRA is transitioning from the older government website to a new centralized website. It was noted that this document is slated for transition but has not been added to the new site. Further, OMAFRA will be updating the document to include more detailed instructions as to the depths of soil inspection, and to indicate that detailed soil survey is useful in more than just agricultural land use planning. Staff from OMAFRA have indicated that in the interim, the document can still be identified (included as Appendix A), with further reference being made to the Mapping Systems Working Group documents as follows:

Soil Mapping System for Canada: (https://sis.agr.gc.ca/cansis/publications/manuals/1981-smsc/index.html).

Soil Survey Handbook: (https://sis.agr.gc.ca/cansis/publications/manuals/1987-9/index.html).

The original OMAFRA guidelines (Appendix A) were created in response to concerns with the accuracy of published mapping and classification of soil materials and that the existing information is of too general a nature to adequately describe and interpret the soil properties for site-specific planning purposes.

The standards for completing a detailed soil evaluation included the following tasks:

- Completion of a review of published soil information – County/Region Soil Report of the Ontario Soil Survey (OMAFRA),
- Conduct a review of published Canada Land Inventory (CLI) ratings for the soils of this area,
- Conduct an aerial photographic review and interpretation of the soil polygons, disturbed soil areas and miscellaneous landscape units (ie: streams, wayside pits),

- Conduct an onsite soil survey at an appropriate scale and survey density,
- Completion of mapping to illustrate the location of the property, the occurrence of the OMAFRA soil polygons and appropriate CLI capability ratings,
- Completion of a report outlining the methodologies employed, findings (including a discussion of relevant features identified) and a conclusion as to the relevance of the CLI classifications for the soil polygons on the property and how they relate to the Provincial Policy Statement.

Further, OMAFRA has provided a document titled "Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for Application of the Canada Land Inventory in Ontario." http://www.omafra.gov.on.ca/english/landuse/classify.htm (July 2023, online version).

A detailed onsite soil survey and surrounding land reconnaissance survey were conducted on May 3, 2024.

2.1.2 PHYSIOGRAPHY

Physiographic information and Quaternary Geology information was provided in *The Physiography of Southern Ontario 3rd Edition, Ontario Geological Survey Special Volume 2, Ministry of Natural Resources, 1984*. A further review of the digital Physiographic from the Land Information Ontario website was completed.

Physiographic information provides details on the parent materials from which the soil developed in a specific area.

2.1.3 TOPOGRAPHY AND CLIMATE

Topographic information was reviewed and correlated to the 0.5 m contour mapping available from the Grand River Conservation Authority (GRCA) website (https://maps.grandriver.ca/web-gis/public/?theme=MYP&bbox=539184,4790579,566563,4805220). The GRCA contour mapping is provided in Appendix B.

Additional contour data, mapping and assessments were reviewed and included the 1:10000 scale Ontario Base Mapping, LIO digital contour mapping, detailed soil survey assessment (using a handheld clinometer), aerial photo interpretation and windshield surveys.

Climate data was taken from the OMAFRA document titled *Agronomy Guide for Field Crops – Publication 811 (2017)* and the *Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Factsheet – Crop Heat Units for Corn and Other Warm Season Crops in Ontario, 1993*.

3.0 FINDINGS

3.1 PHYSIOGRAPHY AND CLIMATE

The *Physiography of Southern Ontario* Physiographic Unit Map indicates that the Study Area is located in the Horseshoe Moraines Physiographic Region. The Horseshoe Moraines Physiographic Region is a large, horseshoe shaped area that flanks the upland areas west of the highest portions of the Niagara Cuesta. The chief landforms are irregular stony knobs and ridges that are composed of till, with some sand and gravel deposits, and sand/gravel terraces with swampy valley floors. The southern portion of the Horseshoe Moraine Physiographic Region near Paris comprises moderately hilly areas that flatten out.

The surface material in this physiographic region is generally sandy overlying till, kames, moraines and outwash sands which may occur in the hollows. The majority of the surface sands are fine sandy materials.

3.2 TOPOGRAPHY

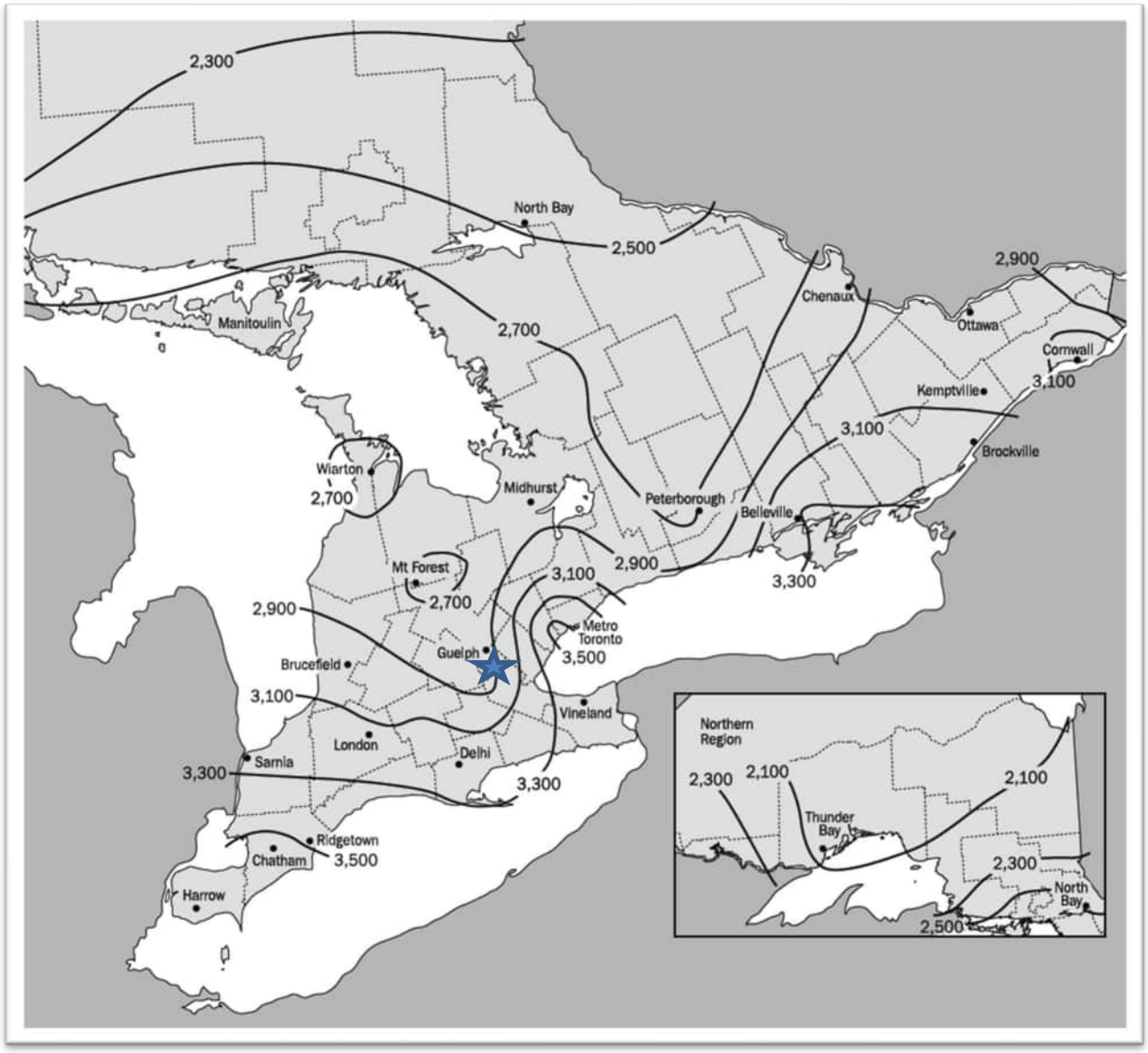
The topography of the Study Area is a mix of gently sloping lands, combined with steeper slopes located adjacent to the ponded areas, a small knoll in the central area, and along the western edge of the fields, in the western portion of the property

3.3 CLIMATE

The Study Area is located near the 2900 average accumulated Crop Heat Units area in Ontario. The Crop Heat Units (CHU) index was originally developed for field corn and has been in use in Ontario for 30 years. The CHU ratings are based on the total accumulated crop heat units for the frost-free growing season in each area of the province. CHU averages range between 2500 near North Bay to over 3500 near Windsor. The higher the CHU value, the longer the growing season and greater are the opportunities for growing value crops.

Crop Heat Units for corn (based on 1971-2000 observed daily minimum and maximum temperature (OMAFRA, 2009)) map image is illustrated below. The approximate location of the Study Area is marked with a blue star.

Image 2 Crop Heat Units Mapping



Source: Agronomy Guide for Field Crops OMAFRA – Publication 811

3.4 DETAILED SOIL SURVEY

A detailed on-site soil survey was conducted to map and classify the soil resources of the soil materials on the Study Area lands. The soil survey included the following tasks:

- Completion of a review of published soil information *(Soil Survey of Wellington County (Report No. 35 of the Ontario Soil Survey, Hoffman, D.W, B.C. Matthews and R.E. Wicklund,1963))*
- Conduct a review of published Canada Land Inventory (CLI) ratings for the soils of this area,
- Conduct an aerial photographic review and interpretation of the soil polygons,

disturbed soil areas and miscellaneous landscape units (ie: streams, boulder pavement, wayside pits),
- Conduct an on-site soil survey,
- Completion of mapping to illustrate the location of the property, the occurrence of soil polygons and appropriate CLI capability ratings,
- Completion of a report outlining the methodologies employed, findings (including a discussion of relevant features identified) and a conclusion as to the relevance of the CLI classifications for the soil polygons on the property.

The detailed soil survey of the Study Area lands, and reconnaissance of the surrounding area was conducted on May 3, 2024. Aerial photographic interpretation was used to delineate soil polygon boundaries by comparing areas, on stereoscopic photographs (and imagery), for similar tone and texture. Delineated soil polygons were evaluated for the purpose of verifying soil series and polygon boundaries. The evaluation was completed through an examination of the existing soil conditions to a minimum depth of 100 cm or to refusal. A handheld Dutch soil auger and/or Dutch stone auger was used to extract the soil material to a minimum depth of one metre (or to refusal).

Each soil profile was examined to assess inherent soil characteristics. Soil attributes were correlated with the *Canadian System of Soil Classification (CSSC) (Agriculture Canada, 1998)* and the *Field Manual for Describing Soils in Ontario (Ontario Centre for Soil Resource Evaluation, 1993)*. A handheld clinometer was used to assess percent slope characteristics. Soils were assigned to a soil map unit (series) based on soil texture (hand texturing assessment), soil drainage class and topography (position and slope).

Depth to free water within one metre of the soil surface was also recorded at inspection sites located on lower slope positions (where applicable). Names for the soil series and the CLI ratings were assigned to each soil polygon by correlating the soil series with soils information presented in the *Soil Survey of Wellington County (Report No. 35 of the Ontario Soil Survey, Hoffman, D.W, B.C. Matthews and R.E. Wicklund,1963)* and with the CLI information presented on the 1:50000 scale manuscript mapping, and the OMAFRA digital soils data.

Observations noted at the time of the onsite soil survey included:
- The majority of the Study Area lands were used for the production of common field crop (soybean in the 2023 growing season).
- Woodland areas were noted around the ponded areas, along the eastern portion of the parcel, in fence rows, and along the western portions of the parcel.
- A small area of scrubland was noted in the eastern portion of the Study Area.
- The lands were generally gently sloping, except for steeper slopes near the ponded areas.
- Stone piles were noted along the edge of the fields in various locations around the Study Area.
- Stones were noted on the surface of the soils throughout the parcel.
- Stones were of varying size including gravel and cobble sizes.
- Stones were rounded (river stone).

- A few small ponds and seasonally ponded areas were noted.
- A larger poorly drained area was noted in the western portion of the parcel.

Photographs 1 through 6 provide a depiction of the general Study Area physical conditions. The area near the residential unit is considered a disturbed soil area. This area extends to the west past the large, ponded area and includes steeper, short slopes. Based on the small piles of stone and soil materials located within this area, this area was considered a disturbed area. Smaller ponded areas were noted along the northern property boundary, adjacent to the disturbed area.

The north central area included small ponds, disturbed areas (associated with a small cabin), and small wayside pits. Small piles of soil, stones and other detritus were noted in this area. The remainder of the Study Area included agricultural fields, ponded areas, and woodlands.

Photograph 1 illustrates the hummocky topography looking west from near the back of the residential unit and pathway.

Photograph 1

Photograph 2 illustrates the stony soils from the wall of a small wayside pit on the Study Area lands.

Photograph 2

Photograph 3 looks to the west from the central area at the gently sloping lands.

Photograph 3

Photograph 4 illustrates the steeply sloped lands around a ponded area on the Study Area.

Photograph 4

Photograph 5 illustrates the relative size and intensity of surface stone that was observed in the Study Area.

Photograph 5

Photograph 6 illustrates the relative size and quantity of stone observed in one of the stone piles observed on the Study Area.

Photograph 6

A total of 19 soil inspection sites were examined in the Study Area. The majority of these soil inspection sites were limited to shallow depths (topsoil, A horizon only) due to the stoniness of the soil materials.

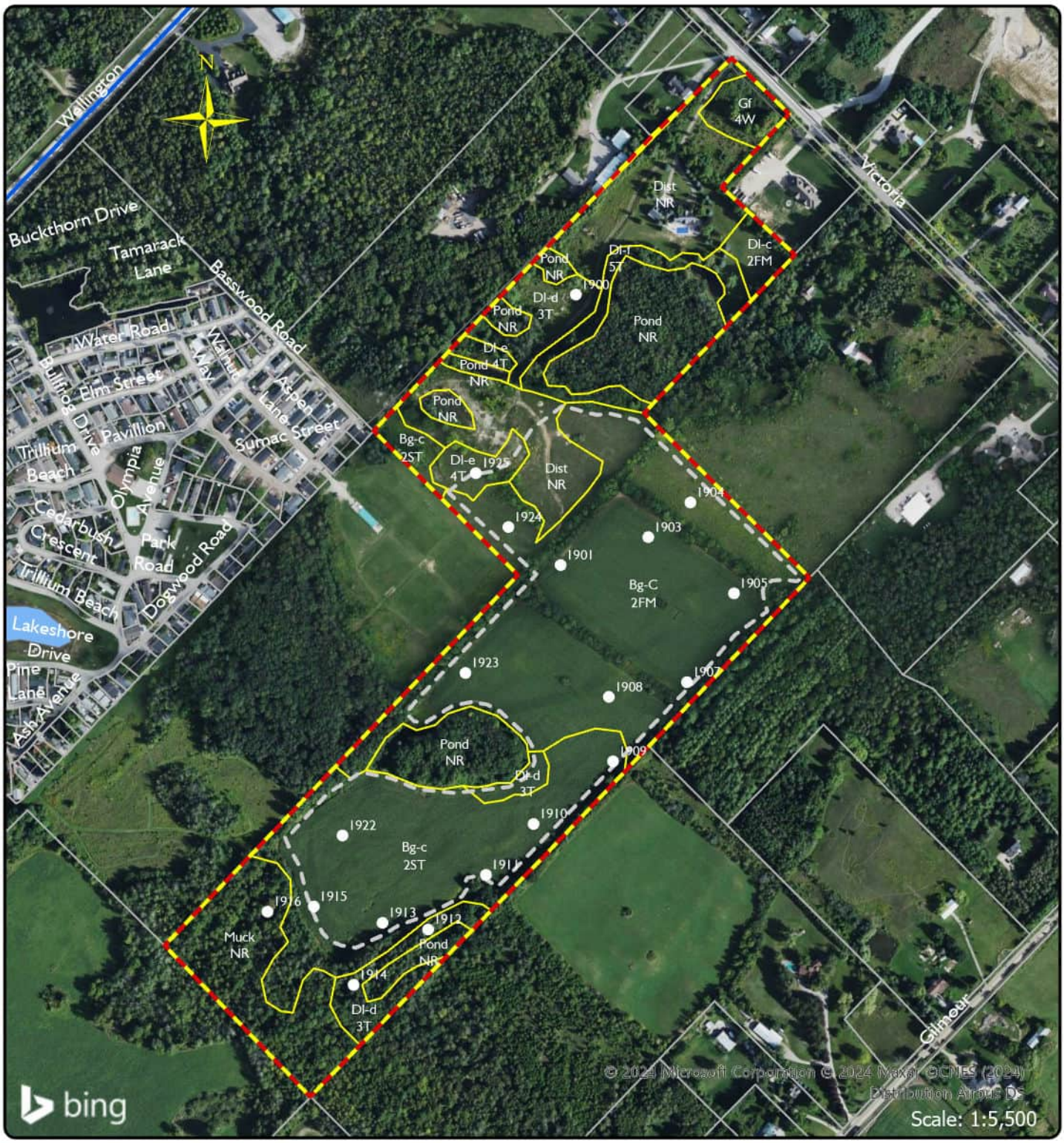
The soil inspection information was correlated with soil descriptions in the *Soil Survey of Wellington County (Report No. 35 of the Ontario Soil Survey, Hoffman, D.W, B.C. Matthews and R.E. Wicklund,1963) and* the OMAFRA digital soils data (Land Information Ontario, 2022), prior to the production of the soils map in Figure 2. Soil names used in the identification of the soil series on Figure 2 were taken from the *Soil Survey of Wellington County (Report No. 35 of the Ontario Soil Survey, Hoffman, D.W, B.C. Matthews and R.E. Wicklund,1963)*.

It should be noted that the soil mapping provided with the *Soil Survey of Wellington County (Report No. 35 of the Ontario Soil Survey, Hoffman, D.W, B.C. Matthews and R.E. Wicklund,1963)* report makes use of slope groupings as follows:

TOPOGRAPHIC CLASSES

A_0 - Smooth basin	B_0 - Irregular basin
A_1 - Smooth level	B_1 - Irregular level
A_2 - Smooth very gently sloping	B_2 - Irregular very gently sloping
A_3 - Smooth gently sloping	B_3 - Irregular gently sloping
A_4 - Smooth moderately sloping	B_4 - Irregular moderately sloping
A_5 - Smooth steeply sloping	B_5 - Irregular steeply sloping
A_6 - Smooth very steeply sloping	B_6 - Irregular very steeply sloping

Source: *Soil Survey of Wellington County (Report No. 35 of the Ontario Soil Survey, Hoffman, D.W, B.C. Matthews and R.E. Wicklund,1963)*.



Legend

- Soil Inspection Location
- Maximum Extraction Limit
- Proposed License Boundary
- Parcels
- Soil Polygon Boundary
- Study Area

Roads

- Local Road - Rural
- County

Soil Code
Bg - Burford Loam
Dl - Dumfries Loam
Gf - Gilford Loam
Dist - Disturbed Soils

CLI Subclass Limitation
F - Fertility
M - Moisture
S - Combined subclasses
T - Topography
W - Excess Moisture

Slope Class
Aa = 0.0 - 0.5%
Bb = 0.5 - 2.0%
Cc = 2.0 - 5.0%
Dd = 5.0 - 9.0%
Ee = 9.0 - 15.0%
Ff = 15.0 - 30.0%
Gg = 30.0 - 45.0%
Slope length < 50 m
Slope length > 50 m

Soil Code / Slope Code
Dl
2FM
CLI Class / CLI Subclass

Figure 2

Detailed Soil Survey and Canada Land Inventory(CLI)

DBH Soil Services Inc.

May 2024

The standard slope groupings (as presented in the Ontario Centre for Soil Resource Evaluation document *Field Manual for Describing Soils in Ontario*, 4th Edition (1993) provides slope groupings as follows: Aa = 0.0 – 0.5 percent; Bb = 0.5 – 2.0 percent; Cc = 2.0 – 5.0 percent; Dd = 5.0 – 9.0 percent; Ee = 9.0 – 15.0 percent; Ff = 15.0 – 30.0 percent; and Gg = 30.0 – 45.0 percent. Where capital letters represent simple slopes (slope lengths greater than 50 metres), while lower case letters represent complex slopes (slope lengths less than 50 metres).

On review of the OMAFRA document *Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for Application of the Canada Land Inventory In Ontario* soils are rated for topography with slopes grouped similar to the description provided in the *Field Manual for Describing Soils in Ontario* and are presented as follows: <2; 2-5; 5-9; 9-15; 15-30; 30-60; and >60.

For the purposes of providing mapping and soil capability ratings that are consistent with the OMAFRA document *Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for Application of the Canada Land Inventory In Ontario*, the slope groupings and mapping presented in this report reflect the standard percent slope groupings as are documented in the *Field Manual for Describing Soils in Ontario*, 4th Edition (1993).

The onsite soil survey identified four soil series, and one miscellaneous soil group. The soil series were identified as Dumfries Loam, Burford Loam, Gilford Loam, and Muck Soils. The miscellaneous soil group was identified as disturbed lands. Disturbed soils include the residential unit area, the laneways, and any areas where the surface soil materials have been altered.

Small ponds and seasonally ponded areas were noted during the onsite visit. Small areas of imperfectly drained, and poorly drained soils were observed, and were too small to map out individually.

Dumfries Loam is the well-drained member of the Dumfries Soil catena. Dumfries soils developed on stony soil material derived from limestone. The topography is generally hilly with steep complex (slope length less than 50 m) slopes. It is noted in the *Soil Survey of Wellington County (Report No. 35 of the Ontario Soil Survey, Hoffman, D.W, B.C. Matthews and R.E. Wicklund,1963)* that "there are often areas of poorly drained soils too small to be delineated". These areas are not easily drained and are often not arable.

Burford Loam is the well-drained member of the Burford Soil catena. Burford soils are well drained loam materials occurring over coarse gravels. The gravel materials were deposited by glacial meltwater spillways. The deposits are stratified with a considerable range in size from fine sands to cobbles. The topography is gently undulating. Gravel, stones, and stones are present on the surface and throughout the soil profile.

Gilford Loam is the poorly drained member of the Burford Soil Catena. Gilford soils are located in depressional areas and are typically seasonally wet areas, with shallow water tables. The surface soils generally comprise high organic matter content, while the lower layers comprise gleyed materials and gravels within 50 cm of the surface.

Muck soils are very poorly drained organic deposits that have accumulated in shallow lakes, ponds, and undrained depressional areas. The organic deposits are well decomposed, with coarse woody fragments from trees, and roots.

A description of the soil at each inspection site is included in Appendix C.

3.5 ARTIFICIAL DRAINAGE

An evaluation of artificial drainage on the Study Area was completed through a correlation of observations noted during the windshield surveys, aerial photographic interpretation, and a review of the OMAFRA Artificial Drainage System Mapping. Figure 1 illustrates the tile drainage areas that are registered in the OMAFRA database.

Visual evidence supporting the use of subsurface tile drains would include observations of drain outlets to roadside ditches or surface waterways, and surface inlet structures (hickenbottom or french drain inlets).

Evidence in support of subsurface tile drainage on aerial photographs would be based on the visual pattern of tile drainage lines as identified by linear features in the agricultural lands and by the respective light and dark tones on the aerial photographs. The light and dark tones relate to the moisture content in the surface soils at the time the aerial photograph was taken.

OMAFRA Artificial Drainage System Maps were reviewed to determine if an agricultural tile drainage system had been registered to the Study Area. The OMAFRA maps revealed that no agricultural drainage systems were registered on the Study Area (Figure 1).

Absence of agricultural drainage systems is typical of areas where the soil developed on sandy or gravelly materials. The soil is generally open or coarse texture where water easily infiltrates and moves through the soil profile.

3.6 IRRIGATION

Observations noted during the surficial soil survey indicated that the Study Area is not irrigated, and that the property is not set up for the use of irrigation equipment. Visual evidence supporting the use of irrigation equipment would include the presence of the irrigation equipment (piping, water guns, sprayers, tubing, etc), the presence of a body of water capable of sustaining the irrigation operation and lands that are appropriate for the use of such equipment.

No irrigation equipment was observed onsite during the course of the on-site survey.

3.7 LANDFORMING

With the exception of the creation of a laneway to allow access to the property (and the farmstead area and farther to the west) there is no evidence of any landforming for the purposes of leveling or reducing slope for the enhancement of agricultural activities or operations.

3.8 SOIL CAPABILITY FOR AGRICULTURE

Basic information about the soils of Ontario is made more useful by providing an interpretation of the agricultural capability of the soil for various crops. The CLI system combines attributes of the soil to place the soils into a seven-class system of land use capabilities. The CLI soil capability classification system groups mineral soils according to their potentialities and limitations for agricultural use. The first three classes are considered capable of sustained production of common field crops, the fourth is marginal for sustained agriculture, the fifth is capable for use of permanent pasture and hay, the sixth for wild pasture and the seventh class is for soils or landforms incapable for use for arable culture or permanent pasture. Organic or Muck soils are not classified under this system. Disturbed Soil Areas are not rated under this system.

The OMAFRA document *Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for Application of the Canada Land Inventory in Ontario* defines CLI classification as follows:

Class 1 - Soils in this class have no significant limitations in use for crops. Soils in Class 1 are level to nearly level, deep, well to imperfectly drained and have good nutrient and water holding capacity. They can be managed and cropped without difficulty. Under good management they are moderately high to high in productivity for the full range of common field crops

Class 2 - Soils in this class have moderate limitations that reduce the choice of crops, or require moderate conservation practices. These soils are deep and may not hold moisture and nutrients as well as Class 1 soils. The limitations are moderate and the soils can be managed and cropped with little difficulty. Under good management they are moderately high to high in productivity for a wide range of common field crops.

Class 3 - Soils in this class have moderately severe limitations that reduce the choice of crops or require special conservation practices. The limitations are more severe than for Class 2 soils. They affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. Under good management these soils are fair to moderately high in productivity for a wide range of common field crops.

Class 4 - Soils in this class have severe limitations that restrict the choice of crops, or require special conservation practices and very careful management, or both. The severe limitations seriously affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. These soils are low to medium in productivity for a narrow to wide range of common field crops, but may have higher productivity for a specially adapted crop.

Class 5 - Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible. The limitations are so severe that the soils are not capable of use for sustained production of annual field crops. The soils are capable of producing native or tame species of perennial forage plants and may be improved through the use of farm machinery. Feasible improvement practices may include clearing of bush, cultivation, seeding, fertilizing or water control.

Class 6 - Soils in this class are unsuited for cultivation, but are capable of use for unimproved permanent pasture. These soils may provide some sustained grazing for farm animals, but the limitations are so severe that improvement through the use of farm machinery is impractical. The terrain may be unsuitable for the use of farm machinery, or the soils may not respond to improvement, or the grazing season may be very short.

Class 7 - Soils in this class have no capability for arable culture or permanent pasture. This class includes marsh, rockland and soil on very steep slopes.

The OMAFRA document *Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for Application of the Canada Land Inventory in Ontario* defines the CLI subclassification as follows:

Subclass F – Low Natural Fertility: This subclass is made up of soils having low fertility that is either correctable with careful management in the use of fertilizers and soil amendments or is difficult to correct in a feasible way. The limitation may be due to a lack of available plant nutrients, high acidity, low exchange capacity, or presence of toxic compounds.

Subclass M – Moisture Deficiency: This subclass denotes soils which have low moisture holding capacities and are more prone to droughtiness.

Subclass S – Adverse Soil Characteristics: This subclass denotes a combination of limitations of equal severity. In Ontario it has often been used to denote a combination of fertility (f) and moisture (m) when these are present with a third limitation such as topography (t) or stoniness (p).

Subclass T - Topography: This subclass denotes limitations due to slope steepness and length. Such limitations may hinder machinery use, decrease the uniformity of crop growth and maturity, and increase water erosion potential.

Subclass W - Excess Water: The presence of excess soil moisture, other than that brought about by inundation, is a limitation to field crop agriculture. Excess water may result from inadequate soil drainage, a high-water table, seepage, or runoff from surrounding areas. This limitation only applies to soils classified as poorly or very poorly drained.

Each polygon identified on-site was classified according to the CLI rating system then correlated to the CLI classifications as presented in the *Soil Survey of Wellington County (Report No. 35 of the Ontario Soil Survey, Hoffman, D.W, B.C. Matthews and R.E. Wicklund,1963)*, the digital soil data

provided by OMAFRA, and the OMAFRA document *Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for the Application of the Canada Land Inventory in Ontario*.

Dumfries soils located on complex (slope length less than 50 m) 'c' slopes (2-5 percent) were rated as CLI class 2FM, on complex 'd' slopes (5-9 percent) as CLI class 3T, on complex 'd' slopes (5-9 percent) as CLI class 3T, on complex 'e' slopes (9-15 percent) as CLI class 4T, and on complex 'f' slopes (15-30 percent) as CLI class 5T.

Burford soils located on simple 'C' slopes (2-5 percent) (slope length greater than 50 m) were rated as 2FM, and on complex 'c' slopes (slope length less than 50 m) were rated as 2ST.

Gilford Loam soil was rated as 4W.

Muck soils are not classified in the Canada Land Inventory rating system.

Disturbed soils are not rated in the CLI classification system.

Table 1 summarizes the relative percent area occupied by each capability class for the Proposed License Area and the Maximum Extraction Area.

Table 1 Canada Land Inventory – Study Area

Canada Land Inventory Class (CLI)	Proposed License Area (ha)	Proposed License Area Percent Occurrence	Maximum Extraction Area (ha)	Maximum Extraction Area Percent Occurrence
Class 1	-	-	-	-
Class 2	12.5	53.9	9.6	92.2
Class 3	1.3	5.6	0.1	1.2
Class 4	0.8	3.4	0.1	1.2
Class 5	0.7	3.0	-	-
Class 6	-	-	-	-
Class 7	-	-	-	-
Not Rated (Disturbed areas, ponded areas, and organic soil)	7.9	34.1	0.6	5.5
Totals	23.5	100.0	10.4	100.0

The Proposed License Area comprised approximately 59.5 percent CLI class 1 – 3 soils, with CLI class 2 of approximately 53.9 percent, and CLI class 3 of approximately 5.6 percent. The remaining mineral soils (CLI class 4 – 7) comprise approximately 6.4 percent of the Study Area. Not rated (disturbed soil areas) comprised approximately 34.1 percent.

The Maximum Extraction Area comprised approximately 93.4 percent CLI class 1 – 3 soils, with CLI class 2 of approximately 92.2 percent, and CLI class 3 of approximately 1.2 percent. The remaining mineral soils (CLI class 4 – 7) comprise approximately 1.2 percent of the Study Area. Not rated (disturbed soil areas) comprised approximately 5.5 percent.

3.9 HOFFMAN PRODUCTIVITY INDEX (SOIL PRODUCTIVITY RATING)

The Hoffman Productivity Index (HPI) is a tool that was published in ARDA Report No. 4 *The Assessment of Soil Productivity for Agriculture* and is used to relate the productivity of lands to the CLI soil capability.

These indices are also referred to as the Soil Productivity Index and are used to calculate and assign a parcel or polygon a single value which represents the overall productivity of that parcel or polygon.

The single value is derived from the sum of the percent occurrence of each CLI Soil Capability Class on the parcel or within the polygon multiplied by the productivity index corresponding to the soil class.

Certain assumptions are made when using the productivity index. The HPI assumes that if the same level of management is applied to areas of differing CLI classes, then the productivity for each class will differ. Hoffman determined the average yields produced for common field crops on lands with CLI classes 1 to 4 within Ontario.

In developing the HPI, it was determined that a CLI class 2 land produced approximately 80% of the yield that would be associated with a CLI class 1 land. Further that a CLI class 3 land produced approximately 64% of the yield that would be associated with a CLI class1 land, while a CLI class 4 land produced approximately 49%. Values for class 5 through class 7 lands were extrapolated. As a result, it was determined that the productivity ranges were as follows as illustrated in Table 2.

Table 2 Soil Productivity Index Ranges

Soil Productivity Index Ratings	
CLI Class	**Soil Productivity Index**
1	1.0
2	0.8
3	0.64
4	0.49
5	0.33
6	0.17
7	0.02

A parcels or polygons HPI or Soil Productivity Index is calculated as follows:

Soil Productivity Index =
(percent occurrence of class 1 lands x 1.0) + (percent occurrence of class 2 lands x 0.8) + (percent occurrence of class 3 lands x 0.64) + (percent occurrence of class 4 lands x 0.49) + (percent occurrence of class 5 lands x 0.33) + (percent occurrence of class 6 lands x 0.17) + (percent occurrence of class 7 lands x 0.02)

Once a Soil Productivity Index value is calculated for the parcel or polygon, the value can be related back to a CLI Equivalent. The following table (Table 3) illustrates the range of values which can be directly correlated to the equivalent CLI class.

Table 3 Soil Productivity Index Range and Equivalent CLI

Soil Productivity Index Range	
Equivalent CLI Class	**Soil Productivity Range**
1	0.90 - 1.00
2	0.73 - 0.89
3	0.58 – 0.72
4	0.43 – 0.57
5	0.28 – 0.42
6	0.10 – 0.27
7	0.00 – 0.09

With respect to the Study Area Lands, an HPI calculation was completed. The HPI value and subsequent CLI class are provided in Table 4.

Table 4 Soil (Hoffman) Productivity Rating and Equivalent CLI Class

	Soil (Hoffman) Productivity Rating	Corresponding CLI Class
Proposed License Boundary	0.494	4
Maximum Extraction Area	0.749	2

The calculated Soil Productivity Rating for the Proposed License Boundary Area was 0.494 or a CLI class 4 equivalent.

The calculated Soil Productivity Rating for the Maximum Extraction Area was 0.749 or a CLI class 2 equivalent.

4.0 SUMMARY AND CONCLUSIONS

DBH Soil Services Inc. was retained to complete a Soil Survey and Canada Land Inventory (CLI) classification assessment for an area identified as:

4454 Victoria Road South
Township of Puslinch
County of Wellington

The Study Area lands comprise approximately 23.5 ha (58.06 acres) of which much of the lands are used for agricultural crop production (common field crop). The non-cropped lands included woodland areas located in fence rows, large woodland areas near the residential unit (east) and in the western portion of the parcel. Additional woodland areas were noted in fence rows throughout the parcel. Scrub lands were noted west of the residential unit, and in the central area. Areas of surface water (ponding) were noted near the residential unit and in the central portions of the parcel.

A rural residential unit was observed on the eastern portion of the parcel fronting Victoria Road South. No livestock was observed on the property during the onsite soil survey.

The results of the Soil Survey assessment include the following:

- The Study Area is roughly bounded: on the east by Victoria Road South, rural residential units, and woodlands; on the south by woodlands, agricultural fields, and rural residential units; on the west by woodlands, agricultural fields; and on the north by agricultural fields, woodlands, and the Millcreek Country Club community.

- The Study Area is located east of the urban area of Aberfoyle, approximately 2.7 km north of Highway 401, and approximately 4.2 km southeast of the urban area of Guelph.

- A large portion of the Study Area lands was used for the production of common field crops.

- The remaining portions of the Study Area lands were comprised of woodlands, ponded areas, and a small area of scrublands.

- A few small, ponded areas, and seasonally ponded areas were noted on the Study Area.

- A large woodland area was observed in the western extent of the Study Area and near the residential unit.

- Stone piles (cobble and boulder size) were noted along portions of the woodlots, fence rows, and along the property boundaries.

- No irrigation equipment or irrigation systems were observed on the Study Area

- There are no registered artificial tile drains associated with this property.

- The Proposed License Area comprised approximately 59.5 percent CLI class 1 – 3 soils, with CLI class 2 of approximately 53.9 percent, and CLI class 3 of approximately 5.6 percent. The remaining mineral soils (CLI class 4 – 7) comprise approximately 6.4 percent of the Study Area. Not rated (disturbed soil areas) comprised approximately 34.1 percent.

- The Maximum Extraction Area comprised approximately 93.4 percent CLI class 1 – 3 soils, with CLI class 2 of approximately 92.2 percent, and CLI class 3 of approximately 1.2 percent. The remaining mineral soils (CLI class 4 – 7) comprise approximately 1.2 percent of the Study Area. Not rated (disturbed soil areas) comprised approximately 5.5 percent.

- The calculated Soil Productivity Rating for the Proposed License Boundary Area was 0.494 or a CLI class 4 equivalent.

- The calculated Soil Productivity Rating for the Preliminary Extraction Area was 0.749 or a CLI class 2 equivalent.

5.0 REFERENCES

The following data sources were used to carry out the detailed Soil Survey and CLI assessment for this study:

- 1:10000 scale Ministry of Natural Resources (MNR) Aerial Photography, 1978,
- 1:10000 scale Ontario Base Map (1983) Ministry of Natural Resources:
    - 10 17 5650 48100
    - 10 17 5700 48100

  1:50000 scale NTS Map No 40 P/8 and P/9. 1984. Ministry of Energy Mines and Resources, Canada,
- 1:50000 scale NTS Map No 40 P/8 and P/9. Canada Land Inventory (CLI) Capability Mapping,
- Agricultural Information Atlas (online resource, Ontario Ministry of Natural Resources),
- *Agronomy Guide for Field Crops (Publication 811). (2017).* Ontario Ministry of Agriculture, Food and Rural Affairs,
- ARDA Report No. 4, *The Assessment of Soil Productivity for Agriculture,*
- *Canadian System of Soil Classification (CSSC) (Agriculture Canada, 1998)* and the *Field Manual for Describing Soils in Ontario (Ontario Centre for Soil Resource Evaluation, 1993)*.
- *Classifying Prime and Marginal Agricultural Soils and Landscapes:* Guidelines for Application of the Canada Land Inventory in Ontario. OMAFRA. Online, 2023,
- County of Wellington online mapping, (https://sgis.wellington.ca/Maps/index.html?viewer=WellingtonCountyExternal),
- *Draft Agricultural Impact Assessment (AIA) Guidance Document (March 2018),*
- *Google Earth Pro Imagery,*
- Grand River Conservation Authority (GRCA) website (https://maps.grandriver.ca/web-gis/public/?theme=MYP&bbox=539184,4790579,566563,4805220),
- *Greenbelt Plan* (2022),
- *Growth Plan for the Greater Golden Horseshoe (2020),*
- *Guide to Agricultural Land Use*, Ontario Ministry of Agriculture, Food and Rural Affairs, March 1995,
- *Guidelines for Detailed Soil Surveys for Agricultural Land Use Planning (OMAFRA, 2022 online),*
- Guidelines on Permitted Uses in Ontario's Prime Agricultural Areas (Publication 851), Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), 2016,
- Online Soils data for the Province of Ontario (Land Information Ontario (LIO), 2023,
- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Factsheet – Crop Heat Units for Corn and Other Warm Season Crops in Ontario, 1993,
- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) AgMaps online mapping, (http://www.gisapplication.lrc.gov.on.ca/AIA/Index.html?viewer=AIA.AIA&locale=en-US),
- Ontario Ministry of Agriculture and Food - Land Use Systems Mapping,
- Ontario Ministry of Agriculture and Food - Artificial Drainage System Mapping,
- *Provincial Policy Statement, 2020,*
- *Soil Mapping System for Canada:* (https://sis.agr.gc.ca/cansis/publications/manuals/1981-smsc/index.html),

- *Soil Survey Handbook:* (https://sis.agr.gc.ca/cansis/publications/manuals/1987-9/index.html),
- *Soil Survey of Wellington County (Report No. 35 of the Ontario Soil Survey, Hoffman, D.W, B.C. Matthews and R.E. Wicklund,1963)*
- *The Physiography of Southern Ontario 3rd Edition, Ontario Geological Survey Special Volume 2, Ministry of Natural Resources, 1984,*
- Windshield and field surveys by DBH Soil Services staff, May 3, 2024.

APPENDIX A

OMAFRA ***Guidelines for Detailed Soil Surveys for Agricultural Land Use Planning***

Guidelines for Detailed Soil Surveys for Agricultural Land Use Planning

Table of Contents

1. Introduction
2. Components of the Detailed Soil Survey
3. References
4. Qualifications
5. Related Links

Introduction

More detailed, property specific soil surveys are sometimes needed when a land use change (e.g., an official plan amendment) is being sought that would permanently remove the land from agriculture. The Planning Act establishes that decision makers such as municipalities and the Ontario Municipal Board must have regard for the Provincial Policy Statement of 1997. This statement provides direction on the protection of prime agricultural areas, and establishes criteria to be considered when prime agricultural lands are to be designated for non-agricultural land uses.

The following guidelines provide direction for land resource consultants and their clients undertaking detailed soil surveys for the assessment of agricultural crop capabilities and suitabilities. For these guidelines a "detailed" soil survey is one compiled at a working map scale of 1:10,000 or greater. These guidelines, or terms of reference, are a set of basic requirements to ensure that planners, landowners and consultants have the necessary detailed agricultural land resource information presented and reported in a standard form in order to make planning decisions or to advocate for changes to planning decisions.

The need for detailed soil information for some local decisions often arises from concerns with

1. the accuracy of the published soil information mapping, classification, and agricultural interpretations.
2. situations where the published information is too general for decisions about a specific area.

"Published soil information" refers to the county and municipal soil reports and maps, and also the Agricultural Capability maps. These map and report documents are all available from OMAF.

Soil Survey Components

1. The soil survey should be done according to generally accepted soil survey procedures and be based on an adequate density and distribution of soil profile and landscape inspections. A general guideline is one ground inspection per two square centimetres on the final map (Soil Mapping System for Canada, Agriculture Canada, 1981). At a scale of 1:10,000 this is one inspection per two hectares. Inspection locations and data should be included with the soil map and report.
   The "Field Manual for Describing Soils in Ontario" (Ontario Centre for Soil Resource Evaluation, 1993) provides guidelines for classifying soils and the landscapes in which they occur.
2. Soils of the subject area should be correlated with the soils classified in the published soil survey map and report for that county or municipality.
3. Agricultural capability for common field crops (corn, soybeans, small grains, forages) should be interpreted using the document "Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for the Application of the Canada Land Inventory in Ontario" (www.omafra.gov.on.ca/english/ag.html). As explained in this document, land and soils which are classified as "prime agricultural land" (CLI classes 1 to 3) have necessary capital improvements in place or it is physically feasible for the landowner/manager/farmer to make the necessary improvements. If it is not feasible to make improvements that would enable mechanized row cropping, then the land may be considered as less than "prime" (CLI class 4 or 5). The question of "feasibility" often arises about land with wetness limitations for which more drainage improvement is required for productivity to be optimized. Each case must be considered individually. The Agricultural Drainage System Mapping (OMAF) for the subject area is a necessary reference to help argue and answer the question of drainage improvement feasibility.
4. If the subject area lies within or adjacent to a larger area of specialty crop production, then its soil suitability for specialty crops needs to be evaluated. (Provincial Policy Statement, 1996). "Specialty crops" refer to fruit, vegetable and other crops grown commercially in Ontario and which cannot be grouped with the general "common field crop" types listed above. A definition of "Specialty crop land" is given in the Provincial Policy Statement. The following publications and guidelines are useful for evaluating land and soil quality for specialty crops:
   a. More recent soil survey reports (Brant, Elgin, Haldimand-Norfolk, Middlesex, and Niagara) include ratings of soil suitability for some specialty crops. The ratings published in these reports may also guide the interpretation of reasonably correlated soils in adjacent counties whose soil reports contain no such specialty crop interpretations.
   b. The publication "A Compilation of Soil, Water and Climatic Requirements for Selected Horticultural Crops in Southern Ontario" (Ontario Institute of Pedology Publication, 1989) outlines general landscape and moisture needs for more than 40 different tree fruit, small fruit and vegetable crops. It comprises many of the soil principles used to arrive at the soil suitability ratings given in soil survey publications cited in (a).
   c. Irrigation and/or artificial drainage are often necessary, depending on the site and crop. Climatic regime needs consideration. The longer the frost free period and the greater the heat units available, the greater the range and productivity of crops land tends to support.
   d. In general, soils which are interpreted to be "prime" (Class 1-3) for the common field crop types of corn, soybeans, small grains and forages will have viable suitability for a range of specialty crops. This is most true of sandy and

loamy soils. Clayey soils are suitable for a lesser range of specialty crops but may still be well suited for some crops.

References

Provincial Policy Statement, 1997. As it regards agriculture, see www.omafra.gov.on.ca/english/landuse/facts/provpoli.htm

The Canadian System of Soil Classification; Agriculture and Agri-Food Canada, 1998

Field Manual for Describing Soils in Ontario; Ontario Centre for Soil Resource Evaluation, 1993.

Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for Application of the Canada Land Inventory in Ontario; Ontario Ministry of Agriculture and Food, 2004

A Soil Mapping System for Canada: Revised; Agriculture Canada, 1981

Agricultural Drainage Systems Mapping, OMAF, 1983

A Compilation of Soil, Water and Climatic Requirements for Selected Horticultural Crops in Southern Ontario, Ontario Institute of Pedology, 1993

Qualifications

In order to ensure that all of the components for the detailed soil survey are completed properly, an experienced pedologist should be retained for any survey work. The Ontario Ministry of Agriculture and Food provides a list of consulting businesses with expertise in pedology.

Feedback and technical inquiries to: landuse@omafra.gov.on.ca

Related Links

- Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for Application of the Canada Land Inventory in Ontario
- Provincial Policy Statement Agricultural Policies

For more information:
Toll Free: 1-877-424-1300
Local: (519) 826-4047
E-mail: ag.info.omafra@ontario.ca

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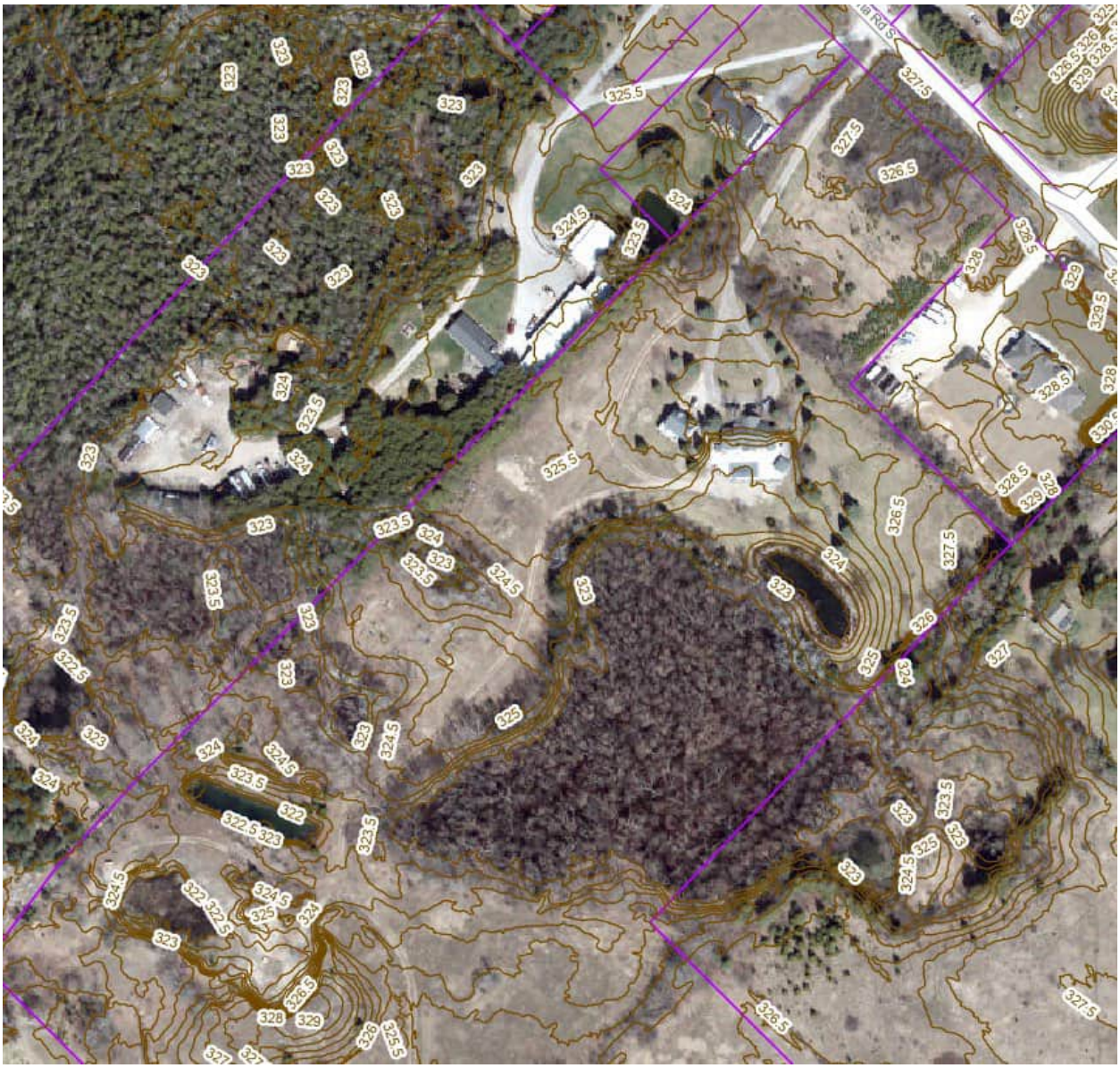
APPENDIX B

Grand River Conservation Authority Contour Mapping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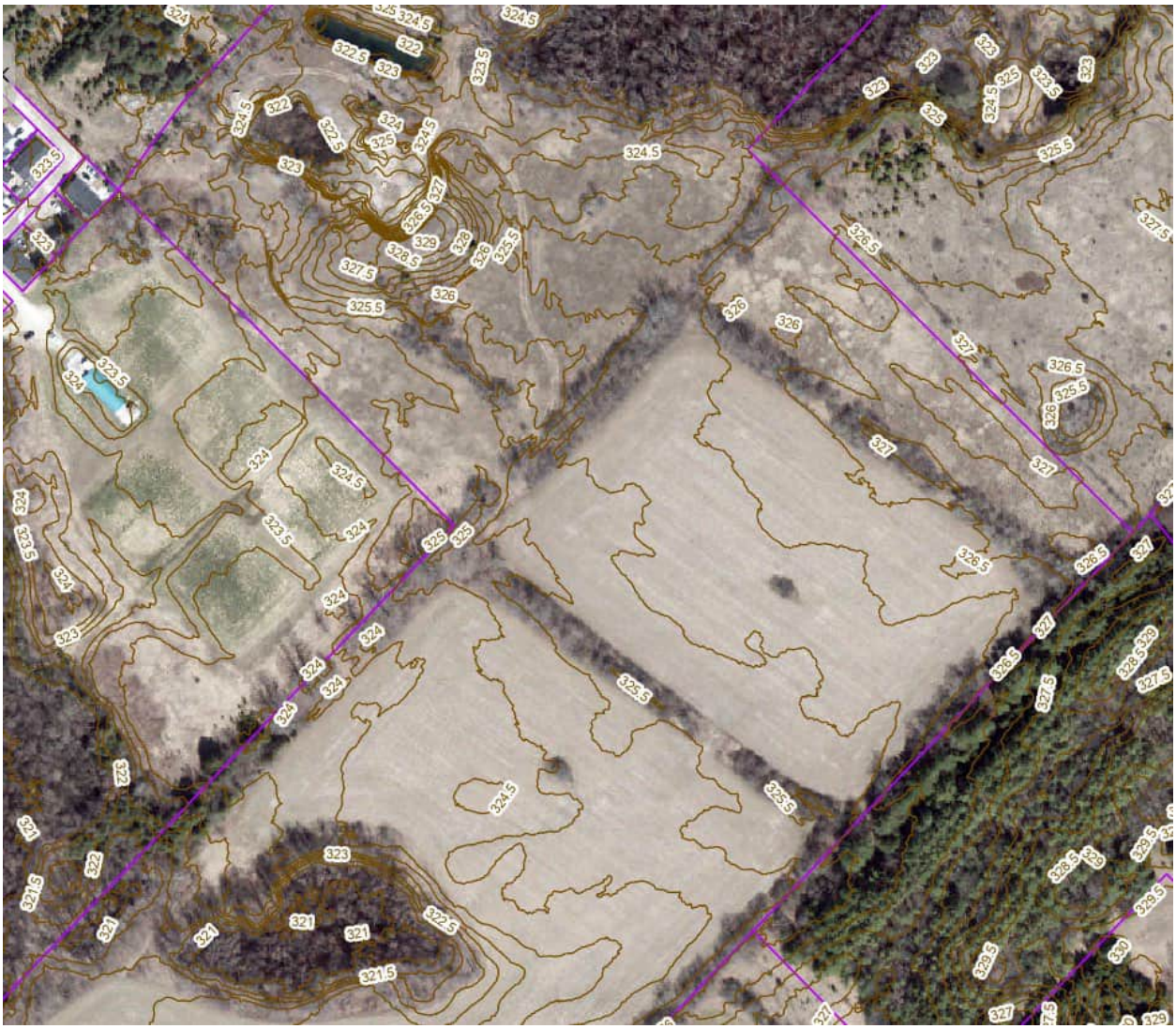
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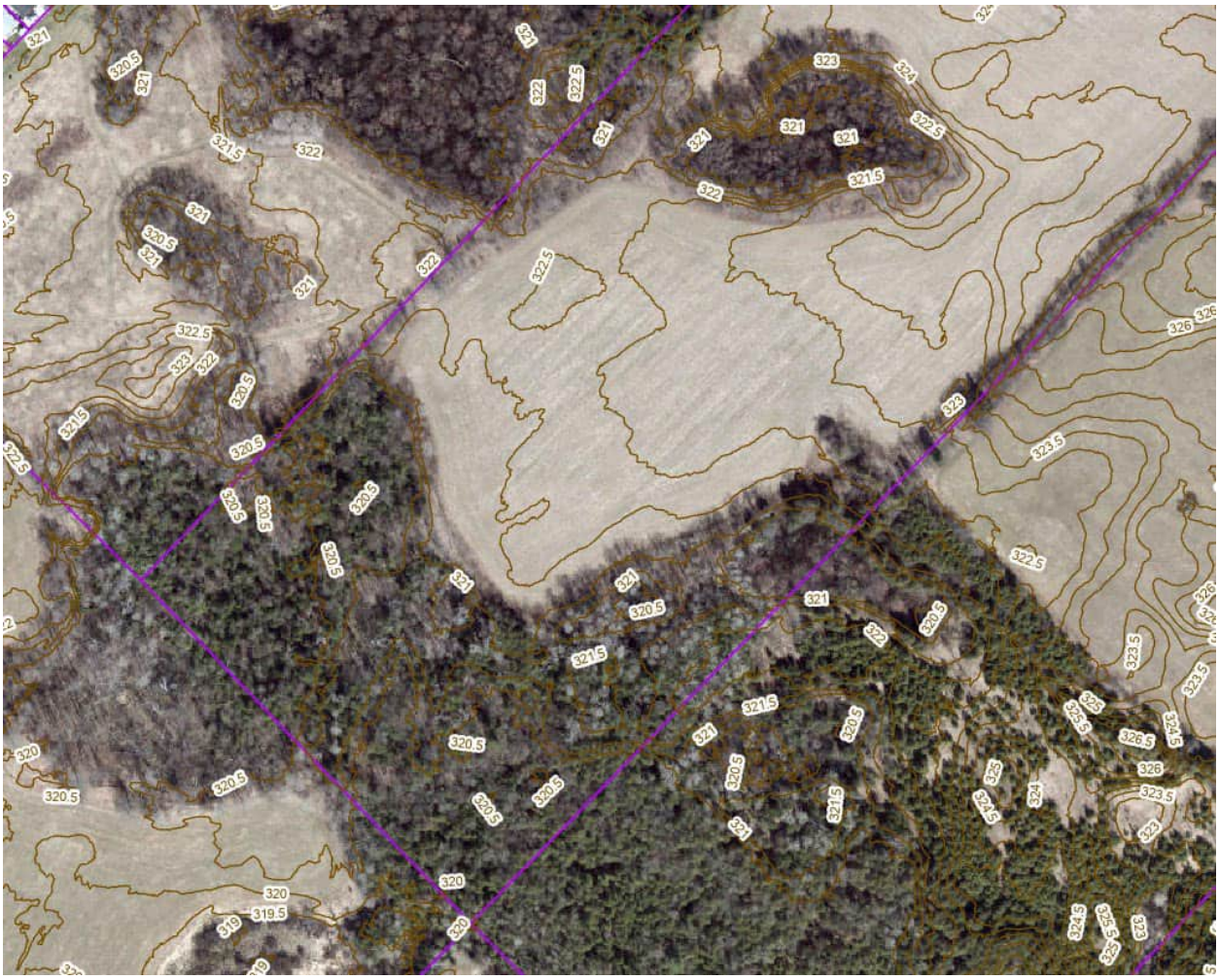
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APPENDIX C

Soil Inspection Data

Soil Inspection Site Number	Horizon	Depth of Horizon (cm)	Soil Texture	Drainage Class	Soil Series
1900	Ah	0 - 22	SL	Well	Dumfries
1901	Ap	0 – 18	SL	Well	Burford
1903	Ap	0 – 18	SL	Well	Burford
1904	Ah	0 – 15	SL	Well	Burford
1905	Ah	0 – 15	SL	Well	Burford
1907	Ap Bm	0 – 30 30 - 48	SL	Well	Burford
1908	Ah	0 – 15	SL	Well	Burford
1909	Ah	0 – 15	SL	Well	Burford
1910	Ap	0 – 20	SL	Well	Burford
1911	Ap	0 – 15	SL	Well	Burford
1912	Ah	0 – 21	SL	Well	Dumfries
1913	Ap	0 – 15	SL	Well	Burford
1914	Ah Bm	0 – 25 25 – 35	SL	Well	Dumfries
1915	Ap	0 – 15	SL	Well	Burford
1916	O	0 – 100	Oh	Very Poor	Muck
1922	Ap	0 – 15	SL	Well	Burford
1923	Ap	0 – 15	SL	Well	Burford
1924	Ap	0 – 15	SL	Well	Burford
1925	Ap	0 – 12	SL	Well	Dumfries

Notes: L = Loam; SL = Sandy Loam, LS = Loamy Sand, fSL = fine Sandy Loam, fS = fine Sand, S = Sand; gSL = gravelly Sandy Loam; vgSL = very gravelly Sandy Loam, SiL = Silt Loam, gSCL = gravelly Sandy Clay Loam, Oh = Organic Humic.

A horizon = topsoil. B horizon = subsoil. C horizon = parent material. O = Organic Soil

* = refusal (stone, tree root, etc).

APPENDIX D

Curriculum Vitae

DBH Soil Services Inc
217 Highgate Court
Kitchener Ontario N2N 3N9

phone: (519) 578-9226
email: dhodgson@dbhsoilservices.ca

DAVID B. HODGSON, B.Sc., P. Ag.
PRESIDENT – Senior Pedologist/Agrologist

EDUCATION

- B.Sc. (Agriculture), 1983-1987; University of Guelph, Major in Soil Science
- Agricultural Engineering, 1982-1983; University of Guelph.
- Materials Science Technology, 1981-1982; Northern Alberta Institute of Technology (NAIT), Edmonton, Alberta.

AREAS OF PROFESSIONAL EXPERIENCE

2000 to Present — **Senior Pedologist/President. DBH Soil Services Inc., Kitchener, Ontario.**
Mr. Hodgson provides expertise in the investigation, assessment and resource evaluation of agricultural operations/facilities and soil materials. Dave is directly responsible for the field and office operations of DBH Soil Services and for providing advanced problem solving skills as required on an individual client/project basis. Dave is skilled at assessing soil and agricultural resources, determining potential impacts and is responsible for providing the analysis of and recommendations for the remediation of impacts to soil/agricultural/environmental systems in both rural and urban environments.

1992 to 2000 — **Pedologist/Project Scientist. Ecologistics Limited, Waterloo, Ontario.**
As pedologist (soil scientist), Mr. Hodgson provided expertise in the morphological, chemical and physical characterization of insitu soils. As such, Mr. Hodgson was involved in a variety of environmental assessment, waste management, agricultural research and site/route selection studies.
Dave was directly responsible for compiling, analysis and management of the environmental resource information. Dave is skilled at evaluating the resource information utilizing Geographic Information System (GIS) applications.

Dave was also involved the firms Environmental Audit and Remediation Division in the capacity of: asbestos identification; an inspector for the remediation of a pesticide contaminated site; and an investigator for Phase I and Phase II Audits.

SELECT PROJECT EXPERIENCE

Environmental Assessment Studies

- Agricultural Component of the Highway 401 Widening Milton to Wellington County Boundary, 2023 – ongoing.
- Agricultural Component of the Highway 6 Widening Hamilton 2022 – ongoing.
- Agricultural Component of the Bradford Bypass (Highway 400 to 404 link) 2021 – ongoing.
- Agricultural Component of the Green for Life (GFL) Environmental, Moose Creek, Eastern Ontario Waste Handling Facility (EOWHF) Expansion, 2020 – 2023.
- Agricultural Component of the Greater Toronto Area West (GTAW) Highway 413 Corridor Assessment, 2019 – ongoing.
- Peer Review of the Walker Environmental Group (WEG) Inc. Southwestern Landfill Proposal, Ingersoll, 2013 – 2021.
- Agricultural Component for the High-Speed Rail Kitchener to London –Terms of Reference, 2018,
- Agricultural Component of the Mount Nemo Heritage District Conservation Study – City of Burlington, 2014 – 2015.
- Agricultural Component of the Greater Toronto Area West (GTAW) Highway Corridor Assessment – Phase 2, 2014 – 2016.

- Peer Review of the Agricultural Component of the Walker Group Landfill – Ingersoll, 2013 – 2015.
- Agricultural Component of the Highway 407 East Extension Design and Build Phase, 2012 – 2013.
- Agricultural Component of the Beechwood Road Environmental Centre (Landfill/Recycling) – Napanee, 2012 – 2013.
- Agricultural Component of the Clean Harbors Hazardous Waste Landfill Lambton County 2009 – 2015.
- Agricultural Component of the Highway 401 widening Cambridge to Halton Region 2009 – 2012.
- Agricultural Component of the Upper York Sanitary Sewer Study, York Region, 2009 – 2013.
- Agricultural Component of the Greater Toronto Area West Corridor Environmental Assessment Study 2007 – 2013 (Phase 1).
- Agricultural Component of the Niagara to GTA Planning and Environmental Assessment Study, 2007 – 2013.
- Agricultural Component of the Highway 401 widening, Chatham, 2006 - 2007.
- Agricultural Component of the Trafalgar Road study, Halton Region, 2005.
- Agricultural Component of the Highway 404 Extension North, 2004.
- Agricultural Component of the Highway 404 – 400 Bradford Bypass, 2004.
- Agricultural Component of the Highway 407 East Extension, 2002 – 2010.

Agricultural Impact Assessment/Minimum Distance Separation Studies

- Whistle Bare Road, North Dumfries Minimum Distance Separation (MDS1 Assessment), 2024.
- Balsam Road, Pickering Minimum Distances Separation (MDS1) Assessment, 2024.
- Port Hope West Urban Boundary Expansion Scoped Agricultural Impact Assessment (including MDS1), 2023.
- Port Hope East Urban Boundary Expansion Scoped Agricultural Impact Assessment (including MDS1), 2023.
- Town of King Battery Energy Storage System (BESS) Agricultural Impact Assessment, 2023.
- City of London Agricultural Impact Assessment (including MDS1), 2023.
- Caledonia Secondary Plan Scoped Agricultural Impact Assessment (including MDS), 2023.
- Inglewood Well Agricultural Impact Assessment, 2023.
- Orangeville Battery Energy Storage System (BESS) Agricultural Impact Assessment, 2023.
- County Road 109 Realignment Agricultural Impact Assessment, 2023.
- Thornbury Acres Agricultural Impact Assessment (including MDS1), 2022 – 2023.
- Highway 6 Widening Hamilton Agricultural Impact Assessment, 2022 – ongoing.
- Whistle Bare Pit Agricultural Impact Assessment, 2022.
- Middletown Road Agricultural Impact Assessment (including MDS1), 2022.
- Claremont, Durham Region Minimum Distance Separation (MDS1), 2022.
- Grand Valley Settlement Area Boundary Expansion 2022 - ongoing.
- Hagersville Minimum Distance Separation (MDS1), 2022.
- East River Road Minimum Distance Separation (MDS1), County of Brant, 2022.
- Brampton Brick Norval Quarry, Agricultural Impact Assessment, 2022 – ongoing.
- Northfield Drive Minimum Distance Separation (MDS1), Waterloo Region, 2021
- Bradford Bypass Highway 400- 404 Link, Agricultural Impact Assessment, 2021 – ongoing.
- Wilfrid Laurier Milton Campus, Agricultural Impact Assessment (including MDS1), 2021 – 2023.
- Town of Lincoln Road Realignment, Agricultural Impact Assessment, 2021 – 2023.
- Britannia Secondary Plan, Agricultural Impact Assessment (including MDS1), Milton, 2021 – 2023.
- Reesor Road Minimum Distance Separation (MDS1), Markham, 2021.
- Maclean School Road Minimum Distance Separation (MDS1), County of Brant, 2021.
- Petersburgh Sand Pit, Agricultural Impact Assessment, 2021 – 2022.
- Milton, CRH Quarry Expansion, Agricultural Impact Assessment, 2020 – 2022.
- Grimsby, Specialty Crop Area Redesignation, Agricultural Impact Assessment, 2020 - 2022.
- Halton Hills, Premier Gateway Phase 2 Employment Lands Secondary Plan, Agricultural Impact Assessment (including MDS1), 2020 - 2021.
- Milton Education Village Secondary Plan, Agricultural Impact Assessment (including MDS1), 2020 - 2021.
- Woodstock, Pattullo Avenue Realignment, Agricultural Impact Assessment, 2020 - 2021.

- Smithville, West Lincoln Master Community Plan, Agricultural Impact Assessment (including MDS1), AECOM, 2019 – 2022.
- Kirby Road Agricultural Impact Assessment, HDR, Vaughan, 2019 – 2021.
- Elfrida Lands, City of Hamilton, Agricultural Impact Assessment Update, WSP, 2019 – 2021.
- Dorsay Development – Durham Region High Level Agricultural Assessment, 2019.
- Stoney Creek Landfill AIA Update – GHD, 2019.
- Town of Wilmot, Agricultural Impact Assessment (AIA) Aggregate Pit Study (Hallman Pit), 2018, on-going.
- Courtice Area Southeast Secondary Plan (Clarington) Agricultural Impact Assessment (AIA) (including MDS1), 2019,
- Town of Halton Hills, Minimum Distance Separation (MDS 1), August 2018,
- Cedar Creek Pit/Alps Pit (North Dumfries), Agricultural Impact Assessment (AIA), 2018 – 2021,
- Belle Aire Road (Simcoe County) Agricultural Impact Assessment (AIA) Study (including MDS1), 2019,
- Vinemount Quarry Extension (Niagara) Agricultural Impact Assessment (AIA) Study, December 2017.
- Grimsby – Agricultural Impact Assessment Opinion, November 2017.
- City of Hamilton, Urban Core Developments – Agricultural Capability Assessment, February 2017.
- Township of North Dumfries – Minimum Distance Separation (MDS 1), February 2017.
- Township of Erin, County of Wellington – Minimum Distance Separation 1(MDS1 Study), 2016.
- Halton Hills Employment Area Secondary Plan, Halton, 2015 - 2016.
- Peer Review of Agricultural Impact Assessment, Oro-Medonte Township, 2015.
- Greenwood Construction Aggregate Pit, Mono Township, 2014 - 2015.
- Innisfil Mapleview Developments, Town of Innisfil – Minimum Distance Separation (MDS 1), 2014.
- Loyalist Township – Minimum Distance Separation (MDS 1 & 2), 2014.
- Rivera Fine Homes, Caledon – Minimum Distance Separation (MDS 1), 2014.
- Town of Milton PanAm Velodrome – Minimum Distance Separation (MDS) 2012 – 2013.

Soil Surveys/Soil Evaluations

- Ontario Stone, Sand & Gravel Association Case Study Rehabilitated Pits, 2023 – ongoing.
- Soil Survey and Canada Land Inventory Evaluation, Neubauer Pit, 2023.
- Soil Survey and Canada Land Inventory Evaluation, David Pit, 2023.
- Soil Survey and Canada Land Inventory Evaluation, Pinehurst Road, 2023.
- Soil Survey and Canada Land Inventory Evaluation, Paris Plains Church Road Site, 2022.
- Soil Survey and Canada Land Inventory Evaluation, Mulmur Site, 2022.
- Soil Survey and Canada Land Inventory Evaluation, Port Colborne Site, 2022.
- Soil Survey and Canada Land Inventory Evaluation, Pike Site, 2022.
- Soil Survey and Canada Land Inventory Evaluation, New Dundee Road Site, 2022.
- Soil Survey and Canada Land Inventory Evaluation, Gehl Farm, 2022
- Soil Sampling, City of Kitchener, 2021 – 2022.
- Soybean Cyst Nematode Soil Sampling, Enbridge, 2021.
- Soil Survey and Canada Land Inventory Evaluation, Max Becker Enterprises, City of Kitchener, 2021
- Soil Survey and Canada Land Inventory Evaluation, Max Beck Enterprises, City of Kitchener, 2021 – 2022.
- Soil Survey and Canada Land Inventory Evaluation, Burlington, Nelson Quarry, 2020-2021.
- City of Kitchener, City Wide Soil Studies, 2020-ongoing.
- Soil Survey, Fallowfield Drive, City of Kitchener Development Manual Study, 2020 - ongoing.
- Soil Survey, Williamsburg Estates, City of Kitchener Development Manual Study, 2020 - 2021.
- Soil Survey, South Estates, City of Kitchener Development Manual Study, 2020 - 2021.
- Soil Survey and Canada Land Inventory Evaluation, Burlington, Nelson Quarry, 2019.
- Soil Survey and Canada Land Inventory Evaluation, Maryhill Pit, 2019.
- Soil Survey and Canada Land Inventory Evaluation, Glen Morris Pit, Lafarge Canada, 2018,
- Soil Survey and Canada Land Inventory Evaluation, Brantford Pit Extension, Lafarge Canada, 2018,
- Soil Survey and Canada Land Inventory Evaluation, Pinkney Pit Extension, Lafarge Canada, May 2018,
- Soil evaluation and opinion, King-Vaughan Road, March 2018,

- Soil Sampling, Upper Medway Watershed, Agriculture and Agri-Food Canada. December 2017 – June 2018.
- Soil Survey and Canada Land Inventory Evaluation, Hillsburgh Pit Extension, SBM St Marys, December 2017.
- Soil Survey and Canada Land Inventory Evaluation, Erin South Pit Extension, Halton Crushed Stone, December 2017.
- City of Kitchener, City Wide Urban Soil Assessments, 2016 – On-going.
- Soil Survey and Canada Land Inventory Evaluation, Solar Feed-In Tariff (FIT) Program Study, 2016.
    - Bruce County (15 sites)
    - Grey County (4 sites)
- Soil Survey and Canada Land Inventory Evaluation, Wasaga Beach area, County of Simcoe, 2016.
- Soil Survey and Canada Land Inventory Evaluation Study, MHBC Bradford, Simcoe County, 2016.
- Soil Survey and Canada Land Inventory Evaluation, Solar Feed-In Tariff (FIT Program Study), Carbon Foot Print Offsetters, Durham Region, 2015.
- Soil Survey and Canada Land Inventory Evaluation, Solar Feed-In Tariff (FIT Program Study), Abundant Solar Energy (12 Sites – Peterborough, Madoc, Havelock, Belleville), 2015.
- Soil Survey and Canada Land Inventory Evaluation, Solar Feed-In Tariff (FIT Program Study), City of Hamilton, 2015.

Municipal Comprehensive Review and Mapping Studies (MCR)

- Bruce County 2022 – 2023.
- Simcoe County, 2020 - ongoing.
- Northumberland County, 2020 - ongoing.
- Halton Region, 2019 - 2022.

Land Evaluation and Area Review Studies (LEAR)

- Land Evaluation and Area Review (LEAR) presentation for Lanark County Council, 2024.
- Land Evaluation and Area Review (LEAR) Town of Amaranth, 2023 – ongoing.
- Mapping Audit Bruce County. Assessment of Prime and Non-Prime Agricultural Lands, 2022.
- Mapping Audit Northumberland County. Comparison of Regional and Provincial Prime Agricultural Area Mapping – 2021 - ongoing.
- Mapping Audit Simcoe County. Comparison of Regional and Provincial Prime Agricultural Area Mapping – 2021 - ongoing.
- Mapping Audit Halton Region. Comparison of Regional and Provincial Prime Agricultural Area Mapping – 2019 - 2022.
- Land Evaluation and Area Review (LEAR) – Soils Component, in Association with AgPlan Ltd, Kanata/Munster. December 2017 – July 2018.
- Land Evaluation and Area Review (LEAR) – Soils Component, Prince Edward County, 2016 – 2017.
- Land Evaluation and Area Review (LEAR) – Soils Component, Peel Region, 2013 - 2014.
- Land Evaluation and Area Review (LEAR), Minto Communities, Ottawa, 2012 – 2013.
- GIS and LE component of Land Evaluation and Area Review (LEAR), York Region 2008 – 2009.
- Land Evaluation and Area Review (LEAR), Mattamy Homes, City of Ottawa – Orleans, 2008 – 2009.
- GIS for Manitoba Environmental Goods and Services (EG&S) Study. 2007 – 2008.
- GIS and LE component of Land Evaluation and Area Review (LEAR), Halton Region 2007 - 2008.
- GIS and LE component of Land Evaluation and Area Review (LEAR), City of Hamilton, 2003 – 2005.

Expert Witness

- Local Planning Appeal Tribunal (LPAT) Hearing, Greenwood Aggregates Limited, Violet Hill Pit Application, 2020.
- Ontario Municipal Board (OMB) Hearing, Burl's Creek Event Grounds 2018-2019.
- Town of Mono Council Meeting, Greenwood Aggregates Violet Hill Pit, January 2018.
- Ontario Municipal Board (OMB) Hearing, Burl's Creek Event Grounds, Simcoe County, 2015 – 2016.
- Ontario Municipal Board (OMB) Hearing, Town of Woolwich, Gravel Pit, 2012 – 2013.
- Ontario Municipal Board (OMB) Hearing, Mattamy Homes – City of Ottawa, 2011 – 2012.

- Ontario Municipal Board (OMB) Hearing, Town of Colgan, Simcoe County, 2010.
- Presentation to Planning Staff on behalf of Mr. MacLaren, City of Ottawa, 2005.
- Ontario Municipal Board (OMB) Hearing, Flamborough Severance, 2002.
- Preparation for an Ontario Municipal Board Hearing, Flamborough Golf Course, 2001.
- Ontario Municipal Board (OMB) Hearing, Stratford RV Resort and Campground – Wetland Delineation Assessment, 2000.
- Ontario Municipal Board (OMB) Hearing, Watcha Farms, Grey County, Agricultural Impact Assessment – Land Use Zoning Change, 1999-2000.
- Ontario Municipal Board (OMB) Hearing, Town of St. Vincent Agricultural Impact Assessment – Land Use Zoning Change, 1999 – 2000.
- Halton Agricultural Advisory Committee (HAAC), Halton Joint Venture Golf Course Proposal - Agricultural Impact Assessment for Zoning Change, 1999-2000
- Halton Agricultural Advisory Committee (HAAC), Sixteen Mile Creek Golf Course Proposal – Agricultural Impact Assessment for Zoning Change, 1999.
- Ontario Municipal Board (OMB) Hearing, Town of Flamborough, Environs Agricultural Impact Assessment for Zoning Change – Golf Course Proposal, 1999.
- Ontario Municipal Board (OMB) Hearing, Stratford RV Resort and Campground – Agricultural Impact Assessment, 1998.

Monitoring Studies

- Ontario Stone, Sand, and Gravel Association (OSSGA) Rehabilitation Study, 2023 – ongoing.
- Enbridge Soil Sampling for Soybean Cyst Nematode, various sites Lambton County, 2022
- Union Gas/Enbridge Gas 20" Gas Pipeline Construction Monitoring – Kingsville – 2019 - 2020.
- Union Gas/Enbridge Gas – Gas Pipeline Construction Monitoring for Tree Clearing. Kingsville Project. February/March 2019.
- CAEPLA – Union Gas 36" Gas Pipeline Construction Monitoring and Post Construction Clean Up – Agricultural Monitoring Panhandle Project. 2017 – 2018.
- CAEPLA – Union Gas 36" Gas Pipeline Construction Clearing Panhandle Project (Dawn Station to Dover Station) – Agricultural Monitoring, 2017 (Feb-March).
- City of Kitchener, Soil Sampling and data set analysis, 2017 – On-going.
- GAPLO – Union Gas 48" Gas Pipeline (Hamilton Station to Milton) Construction Soil and Agricultural Monitoring, 2016 – 2017.
- GAPLO – Union Gas 48" Gas Pipeline (Hamilton –Milton) Clearing – Agricultural Monitoring, 2016.

Publications

D.E. Stephenson and D.B. Hodgson, 1996. Root Zone Moisture Gradients Adjacent to a Cedar Swamp in Southern Ontario. In Malamoottil, G., B.G. Warner and E.A. McBean., *Wetlands Environmental Gradients, Boundaries, and Buffers*, Wetlands Research Centre, University of Waterloo. Pp. 298.

B

Appendix B: Draft Wellington County Official Plan Amendment Text and Schedule

AMENDMENT NUMBER ___

TO THE OFFICIAL PLAN FOR THE

COUNTY OF WELLINGTON

Applicant: CBM Aggregates, a Division of St. Marys Cement Inc. (Canada)
Proposed Anthony Pit
Part of Lot 22, Concession 8
Township of Puslinch

County File No. OP-2026-XXX

AMENDMENT NUMBER ___
TO THE
COUNTY OF WELLINGTON OFFICIAL PLAN

INDEX

PART A – THE PREAMBLE

The Preamble provides an explanation of the proposed amendment including the purpose, location and background information, but does not form part of this amendment.

PART B – THE AMENDMENT

The Amendment describes the changes and/or modifications to the Wellington County Official Plan which constitute Official Plan Amendment Number ___.

PART C – THE APPENDICES

The Appendices, if included herein, provide information related to the Amendment, but do not constitute part of the Amendment.

PART A – THE PREAMBLE

PURPOSE

The purpose of this proposed amendment is to:

1. Amend Schedule B7 of the Official Plan (the land use schedule for the Township of Puslinch) to allow for an aggregate extraction operation by adding the Mineral Aggregate Area Overlay to the subject lands.
2. Amend Schedule B7 of the Official Plan to remove the Greenlands designation and replace it with the Secondary Agricultural designation.
3. Amend Schedule D of the Official Plan (Mineral Aggregate Resource Overlay) to add the entirety of the subject lands to the Sand and Gravel Resources of Primary and Secondary Significance Boundary.

These amendments represent map changes only.

LOCATION

The subject lands are located at 4454 Victoria Road South, legally described as Part of Lot 22, Concession 8 in the Township of Puslinch.

In conjunction with a licence application under the Aggregate Resources Act, this application proposed to licence 18.0 ha (44.5 acres) of land of which 8.7 ha (21.5 acres) are proposed for extraction.

BASIS

The County Official Plan provides for the establishment of a new aggregate extraction operation subject to consideration of the potential impacts of such land uses on the natural environment, surrounding land uses, and the agricultural operations.

The proposed extraction area contains approximately 1 million tonnes of high-quality sand and gravel resources. Resources will be extracted both above and below the water table.

The maximum annual tonnage limit is proposed to be 1,000,000 tonnes. There will be no aggregate processing on the subject lands as extracted resources will be transported by truck west to the CBM Aberfoyle Pit operation for processing and shipment. The existing haul route and main entrance, of the Aberfoyle Pit, onto Concession Road 7 will remain the same.

The subject lands are within the Secondary Agricultural and Greenlands designation of the County of Wellington Official Plan. The Greenlands designation is related to a

hedgerow that has been identified as a non signification woodland through field verification.

New mineral aggregate operations shall only be established through amendment to Mineral Aggregate Area shown on Schedule 'B' of the Official Plan. To permit a new extraction operation, an Official Plan Amendment is required to include the proposed pit lands within the Mineral Aggregate Area.

As part of this application, a request has also been made to revise the boundary of the Greenlands designation which would result in a total net loss of the Greenlands designation of approximately 3.68 ha. These changes are being made to more closely align with the field-verified boundary of the adjacent significant wetlands which will be protected from aggregate extraction.

The Mineral Aggregate Resource Overlay on Schedule 'D' of the Official Plan generally identifies areas of high potential for mineral aggregate extraction. These lands have been identified based on geological information in the Ministry of Energy and Mines Aggregate Resources Inventory Paper (ARIP No. 162) or are areas licenced for a pit or quarry. The amendment also includes a map change to include the proposed licence area within the Schedule D overlay (approximately 18.0 ha / 44.5 ac).

OTHER APPROVALS

An application for a Class 'A' Licence under the *Aggregate Resources Act* has been submitted to the Ministry of Natural Resources. An application for a Zoning By-law Amendment to permit the pit has also been submitted to the Township of Puslinch.

SUPPORTING INFORMATION

In support of the proposed amendment to the Official Plan, CBM Aggregates has prepared a hydrogeological assessment, archaeological assessment, cultural heritage assessment, natural environment assessment, traffic impact study, noise assessment, management plan for fugitive dust and planning justification report.

PART B – THE AMENDMENT

All of this part of the document entitled **Part B – The Amendment**, consisting of the following text and maps constitute Amendment No.___ to the County of Wellington Official Plan.

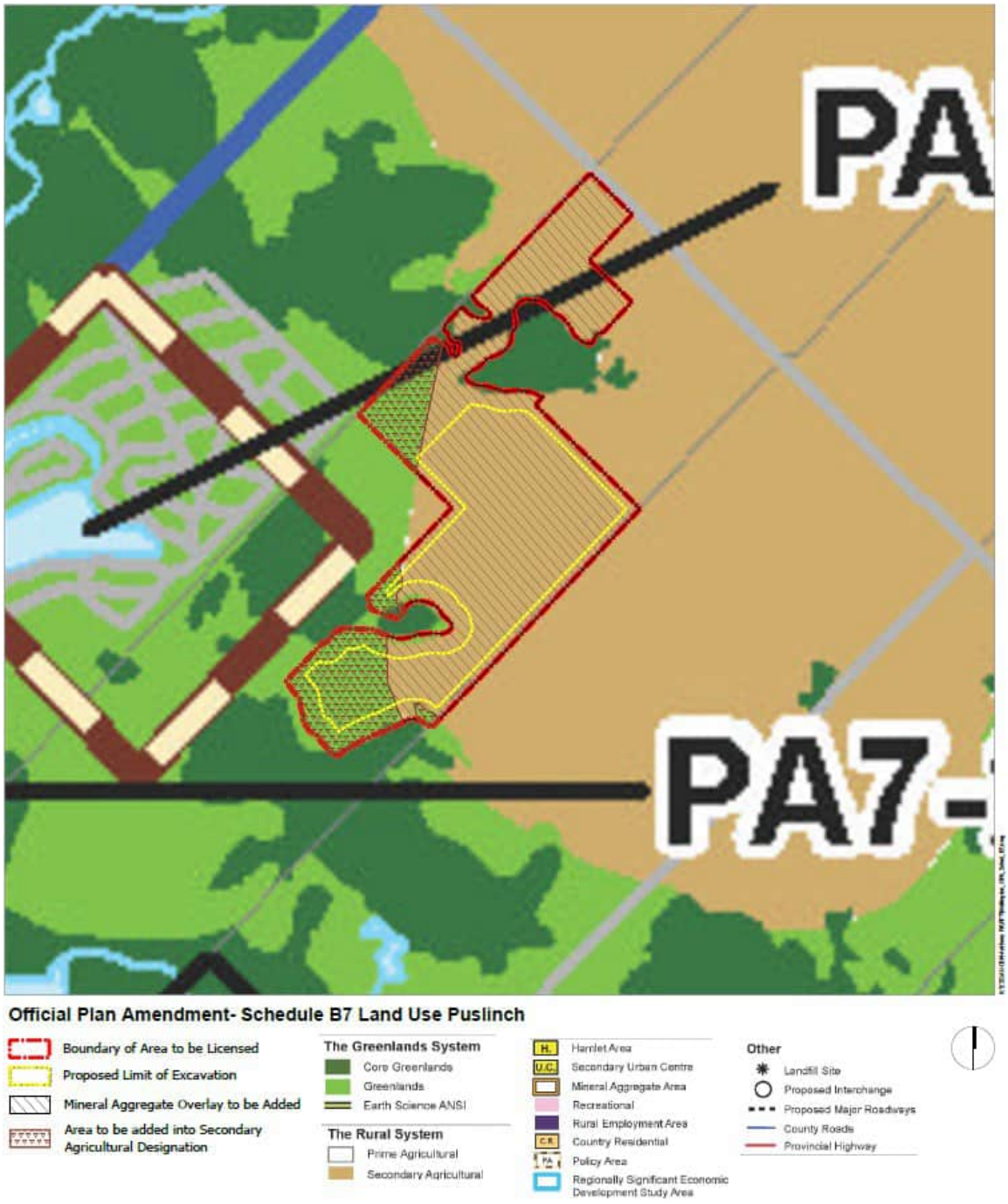
DETAILS OF THE AMENDMENT

The Official Plan of the County of Wellington is hereby amended as follows:

1. **THAT** Schedule B7 (Puslinch) be amended by changing the designation on portions of Part of Lot 22, Concession 8, in the Township of Puslinch by adding the Mineral Aggregate Area to the subject lands as illustrated on the attached Schedule "A" of this Amendment.
2. **THAT** Schedule D (Mineral Aggregate Resource Overlay) be amended by adding Mineral Aggregate Resource Overlay on Part of Lot 22, Concession 8, in the Township of Puslinch by revising the Sand and Gravel Resources of Primary and Secondary Significance Boundary as it relates to the subject lands as illustrated on the attached Schedule "B" of this Amendment.

AMENDMENT NUMBER ___
TO THE
COUNTY OF WELLINGTON OFFICIAL PLAN

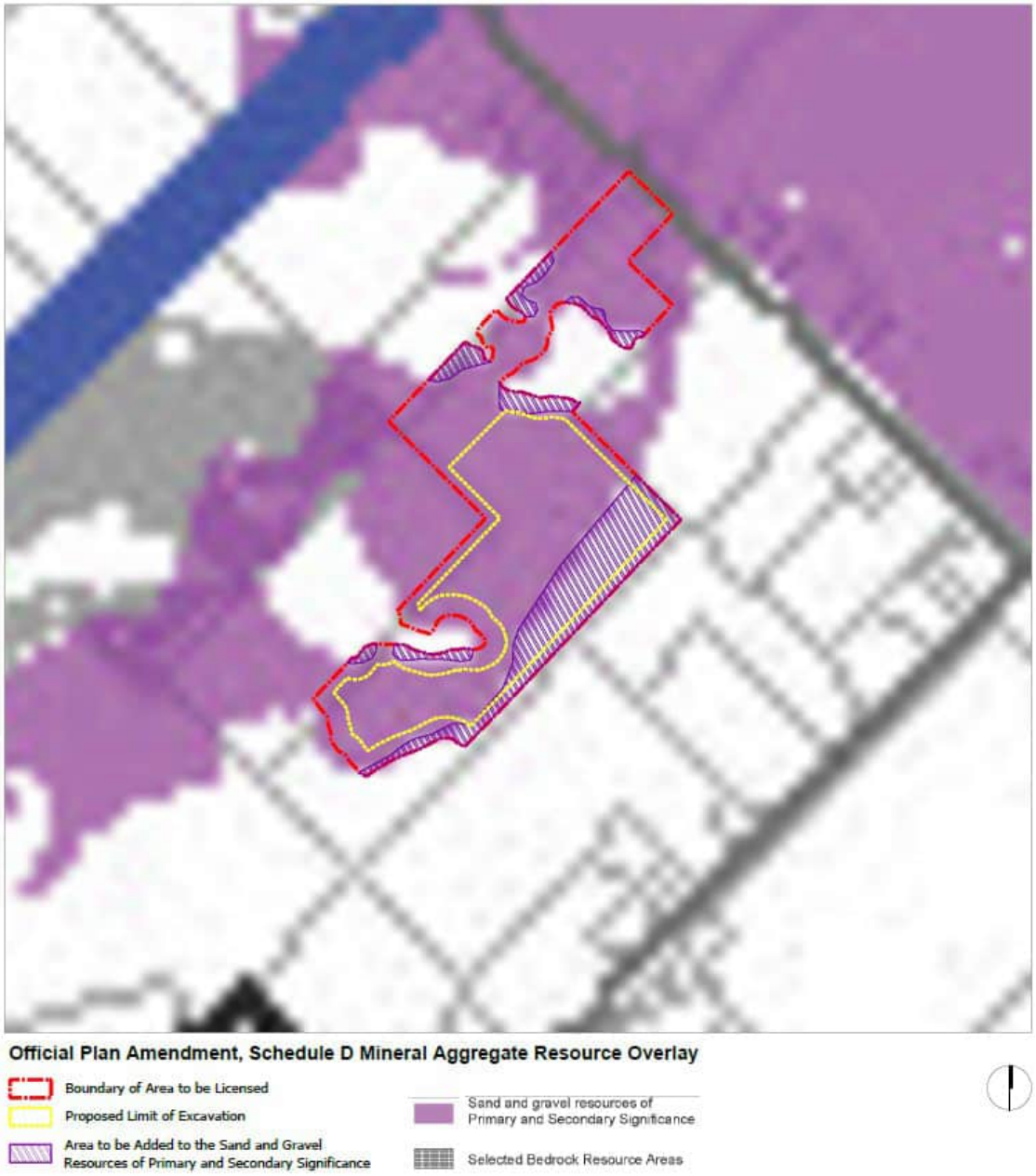
Schedule "A"



Amendment to Schedule B7 (Puslinch)

AMENDMENT NUMBER ___
TO THE
COUNTY OF WELLINGTON OFFICIAL PLAN

Schedule "B"



Amendment to Schedule D

C

Appendix C: Draft Puslinch Zoning Bylaw Amendment Text and Schedule

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

BY-LAW NUMBER 2026-###

A BY-LAW TO AMEND BY-LAW NUMBER 023/18, AS AMENDED, BEING THE ZONING BY-LAW OF THE TOWNSHIP OF PUSLINCH

WHEREAS, the Council of the Corporation of the Township of Puslinch deem it appropriate and in the public interest to amend By-Law Number 023/18 pursuant to Section 34 of the Planning Act, R.S.O. 1990 as amended;

NOW THEREFORE THE COUNCIL OF THE CORPORATION OF THE TOWNSHIP OF PUSLINCH ENACTS AS FOLLOWS:

1. THAT Schedule "A" of the By-law 023/18 is hereby amended by Part of Lot 22, Concession 8 within the Township of Puslinch, 4454 Victoria Road South, from Agricultural (A) Zone to the Extractive Industrial (EX) Zone as shown on Schedule "A" of this By-law.
2. THAT the Environmental Protection Overlay remains on site as shown on Schedule "A" of this By-law.
3. That Table 14.1, Site Specific Special Provisions is amended by adding the following Site Specific Special Provisions:

No.	Parent Zone	By-law	Additional Permitted Uses	Prohibited Uses	Site Specific Special Provisions
##	A	##/2026	N/A	N/A	Visual and acoustic mitigation required for the pit as well as the truck entrance/exit can occur on these lands while such lands remain licensed under the Aggregate Resources Act. A portion of these lands will also be used as an extraction setback from adjacent significant natural features

4. If By-law Number 023/18 has come into full force and effect as it relates to the above-noted lands, this By-law shall become effective from the date of passage

by Council and come into force in accordance with the requirements of the Planning Act, R.S.O. 1990 as amended.

READ A FIRST AND SECOND TIME THIS_____OF_____, 2026.

_____ _____

MAYOR CLERK

READ A THIRD TIME AND PASSED THIS_____OF_____, 2026.

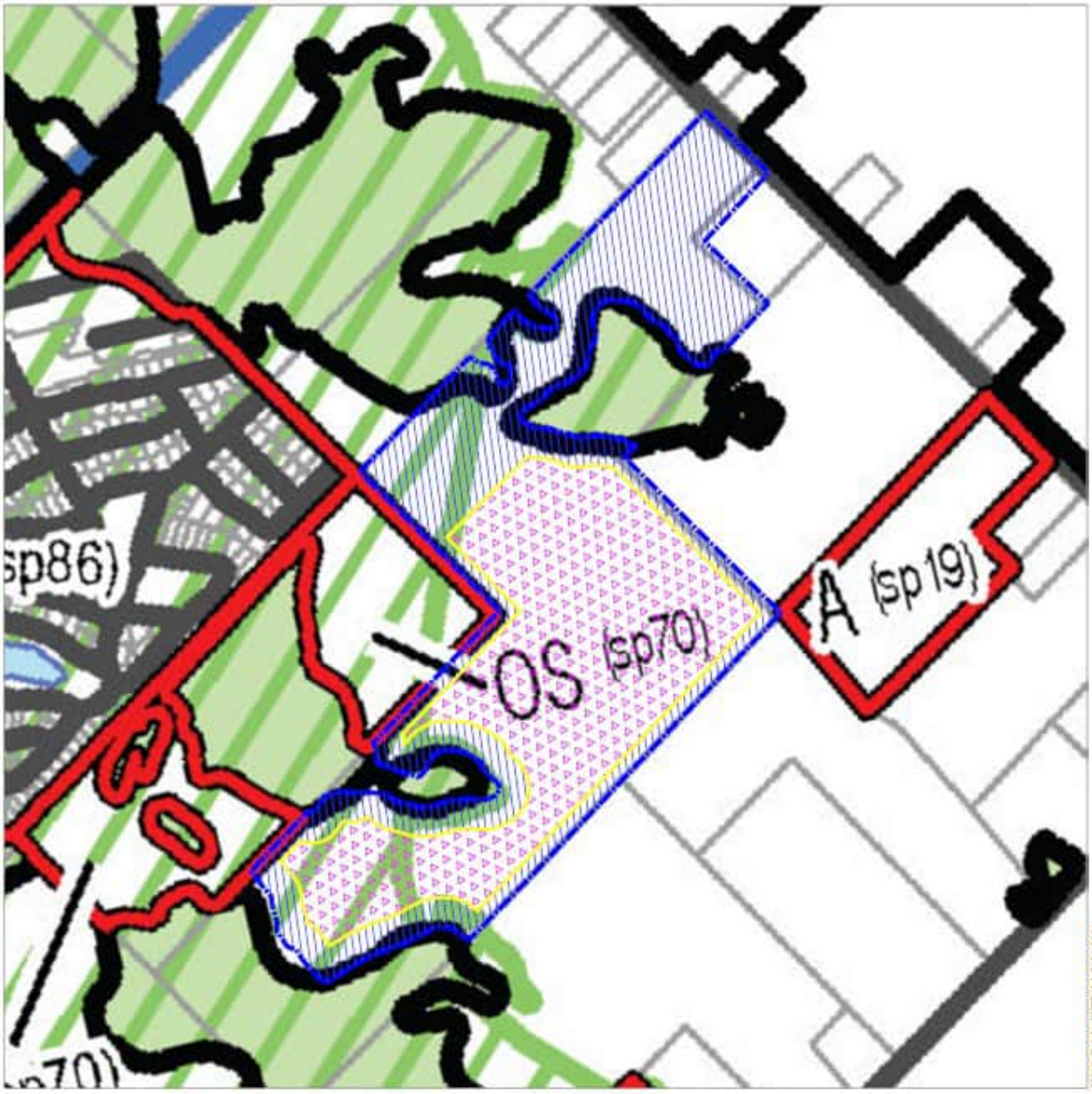
_____ _____

MAYOR CLERK

THE CORPORATION OF THE TOWNSHIP OF PUSLINCH

BY-LAW NUMBER 2026-###

Schedule "A"



Zoning By-law Amendment- Township of Puslinch Zoning By-law No. 023-18, Schedule 'A'

Boundary of Area to be Licensed

Proposed Limit of Excavation

Area to be rezoned from Agricultural (A) to Extractive Industrial (EXI) Zone.

Area to be rezoned from Agricultural (A) to Agricultural (A-SP##)

Zone Descriptions

A	Agricultural	HC	Highway Commercial	RR	Resort Residential
AC	Agricultural Commercial	HR	Hamlet Residential	RUR	Rural Residential
C	Commercial	I	Institutional	UR	Urban Residential
CMU	Core Mixed Use	IND	Industrial	f-	Aberfoyle Flood Plain Overlay
DI	Disposal Industrial	NE	Natural Environment	(sp#)	Site Specific Exemption
EXI	Extractive Industrial	OS	Open Space	(h#)	Holding Provision
FD	Future Development	RC	Resort Commercial	(t#)	Temporary Zone

Site Specific Exemption | Zoning Limits | Natural Environment | Environmental Protection Overlay (to remain)

This is Schedule "A" to By-law No. 2026-###

Passed this_____of_____, 2026.

_____

MAYOR

_____

CLERK

D

Appendix D: Curriculum Vitae of Report Authors

Education

University of Waterloo
Bachelor of Environmental Studies
Honours Planning (Co-op)
2008

Professional Associations

Full Member, Canadian Institute of Planners (CIP)

Full Member, Ontario Professional Planners Institute (OPPI)

Member, Pragma Council (University of Waterloo)

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Neal DeRuyter

BES, MCIP, RPP

Neal DeRuyter, a Partner with MHBC, joined the firm in 2009 after graduating from the University of Waterloo in the Honours Planning Co-op program. Mr. DeRuyter has worked as a Planner in the private and public sectors with experience in aggregate resource, development and municipal planning.

Mr. DeRuyter has processed and managed several development applications including zoning by-law amendments, official plan amendments, and licence and site plan applications under the Aggregate Resources Act. He is certified by the Ministry of Natural Resources & Forestry to prepare site plans under the Aggregate Resources Act. He is a Registered Professional Planner and is a member of the Canadian Institute of Planners and Ontario Professional Planners Institute. He has provided expert evidence before the Ontario Municipal Board, Local Planning Appeal Tribunal and Ontario Land Tribunal.

He has participated and authored several research studies and articles related to aggregate resource management. Mr. DeRuyter has presented on several occasions for various events at the School of Planning at the University of Waterloo. Mr. DeRuyter is a member of the Pragma Council at the University of Waterloo.

Professional History

Partner, MacNaughton Hermsen Britton Clarkson Planning Limited (2017 – Present)

Associate, MacNaughton Hermsen Britton Clarkson Planning Limited (2013 – 2017)

Planner, MacNaughton Hermsen Britton Clarkson Planning Limited (2009 – 2013)

Publications

- 'Future Aggregate Availability and Alternatives Analysis, State of the Aggregate Resource in Ontario Study, 2009' (MNR)
- 'The Future of Ontario's Close to Market Aggregate Supply: The 2015 Provincial Plan Review' (OSSGA, 2015)
- Agricultural Impact Assessment and Rehabilitation Plan Guidelines for Aggregate Extraction, 2016 (OMAFRA)

Selected Project Experience

- Research, preparation and coordination of reports / applications under the Planning Act, Niagara Escarpment Planning and Development Act and Aggregate Resources Act.
- Project management services for development applications.
- Conduct notification and consultation processes under the Aggregate Resources Act. including consultations with Indigenous Communities.
- Due diligence and property overview reports for prospective aggregate sites.
- Aggregate Resources Act site plan amendments.
- Planning assessment for commercial, residential, agricultural and industrial developments.
- Planning assessment for proposed urban use requests in Niagara Escarpment Plan through 2015-2017 Review.
- Research and preparation of reports / evidence for hearings before the Ontario Municipal Board / Local Planning Appeal Tribunal/Ontario Land Tribunal.
- Planning research and assessment for expropriation matters on behalf of public and private sector clients.

Selected Project Examples

- Bell Sand Farms Grose Pit Extension, Perth County
- Blueland McCormick Pit, Town of Caledon
- Brock University, Niagara Escarpment Plan Lands, City of St. Catharines
- Cambridge Aggregates Inc. Edworthy West Pit, Township of North Dumfries
- CBM Ayr Pit, Township of North Dumfries
- CBM Brantford Pit, County of Brant
- CBM Bromberg Pit, Township of North Dumfries
- CBM Dorchester Pit, Municipality of Thames Centre
- CBM Eramosa Pit Extension, Township of Centre Wellington
- CBM Aberfoyle South Pit Expansion, Township of Puslinch
- CBM Lanci Pit Expansion, Township of Puslinch
- Caledon Sand & Gravel, Town of Caledon
- Capital Paving Shantz Station Pit, Township of Woolwich
- City of Iqaluit Pit and Quarry Operations Plans
- City of Kingston, Barriefield Affordable Housing Feasibility Study
- Erie Sand & Gravel MOS Pit, Municipality of Leamington
- Fidelity Construction Colborne Pit, Township of Cramahe
- Gallo Contracting Industrial Use, Township of Puslinch
- Halton Crushed Stone Erin Pit Extension, Town of Erin
- J-AAR Materials Ltd. Bardoel Pit, Township of Southwest Oxford
- James Dick Construction Ltd. Adjala Pit Extension, Township of Adjala-Tosorontio
- James Dick Construction Ltd. Erin Pit Extension, Town of Caledon
- James Dick Construction Ltd. Gamebridge Quarry, Township of Ramara
- James Dick Construction Ltd. Reid Road Quarry, Town of Milton
- Kaneff Properties, Royal Niagara Golf Club, City of St. Catharines
- KPM Brantford Plant Expansion, Brant County
- Lafarge Canada Inc. Brantford Pit Expansion, County of Brant
- Lafarge Canada Inc. Hagersville Quarry, County of Haldimand
- Lafarge Canada Inc. Navan Quarry Extension, City of Ottawa
- Lafarge Canada Inc. Talbot Pit, City of London
- Lafarge Canada Inc. West Paris Pit, County of Brant
- Lillycrop Highway 6 Expropriation, Township of Puslinch
- Limehouse Clay Products Ltd. Georgetown Quarry, Town of Halton Hills
- Miller Aggregates Paris Plains Pit, Brant County
- Ministry of Agriculture, Food and Rural Affairs, Agricultural Impact Assessment and Rehabilitation Plan Guidelines for Aggregate Extraction (2016)
- Ministry of Natural Resources and Forestry, State of the Aggregate Resources in Ontario Study (2009)
- Ministry of Transportation, Highway 410 Expropriation, Town of Caledon
- North York Sand & Gravel Manvers Pit, City of Kawartha Lakes

- Nunavut Association of Municipalities Aggregate Resource Management Plans
- Ontario Stone, Sand & Gravel Association, Municipal Official Plan Reviews in Ontario
- Ontario Trap Rock Quarry, Town of Bruce Mines
- Queenston Quarry Reclamation Company Redevelopment, Town of Niagara-on-the-Lake
- Ramada Beacon Hotel, Town of Lincoln
- R.W. Tomlinson Ltd. Brechin Quarry, City of Kawartha Lakes
- R.W. Tomlinson Ltd. Brickyards Quarry, City of Ottawa
- R.W. Tomlinson Ltd. East Oxford Pit, Municipality of North Grenville
- R.W. Tomlinson Ltd. Environmental Services, Joyceville Environmental Centre, City of Kingston
- R.W. Tomlinson Ltd. Kemptville Quarry, Municipality of North Grenville
- R.W. Tomlinson Ltd. Moodie Quarry Expansion, City of Ottawa
- R.W. Tomlinson Ltd. Moore Quarry, City of Ottawa
- R.W. Tomlinson Ltd. Napanee Asphalt Plant, Town of Greater Napanee
- R.W. Tomlinson Ltd. Reids Mills Pit, City of Ottawa
- R.W. Tomlinson Ltd. Stittsville Quarry, City of Ottawa
- R.W. Tomlinson Ltd. Storyland Pit, Renfrew County
- R.W. Tomlinson Ltd. Ready-Mix Site Plan Approval, City of Ottawa
- Sunrock Canada Burnt River Quarry, City of Kawartha Lakes
- Sunrock Canada Hockley Pit, Town of Uxbridge
- Tackaberry Construction, Woods Quarry Expansion, Elizabethtown-Kitley Township
- Thomas Cavanagh Construction West Carleton Quarry Extension, City of Ottawa
- Thomas Cavanagh Construction Arnott Pit, Lanark County
- Thomas Cavanagh Construction Highland Line Pit, Lanark County
- Thomas Cavanagh Construction Goulbourn Quarry, City of Ottawa
- Thomas Cavanagh Construction Pembroke Quarry, Renfrew County
- Township of Guelph-Eramosa, Review of Tri-City Spencer Pit
- Township of West Lincoln, Preliminary Bedrock Resource Assessment in Smithville
- Walker Aggregates Inc. Amherstburg Quarry and McGregor Quarry, Town of Amherstburg
- Waterford Sand & Gravel Law Quarry Extension, Township of Wainfleet
- Wm. J. Gies Construction Stockyards Lands, Township of Woolwich

Presentations

- "2024 Planning and Policies Update"- Ontario Stone Sand and Gravel Association, 2024 AGM
- "Planners Forum" - Ontario Stone Sand & Gravel Association 2023 AGM
- "Bill 23 and Provincial Planning Changes" – Ontario Stone Sand & Gravel Association 2023
- "Ontario Land Use Planning Update" – Ontario Stone Sand & Gravel Association 2022 AGM
- "Public Engagement in the Time of Covid-19" – Ontario Stone Sand & Gravel Association 2021 AGM
- "Aggregate Information Session & Tour" – OPPI Southwest District 2018
- "Coordinated Plan Review" – Ontario Stone Sand & Gravel Association 2018 AGM
- "Planning as a Profession" – Faculty of Environment Open House at the University of Waterloo, March 2013
- "Rehabilitation of Licensed Pits and Quarries" – Canadian Association of Certified Planning Technicians Professional Development Conference, October 21, 2011
- Professional Practice, Public and Private Administration (PLAN 403), University of Waterloo, January 2010

Articles

- "Planning for a sustainable community" – Avenues Magazine (Ontario Stone, Sand & Gravel Association), Volume 1, Issue 2, 2011
- "The closer the better" – Avenues Magazine (Ontario Stone, Sand & Gravel Association), Volume 2, Issue 2, 2012
- "Diminishing supply" - Avenues Magazine (Ontario Stone, Sand & Gravel Association), Volume 3, Issue 1, 2013
- "Shipping aggregate from further afield" – Avenues Magazine (Ontario Stone, Sand & Gravel Association), Volume 3, Issue 2, 2013
- "The feasibility of alternative transportation options" – Avenues Magazine (Ontario Stone, Sand & Gravel Association), Volume 4, Issue 1, 2014
- "Keeping residents safe and dry" – Avenues Magazine (Ontario Stone, Sand & Gravel Association), Volume 4, Issue 2, 2014

MHBC

Education

University of Waterloo
Doctorate- School of Planning
(ongoing)

University of Guelph
Master of Science in Rural Planning & Development
2000

University of Waterloo
Bachelor of Environmental Studies
Honours Environment & Resource Studies
1988

Professional Associations

Registered Professional Planner

Full Member, Ontario Professional Planners Institute (OPPI)

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Vince Deschamps

M.Sc, MCIP, RPP

Vince Deschamps is an Associate with MHBC specilizing in aggregate resouce, natural heritage and rural land use planning.

Mr. Deschamps has over 30 years of professional experience across a broad range of sectors in Canada and internationally, with a deep interest in Indigenous land use planning systems, resource conservation and biodiversity assessment. Vince is at the forefront of Natural Capital and Ecosystem Service Assessment (NCESA), as a scientific discipline as well as a means to anticipate and plan for the effects of climate change. The NCESA approach is based upon the complex inter-relationships between ecological, socio-economic and cultural values of landscapes and communities, and this is reflected in Mr. Deschamps' research interests and professional practice as a land use planner.

Within the extraction industry, Mr. Deschamps has provided support in assessing the impacts of aggregate and mining activities on biodiversity both domestically across Ontario, Quebec and Labrador, as well as internationally in Indonesia and Romania. The biodiversity component of these projects comprised a variety of tasks, including the review of ecological baseline studies, the development and coordination of extensive ecological field investigations, the management of expert staff and sub-consultants, data analysis, developing management options, report preparation, client management and agency consultation.

Mr. Deschamps is a Registered Professional Planner and a citizen of the Métis Nation of Ontario.

Professional History

Associate, MacNaughton Hermsen Britton Clarkson Planning Limited

(2020-Present)

Director of Sustainability, Moneta Gold Inc.

(2021-2023)

Senior Land Use Planner, Gwich'in Land Use Planning Board

(2020-2022)

Midwestern Ontario Program Director, Nature Conservancy of Canada.

(2017-2019)

Senior Planning Ecologist, Beacon Environmental

(2016-2017)

Senior Environmental Planner, Stantec Consulting Ltd

(2011-2016)

Senior Environmental Planner, AECOM

(2009-2011)

Senior Environmental Planner, ERM Canada Corp

(2007-2009)

Senior Environmental Planner (RJ Burnside & Associates Ltd)

(2005-2007)

Senior Project Manager (ESG International Inc/Stantec Consulting Ltd)

(2001-2005)

Selected Aggregate Resources Project Experience

- Tri City Lands Ltd., Spencer Pit – Natural Environment Level 1 & 2 Report
- Walker Industries, Upper's Lane Quarry – field investigations in support of a Natural Environment Level 1 & 2 Report
- Jennison Construction Ltd, Clinton Pit – Natural Environment Level 1 & 2 Report and expert witness testimony at OMB
- Waterford Sand and Gravel Ltd., Dunnville Quarry Expansion – Natural Environment Level 1 and 2 Report
- Township of East Garafraxa Gravel Pit Expansion – Natural Environmental Level 1 & 2 Report
- PT Holcim Indonesia, Semen Dwima Agung Cement Operation – IFC (World Bank) Biodiversity Evaluation

Selected Mining Project Experience

- Moneta Gold Inc. – Director of Sustainability
- Greenstone Gold Mines, Hard Rock Mine – EIA Terrestrial Disciple Lead
- Eramet/Weda Bay Nickel – ESHIA Terrestrial Biodiversity Team Leader
- Iron Ore Company of Canada – Compatibility Assessment Team Lead
- PT Freeport Indonesia – External Environmental Audit Biodiversity Lead
- Newmont Mining, Martabe Project – Biodiversity Management and Impact Assessment Lead
- Rosia Montana Gold Corporation, Rosia Montana Project – EIA Biodiversity Lead

Selected Indigenous & Land Use Planning Experience

- Gwich'in Land Use Plan Comprehensive Review
- Attawapiskat First Nation Community Based Land Use Plan
- Pays Plat First Nation Land Assessment & Selection
- Animbiigoo Zaagi'igan Anishinaabek First Nation Land Assessment and Selection
- Sand Point First Nation Land Use Plan
- Comprehensive Review & Overhaul of Barbados Groundwater Protection Zoning Policy & System

Selected Land Development Planning Experience

Rehabilitation of the Gore Road from King Street to Patterson Sideroad Municipal Class Environmental Assessment (Schedule B)

- Kincardine Avenue Municipal Service Extension Municipal Class Environmental Assessment (Schedule B)
- Municipal Class EA (Schedule C) for the East Luther Grand Valley Water Pollution Control Plant
- Oak Ridges Moraine Conservation Plan Conformity Report for the Colgan Water Supply Municipal Class EA (Schedule B)
- Bonaire Highlands Scoped Environmental Impact Study
- Veterans Way Lands Environmental Impact Study
- Aberfoyle Creek Estates Phase III Environmental Impact Statement
- Giant's Tomb Subdivision Environmental Impact Statement Review
- Pickering - Kingston Road Environmental Report
- Gamble Road, Lot 5 Environmental Impact Statement
- Hilltop Community, Ayr Environmental Impact Statement
- Churchville Planning & Heritage Study (Natural Heritage Component)
- Humber College Institute of Technology and Advanced Learning, Orangeville Campus, Environmental Management Plan

Part B: Terrestrial and Aquatic Resources

- Trelane Natural Heritage Study

Selected Renewable Energy Project Experience

- Sydenham Wind Energy Centre, Townships of Brooke-Alvinston and Dawn-Euphemia, ON
- Suncor Energy Adelaide Wind Power Project, Municipality of Adelaide-Metcalfe, ON
- Suncor Energy Cedar Point Wind Power Project, Town of Plympton-Wyoming and the Municipality of Lambton Shores, ON
- Bow Lake Wind Farm, Townships of Smilsky and Peever, ON
- Environmental Permitting for Bluewater, Goshen and Jericho Wind Energy Centres, NextEra Energy Canada, Huron and Lambton Counties, ON

Selected Natural Capital & Resource Economics Project Experience

- Valuing Natural Capital in the Lake Simcoe Watershed
- Ecosystem Service Values and Great Lakes Shoreline Ecosystems
- Northwest Brampton Urban Boundary Review, Shale Resources Review
- The Nature Conservancy-Indonesia Program – Carbon/Mangrove Rehabilitation Feasibility Study
- The Nature Conservancy-Indonesia Program – Value of Water Resources in Berau Regency, East Kalimantan
- The Nature Conservancy-Indonesia Program – Value of Water Resources in Lore Lindu National Park, Central Sulawesi
- Leuser Management Unit and CIDA Awards for Canadians –Evaluation of Community Forests as a Buffer Zone Initiative

MHBC

Publications

• Contributor to the Natural Capital Lab, and wrote a series of blogs on the Eco-sociocultual Values of Natural Capital (http://naturalcapitallab.com/blog/)

• Co-presented "Natural Capital Assessment: The Practitioner's Dilemma – Why Hasn't It Caught On In Ontario" at AD Latornell Symposium, Aliston Ontario, November 2014.

• Co-authored "Trends in Forest Ownership, Forest Resources Tenure and Institutional Arrangement: Are they Contributing to Better Forest Management and Poverty Reduction? Case Studies from Indonesia." Prepared for the FAO Regional Workshop in Bangkok, Thailand, October 2005.

• "Biodiversity and Social Benefits in Community-Based Forest Management: The Leuser Ecosystem, Indonesia". Ecological Integrity and Protected Areas, 2001: Proceedings of the Parks Research Forum of Ontario (PRFO) Annual General Meeting, pp. 201-208, 2001.

Education

University of Waterloo
Bachelor of Environmental Studies,
Honours of Urban and Regional Planning
2024

Professional Associations

Candidate Member, Ontario Professional Planners Institute (OPPI)

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Yara Elmahdy

BES, Candidate RPP

Yara joined MHBC in June of 2024 after receiving her Bachelor of Environmental Studies Honors Co-op Planning (BES) with specializations in Environmental Planning and Management; and Land Development Planning from the University of Waterloo. Yara has worked for regional and township planning departments for the review of aggregate and development applications.

Yara provides a variety of land use planning consulting services to private sector clients including project coordination and management, due diligence, policy research and review and assistance in Aggregate Resources Act Licence Applications and a variety of planning approvals (Official Plan and Zoning By-law Amendments, Plans of Subdivision and Condominium, Site Plan Approvals, Consents and Minor Variances).

Yara is a candidate member of the Canadian Institute of Planners.

Professional History

Planner, MacNaughton Hermsen Britton Clarkson Planning Limited

(2024 – Present)

Community Planning Intern, Region of Halton

(2022 – 2023)

Planning Administrative Support, Township of Ramara

(2022)

Professional Experience

Experience in all facets of development applications including applications for minor variance, severance, Plan of Subdivision, Plan of Condominium, Site Plan approval, Zoning By-law and Official Plan Amendment.

Project Management

- Coordination of technical requirements with sub-consultants.
- Minor Variance, Severance, Site Plan, Official Plan and Zoning By-law amendment approvals.

Aggregate / Industrial

- Preparation of due-diligence reports identifying the detailed requirements for the approval of residential, commercial and Industrial developments in municipalities across Ontario.
- Property investigations and planning assessments for due diligence reviews for mineral aggregate and concrete and asphalt plant projects
- Research, preparation and co-ordination of reports / applications under the *Planning Act* (Zoning By-law Amendment, Official Plan Amendment) and the *Aggregate Resources Act* (licence and site plan amendment applications).

Residential / Mixed-Use / Commercial

- Various Consent and Minor Variance Applications across south and central Ontario
- Preparation of planning assessments and due diligence reviews to identify development potential of properties for a range of clients

Other

- Presentation and representation at public meetings, committees and municipal Council on behalf of clients.
- Extensive research of land use policy and regulation and prepare planning justification reports in support of development applications.

County of Wellington

Anthony Pit
4454 Victoria Road South

Transportation Impact Study

Tuesday, October 7, 2025

Z0019264

CIMA+

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Engineering for **people**

County of Wellington

Anthony Pit

4454 Victoria Road South

Transportation Impact Study

CIMA Project Z0019264

Prepared by: [redacted]

Michael Jarrett, T. Dipl.

Verified by: [redacted]

Jaime Garcia, P.Eng., Ph.D.

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Appendix A: Terms of Reference

Appendix B: Synchro/SimTraffic Outputs

Appendix B: Signal Timing Plan

1. Introduction

CBM Aggregates (CBM) seeks to develop a sand and gravel pit, Anthony Pit, at 4454 Victoria Road South, to extract aggregate material to be processed at CBM's nearby aggregate operations. A Traffic Impact Study (TIS) is required under the Aggregate Resources Act for new aggregate sites.

The study objective is to determine the potential impact of the additional truck volumes generated by the proposed mineral aggregate operation during the AM and PM peak hours, and to assess the impact the additional traffic may have on the existing roadway network, and – if required, to provide recommendations to accommodate the projected traffic.

The content of this TIS follows the approach and methodology presented in the Terms of Reference (ToR) submitted to the County of Wellington (the County) on December 13th, 2024. **Appendix A** contains the ToR documentation.

1.1 Study Area

Figure 1 showcases the subject site along with the surrounding lands and proposed haul route, which together represents the study area. The study area is bounded by Wellington County Road 34 on the west, Gilmour Road (Side Road 23) on the east, Victoria Road South on the north and Concession Road 7 on the south. The land use surrounding the study area is characterized by a mix of uses that includes low-density, detached residential neighbourhoods within the immediate vicinity of the study area, as well as some aggregate operations, industrial and manufacturing facilities exist along Victoria Rd S.

As per the approved content of the Terms of Reference, the following intersections were analyzed as part of the road network surrounding the development:

Intersection	Traffic Control
Victoria Road South & Access 1	Signalized
Wellington County Road 34 & Victoria Road South	Unsignalized
Wellington County Road 34 & Brock Road North	Roundabout
Wellington County Road 34 & Concession Road 7	Roundabout

Concession Road 7 & Access 2	Unsignalized

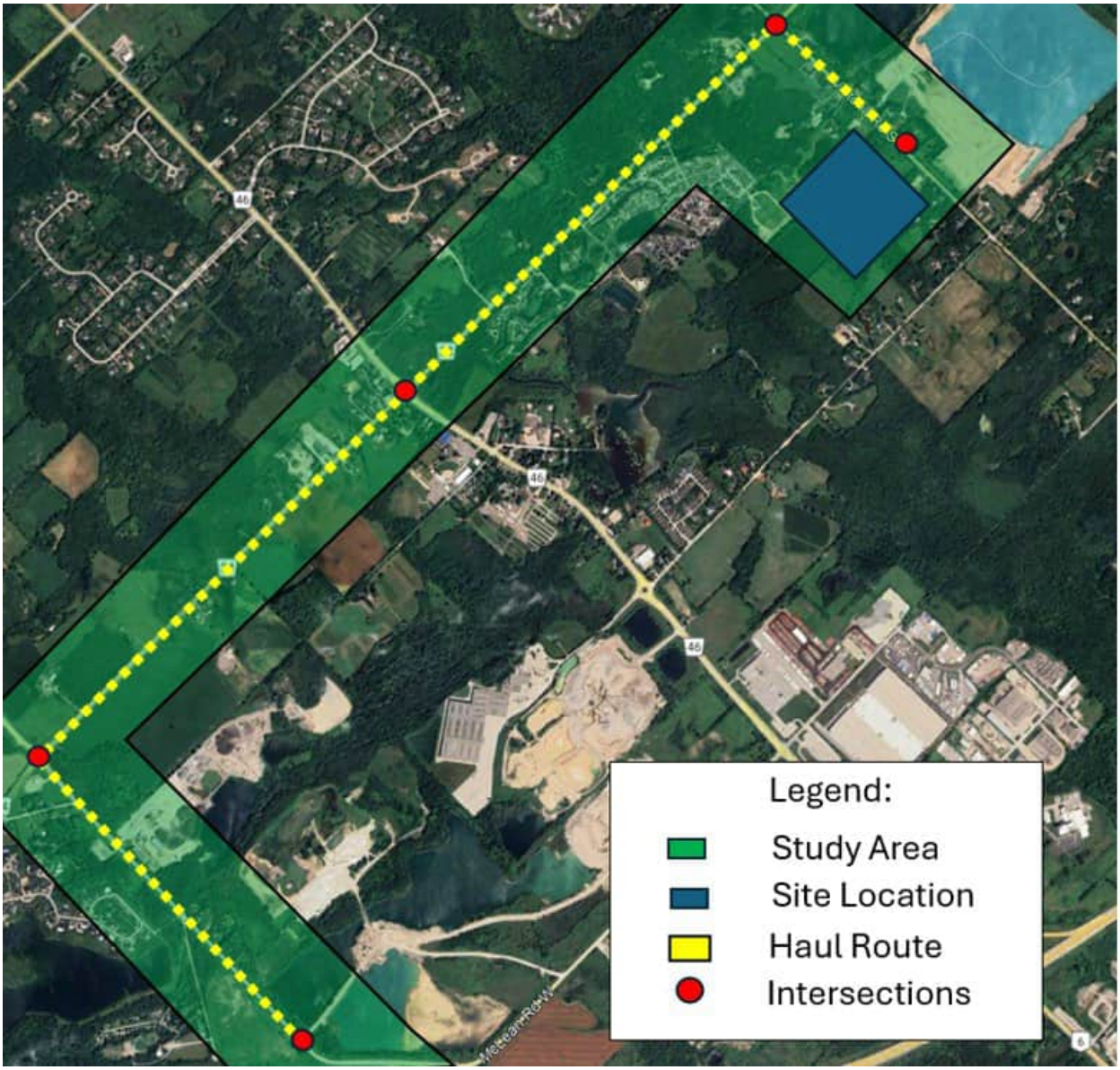

Figure 1: Study Area

1.2 Study Methodology

This study evaluates existing and future traffic operations at study area intersections for the weekday AM peak period (7:00-9:00), and weekday PM peak period (16:00-18:00), as confirmed by the County.

The study assessed traffic operations under existing/build-out (2025) conditions and the following future horizon years:

- Future (2030) Conditions (5-year horizon)
- Future (2035) Conditions (10-year horizon)

Intersection operations were assessed using the Synchro v11 software for Signalized intersections, which utilizes the Highway Capacity Manual (HCM) 2000 methodology published by the Transportation Research Board National Research Council. Synchro v11 can analyze both signalized and unsignalized intersections in a road corridor or network considering the spacing, interaction, queues, and operations between intersections. Intersection operations performance metrics are reported in terms of Level of Service (LOS) and volume to capacity (v/c) ratios.

Level of Service (LOS) is based on the average control delay per vehicle for a given movement at an intersection. Delay is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between 'A' and 'F', with 'F' representing the longest delays. The following table summarizes the LOS criteria for signalized and unsignalized intersections:

Level of Service	Average Control Delay per Vehicle (second/vehicle)	
	Signalized	Unsignalized
A	≤10	≤10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 80

SimTraffic software was used to calculate the 95th percentile queue length as part of the analysis and to assess the available storage capacity and whether queue spillback or lane blockages occur due to long queues. Criteria for critical movements at

intersections, were based upon section 3.8 (Evaluation of Impacts) of the County of Wellington's TIS Guidelines:

For Signalized Intersections;

- Volume to Capacity Ratio over 0.85 for overall intersection operations, through movements or shared through/turn movements
- Volume to Capacity Ratio over 0.90 for a dedicated left or right turn movement
- 95th percentile queues exceed the available storage length

For Unsignalized Intersections;

- Overall intersection Level of Service E or F
- 95th percentile queues exceed the available storage length

Other parameters, such as the peak hour factor (PHF) and the heavy vehicle percentage (HV%) were found on the provided turning movement counts. The PHF and HV% found were used in all existing and future scenarios.

Roundabout operations were assessed using ARCADY (Assessment of Roundabout Capacity and Delay), a software tool primarily used for the design, evaluation, and performance analysis of roundabouts. Due to the differences between the operations of a signalized/unsignalized intersection and a roundabout, the results of the analysis conducted with ARCADY are presented separately.

2. Haul Route Review

2.1 Field Investigation

CIMA+ conducted a field investigation on Thursday, November 19, 2024, to perform a sightline assessment, a route overview and collect other relevant data. Roadway measurements were recorded, and a thorough review of existing traffic control signage, pavement markings, and other environmental features for each of the proposed four trail crossing sites and the existing intersection pedestrian signal at Rossland Road East was conducted. At the time of the field observations, from 10:00 to 16:00, this segment had routine vehicular traffic and pedestrian behaviour; no instances of unordinary pedestrian or driver actions were noted.

2.2 Route Overview

Across the entire haul route, it's important to note that **no dedicated cycling lanes or sidewalks** exist, limiting pedestrian and cyclist accommodation throughout the corridor.

Victoria Road South

The segment from the Site to Wellington County Road 34 consists of a two-lane rural roadway with one lane in each direction. The shoulders are narrow gravel, measuring less than 2 meters in width, offering limited space for stopped vehicles or non-motorized users. The observed pavement was in good condition and pavement markings are present. This segment has minimal adjacent development and does not feature sidewalks or cycling lanes. During the PM peak period, rare instances of queuing were observed at the Victoria Road and Wellington County Road 34 intersection.

Wellington County Road 34

Between Victoria Road & Brock Road, the roadway maintains a single lane in each direction but is characterized by wider, paved shoulders approximately 3.5 to 3.75 meters wide. The observed pavement quality is good, and pavement markings are present, although the crosswalk at the Wellington County Road 34 and Brock Road roundabout is faded. Several private residences are located along this segment, accessed via private roads. The Puslinch Town Hall and Fire Station are also located along this portion of the route.

Observations during the site visit indicated the presence of school buses during both the AM (8:00-9:00) and PM (14:00-15:00) peak periods, likely associated with Aberfoyle Public School, located just south of the Brock Road roundabout. Despite these activities, no queuing was observed at the roundabout during the study area visit.

Between Brock Road and Wellington County Road 34 & Concession Road 7, the road continues as a two-lane route with gravel shoulders, again measuring approximately 3.5 to 3.75 meters. However, the observed pavement condition deteriorates in this section, and it may require improvement. Pavement markings are present but are also in poor condition. This stretch runs through a residential area where homes face the roadway but are significantly set back from the road.

Like the previous segment, school bus activity was observed, suggesting consistent school-related traffic patterns. The Concession Road 7 intersection, which is a single-lane roundabout with crosswalks, experienced no queuing during the site visit.

Concession Road 7

The final segment between Wellington County Road 34 and the CBM Aberfoyle Pit maintains the one-lane-per-direction configuration but lacks any shoulders. Despite the absence of shoulders, the observed pavement is in good condition and markings are clearly present. This area is predominantly rural with little roadside development or activity. There were no signs of traffic congestion or queuing observed along this final segment.

2.3 Sightline Assessment

Minimum stopping sight distance represents the minimum distance recommended a driver needs to see ahead to safely stop a vehicle without colliding with an object or obstruction. As per *Transportation Association of Canada Geometric Design Guide for Canadian Roads* (TAC, 2017), stopping sight distance allows alert, competent drivers to come to a quick stop under ordinary circumstances.

The minimum stopping distance is determined using the TAC Design Guide. In TAC Chapter 2, the minimum stopping sight distance on a level grade is a function of brake reaction time, design speed of roadway and deceleration rate.

From TAC's Table 2.5.2, the minimum stopping sight distance for 70 km/h design speeds is 105 metres.[1] Decision sight distance provides drivers time to decide on a course of action. From TAC, the minimum decision sight distance for a design speed of 70 km/h is 150 metres.

The criteria used for measuring sight distance are the top of car height in the centre of the curb lane, and the distance measured along the centre of the lane to the crossing location. For the purpose of this review, the decision point used 4.4 metres from edge of roadway. While the criteria do not consider heavy vehicles expected to access the site,

[1] The design speed was assumed to be 70 km/h based on the 60 km/h posted/assumed speeds.

the obstruction reducing the sight distance would remain consistent between both vehicle types.

Results for the sightline assessments are shown in **Table 1** and graphically in **Figure 2**.

Table 1: Sight Distance Assessment

Location	Setback Distance from Curb (m)	Maximum Sight Distance (m)	
		Distance Looking Left (D_L)	Distance Looking Right (D_R)
Victoria Road South & Access 1 (60km/h speed limit)	4.4 m	185.0 m	24.0 m

D_L (northbound) – 0 m setback	D_L (northbound) – 4.4 m setback	D_R (southbound) – 0 m setback	D_R (southbound) – 4.4 m setback

Figure 2: Sight Distance Figures

Chapter 9 of the TAC provides an intersection stopping distance calculation based on the design vehicle type. Table 9.9.3 indicates that a time gap modification of 9.5 seconds should be considered for single-unit trucks. Taking that into account, a sight distance of 185 metres would be considered the modified stopping sight distance. **Figure 3** illustrates the formula used.

As shown above, the distance looking left satisfies the stopping sight distance, while the distance looking right is 161 metres, does not meet the criteria. This is due to the

excessive foliage located adjacent to the site entrance. Removing the excess coverage located along the shoulder of the roadway should provide enough visual clearance.

The intersection sight distance along the major road (distance b in **Figure 9.9.2**) is determined by:

$$ISD = 0.278\ V_{major}\ t_g \qquad (9.9.1)$$

Where:

ISD = intersection sight distance (length of the leg of sight triangle along the major road) (m)

V_{major} = design speed of the major road (km/h)

t_g = time gap for minor road vehicle to enter the major road (s)

Figure 3: ISD Single-Unit Truck Modification

2.4 Collision Analysis

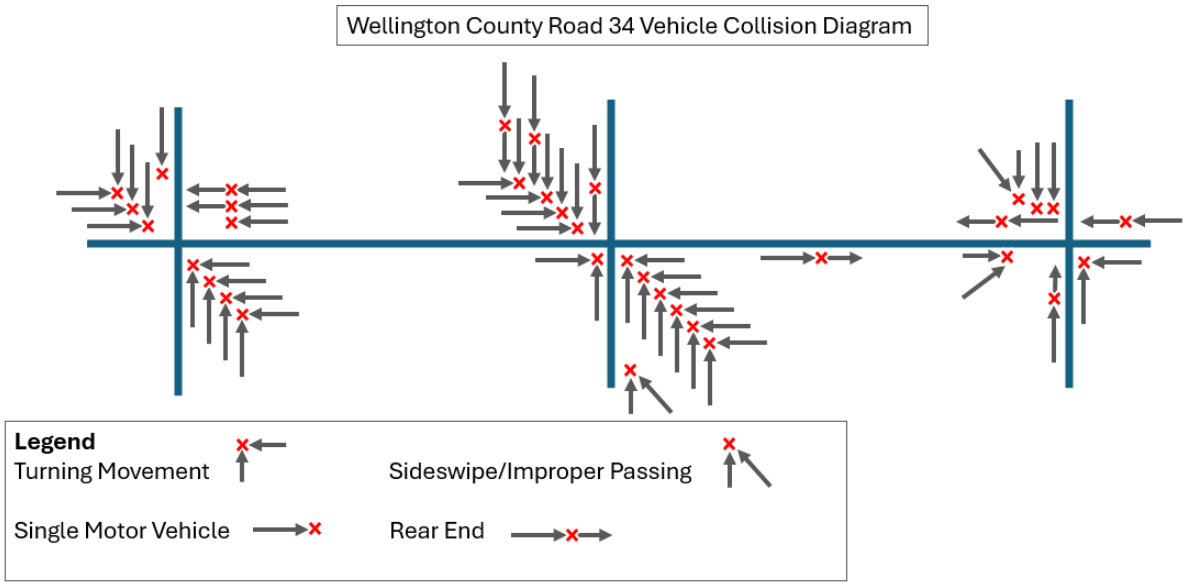

Figure 4: Collision Diagram

Using motor vehicle accident reports provided by the County of Wellington for the 2020-2024 period (see **Table 2**), a traffic collision analysis was conducted to identify any glaring issues along the road network within the study area.

The motor vehicle accident reports were reviewed, and interpretations of each collision was based on the classification indicated on each category of the report; to provide an accurate representation of the events that occurred, and to identify any steps that can be taken to mitigate potential issues.

By further investigating and understanding the dynamics, causes, and consequences of traffic collisions or accidents, the primary goals of traffic collision analysis are to

determine how and why collisions occurred, assess the severity of the collision, and recommend measures to prevent similar incidents in the future. Here are the key aspects of traffic collision analysis:

Of the 35 collisions, most collisions were observed to be caused by driver error, however issues regarding drivers losing control of their vehicles due to inclement weather was a repeated pattern, observed at; Wellington County Road 34 & Concession Road 7; and Wellington County Road 34 & Victoria Road South.

A possible solution to this issue is to warn drivers ahead of time with the implementation of installation of a “slippery when wet" road signs.

The Table below summarizes the collision details provided by the County of Wellington. While **Figure 5** illustrates the collision locations.

Table 2: Collision Summary

Collision Locations			
Latitude	**Longitude**	**Road Name**	**Type of Collision**
2024			
43.4737	-80.1538	WELLINGTON ROAD 34	Following too close
43.4874	-80.1356	WELLINGTON RD. 34	Vehicle Ran Red Light
43.4737	-80.1542	WELLINGTON RD 34	Following too close
43.4738	-80.1539	BROCK RD N	Failed to yield right of way
43.4738	-80.1538	WELLINGTON RD 34	Failed to yield right of way
2023			
43.4737	-80.154	WELLINGTON ROAD 34	Vehicle Struck Posted Sign
43.4737	-80.1538	BROCK RD S	Failed to yield right of way
43.4873	-80.1355	WELLINGTON ROAD 34	Rear End
43.4738	-80.1538	WELLINGTON ROAD 34	Failed to yield right of way
43.4738	-80.1539	WELLINGTON ROAD 34	Collision in roundabout - Side Swipe
43.4874	-80.1356	VICTORIA RD S	Vehicle Ran Red Light
2022			
43.4608	-80.1714	WELLINGTON ROAD 34	Failed to yield right of way
43.4607	-80.1713	WELLINGTON ROAD 34	Speeding too Fast for Conditions
43.4741	-80.1543	WELLINGTON ROAD 34	Rear End
43.4739	-80.1544	WELLINGTON ROAD 34	Failed to yield right of way
43.4738	-80.1542	WELLINGTON ROAD 34	Side Swiped
43.4738	-80.1539	WELLINGTON ROAD 34	Failed to yield right of way
43.4738	-80.1538	WELLINGTON ROAD 34	Failed to yield right of way
43.4736	-80.1542	WELLINGTON ROAD 34	Rear End
43.4736	-80.1541	WELLINGTON ROAD 34	Rear End
43.4874	-80.1355	WELLINGTON ROAD 34	Speeding too Fast for Conditions
2021			

Collision Locations			
Latitude	**Longitude**	**Road Name**	**Type of Collision**
43.4874	-80.1355	WELLINGTON ROAD 34	Speed too Fast for Conditions
43.4874	-80.1356	WELLINGTON ROAD 34	Rear End
43.4745	-80.1528	WELLINGTON ROAD 34	Rear End
43.474	-80.1543	WELLINGTON ROAD 34	Rear End
43.4738	-80.1539	WELLINGTON ROAD 34	Failed to yield right of way
43.4738	-80.1538	WELLINGTON ROAD 34	Failed to yield right of way
43.4736	-80.1537	WELLINGTON ROAD 34	Failed to yield right of way
43.4731	-80.1528	WELLINGTON ROAD 34	Improper Lane Change
2020			
43.4741	-80.1543	WELLINGTON ROAD 34	Side Swiped
43.4737	-80.1538	WELLINGTON ROAD 34	Failed to yield right of way
43.4737	-80.1537	WELLINGTON ROAD 34	Failed to yield right of way
43.4874	-80.1355	WELLINGTON ROAD 34	Rear End
43.4872	-80.1356	WELLINGTON ROAD 34	Side Swiped
43.4876	-80.1359	WELLINGTON ROAD 34	Improper Passing

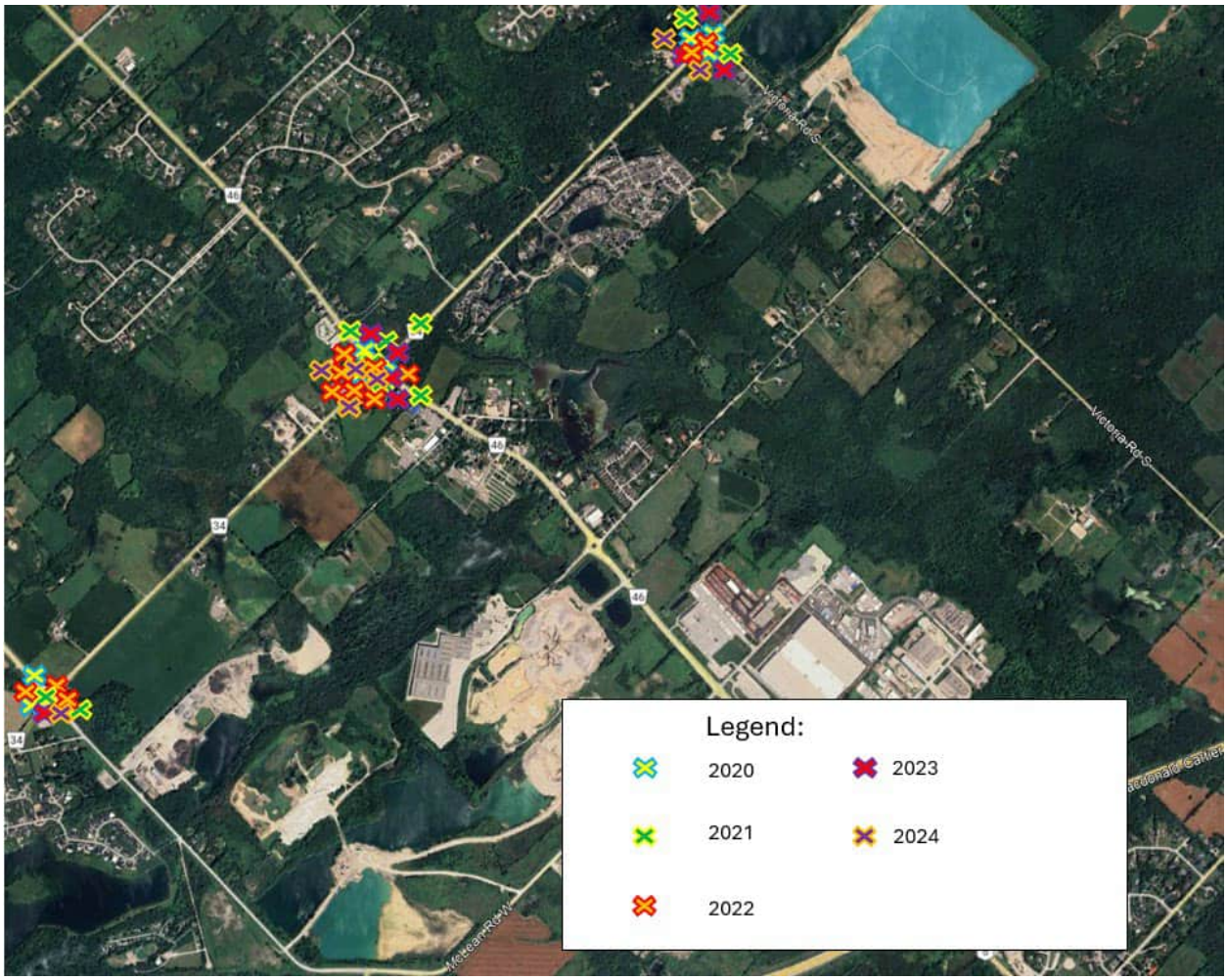

Figure 5: Study Area Collision Locations

3. Existing Conditions

The following section outlines existing conditions for the intersection of Victoria Road South and Wellington County Road 34. Existing intersection operations were analyzed using the lane configurations which were observed in field.

3.1 Existing Traffic Volumes

As part of the analysis, a detailed signal timing plan was provided by the County of Wellington, and weekday AM and PM peak hour turning movement counts were conducted by Ontario Traffic Inc. (OTI) on Tuesday, April 22, 2025.

The counts revealed a consistent AM peak hour, from 7:30- 8:30 for the three observed intersections. For the PM peak hour, the intersections ranged in start time where Concession Road 7 and Wellington County Road 34, and Brock Road and Wellington County Road 34 saw their peak hour as 16:45-17:45; while Victoria Road South and Wellington County Road 34 saw its peak hour as 16:30-17:30. Due to the minor variances in peak hour times, no volume balancing was done.

Table 3 indicates the dates in which each traffic count was collected for the intersections.

Table 3: Turning Movement Counts

Intersection	Date Collected
Victoria Road South and Wellington County Road 34	22/04/2025
Brock Road and Wellington County Road 34	22/04/2025
Concession Road 7 and Wellington County Road 34	22/04/2025

3.2 Existing Conditions Operational Analysis

Table 4 summarizes the results of the operational analysis for the intersection of Victoria Road South and Wellington County Road 34.

It can be observed that the intersection operates well through all movements, with no observable constraints during the AM Peak Hour and PM Peak Hour. During both periods it is expected to operate at an LOS B, with little delay and reasonable queues.

The Synchro/SimTraffic outputs are provided in **Appendix B.**

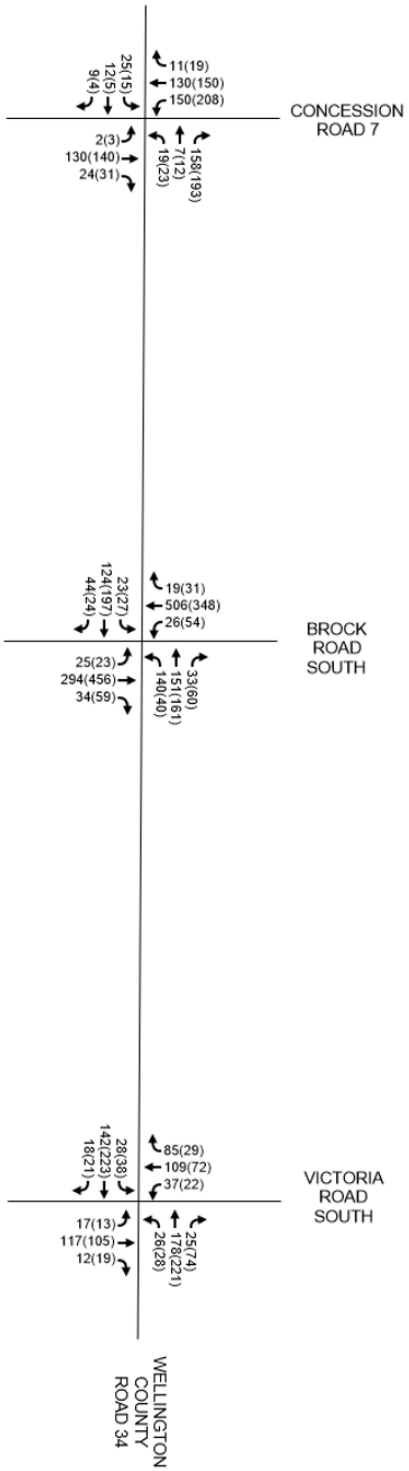

Figure 6: 2025 Existing Conditions Volume Figures

Table 4: Existing Conditions Operational Analysis

Approach/Movement		Delay (sec)	LOS	v/c	95th Q
Existing Conditions: AM Peak Hour					
EB	EBLTR	7.7	A	0.24	35.3
WB	WBLTR	7.8	A	0.26	30.2
NB	NBLTR	19.2	B	0.36	32.7
SB	SBLTR	22.2	C	0.52	53.2
Overall Intersection		**14.1**	**B**	**0.34**	-
Existing Conditions: PM Peak Hour					
EB	EBLTR	12.7	B	0.49	39.2
WB	WBLTR	13.1	B	0.52	36.3
NB	NBLTR	9.6	A	0.22	34.9
SB	SBLTR	9.3	A	0.18	26.4
Overall Intersection		**11.9**	**B**	**0.37**	-

4. Future Background Conditions

Future traffic volumes were estimated using a compound annual growth rate of 2% for the five and ten horizon years as per confirmation received as part of the review of the Terms of Reference.

Based on these assumptions, traffic volumes in 2030 are estimated to be 10% larger, while traffic volumes in 2035 are anticipated to be 22% larger than those estimated for the existing conditions (2025) scenario.

No adjacent developments, or road network alterations are anticipated for the future horizon years. However, CIMA+ was made aware that the County of Wellington is proposing an expansion of the settlement area of Aberfoyle, adjacent to the site, which may create additional traffic volumes in the future. At the time of writing this report, a draft Official Plan Amendment to this effect is proposed but not approved or in effect. Thus, no analysis of this land use proposal has been conducted within this study.

4.1 2030 Future Background

Table 5 illustrates the results of the 2030 future background operational analysis for the intersection of Victoria Road South and Wellington County Road 34.

Within this scenario, signal timing and splits were optimized. Like the existing conditions scenario, the intersection operates well through all movements, with no observable constraints during the AM Peak Hour and PM Peak Hour.

During both periods it is expected to operate at an LOS B, with little delay and reasonable queues. The Synchro/SimTraffic outputs are provided in **Appendix B.**

Table 5: 2030 Future Background Operational Analysis

Approach/Movement		Delay (sec)	LOS	v/c	95th Q
2030 Background: AM Peak Hour					
EB	EBLTR	10.9	B	0.35	40
WB	WBLTR	11.1	B	0.38	34.2
NB	NBLTR	9.9	A	0.25	30.8
SB	SBLTR	10.9	B	0.35	35.4
Overall Intersection		**10.8**	**B**	**0.37**	-
2030 Background: PM Peak Hour					
EB	EBLTR	12.7	B	0.49	51.4
WB	WBLTR	13.1	B	0.52	44.8
NB	NBLTR	9.6	A	0.22	27.7
SB	SBLTR	9.3	A	0.18	23.8
Overall Intersection		**11.9**	**B**	**0.37**	-

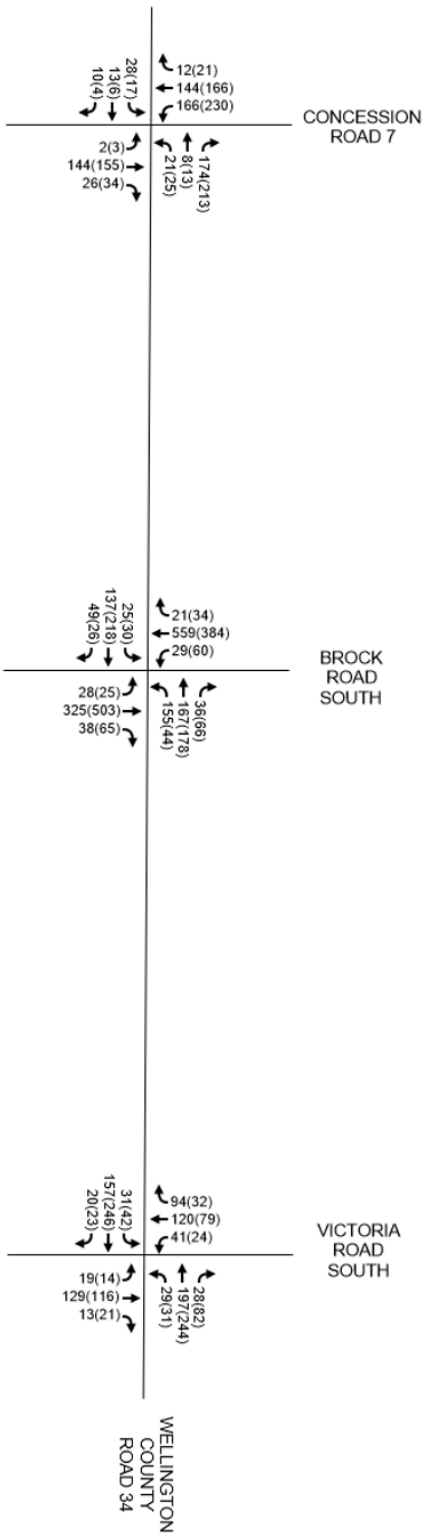

Figure 7: 2030 Future Background Volume Figures

4.2 2035 Future Background

Table 6 highlights the 2035 future background operational analysis results for the intersection of Victoria Road South and Wellington County Road 34. Within this scenario, signal timing and splits were optimized.

Similar to both the existing conditions scenario and 2030 future background scenario, the intersection operates well through all movements, with no observable constraints during the AM Peak Hour and PM Peak Hour.

During both periods it is expected to operate at an LOS B, with little delay and reasonable queues.

The Synchro/SimTraffic outputs are provided in **Appendix B.**

Table 6: 2035 Future Background Operational Analysis

Approach/Movement		Delay (sec)	LOS	v/c	95th Q
2035 Background: AM Peak Hour					
EB	EBLTR	11.4	B	0.39	39.1
WB	WBLTR	11.6	B	0.42	36.5
NB	NBLTR	10.2	B	0.28	34.2
SB	SBLTR	11.5	B	0.4	38.9
Overall Intersection		**11.3**	**B**	**0.41**	-
2035 Background: PM Peak Hour					
EB	EBLTR	13.5	B	0.55	56.1
WB	WBLTR	14.2	B	0.59	66.9
NB	NBLTR	9.8	A	0.24	29.6
SB	SBLTR	9.5	A	0.2	25.1
Overall Intersection		**12.6**	**B**	**0.41**	-

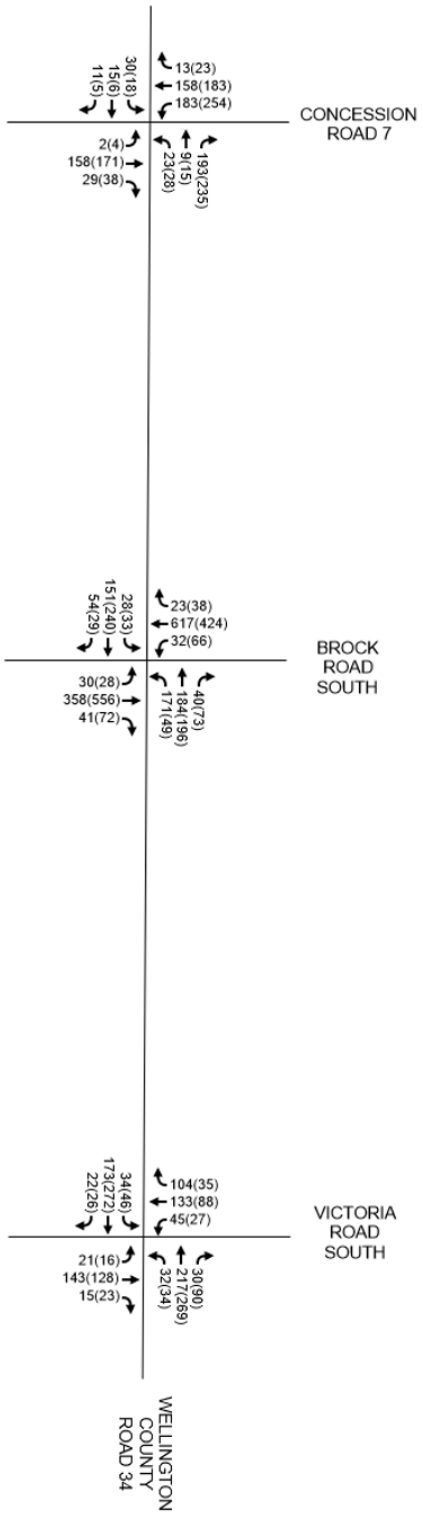

Figure 8: 2035 Future Background Figures

5. Future Total Conditions

5.1 Trip Generation

The site trip estimates were calculated based on the following assumptions.

- Up to 12 tri-axel trucks would travel between the sites, for approximately 10 hours each day.
- Each truck would carry approximately 40 tonnes per haul.
- The loading time per truck was estimated to be around 4 minutes.
- A maximum of 3 trucks at one site at each time could occur.
- Proposed hours of operation would be between 6:00–19:00, Monday to Friday.
- The build-out year was 2025.

With an estimated 10 minutes of travel time, 10-minute headway, and 10 minutes for loading/unloading, with a total of 3 trucks on site at any given time; it was an assumed that 6 trips would take place within any hour.

Within the AM, 6 trips were assumed to travel from the Victoria Road South access to the Concession Road 7 access, with the reverse taking place within the PM. **Figure 9** illustrates the site traffic volume distribution.

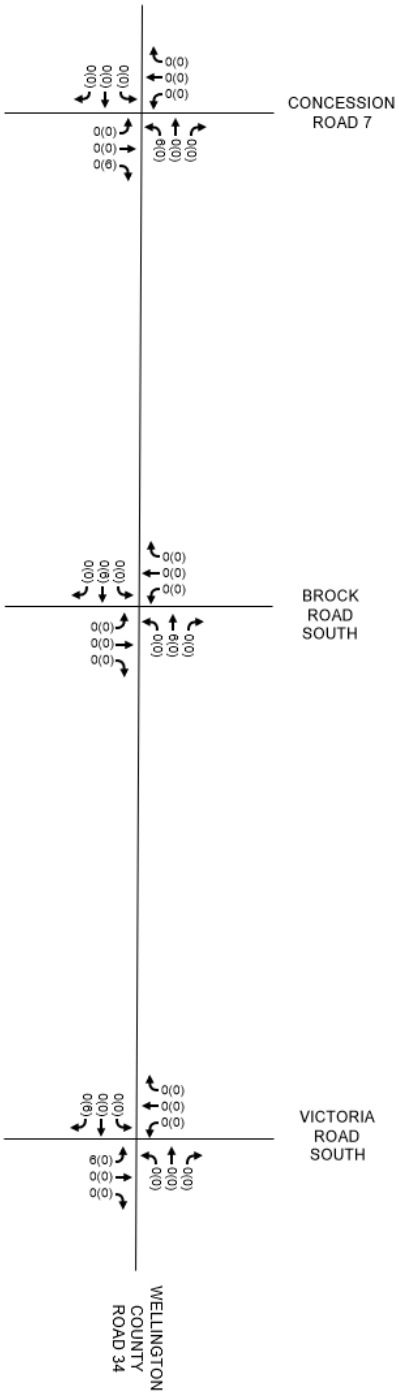

Figure 9: Site Traffic Volumes

5.2 2025 Buildout

Table 7 summarizes the results of the operational analysis for the intersection of Victoria Road South and Wellington County Road 34.

With the small volume addition expected as a result of the increased site traffic showing no significant differences.

Within this scenario, signal timing and splits were optimized. As shown, the intersection operates well through all movements, with no observable constraints during the AM Peak Hour and PM Peak Hour. During both periods it is expected to operate at an LOS B, with little delay and reasonable queues.

The Synchro/SimTraffic outputs are provided **Appendix B.**

Table 7: 2025 Buildout Operational Analysis

Approach/Movement		Delay (sec)	LOS	v/c	95th Q
2025 Buildout: AM Peak Hour					
EB	EBLTR	10.5	B	0.31	35
WB	WBLTR	10.7	B	0.34	31.6
NB	NBLTR	9.9	A	0.24	29.6
SB	SBLTR	10.5	B	0.31	33.5
Overall Intersection		**10.4**	**B**	**0.32**	-
2025 Buildout: PM Peak Hour					
EB	EBLTR	12	B	0.45	44.2
WB	WBLTR	12.3	B	0.47	44.4
NB	NBLTR	9.4	A	0.19	28
SB	SBLTR	9.2	A	0.17	21.6
Overall Intersection		**11.3**	**B**	**0.33**	-

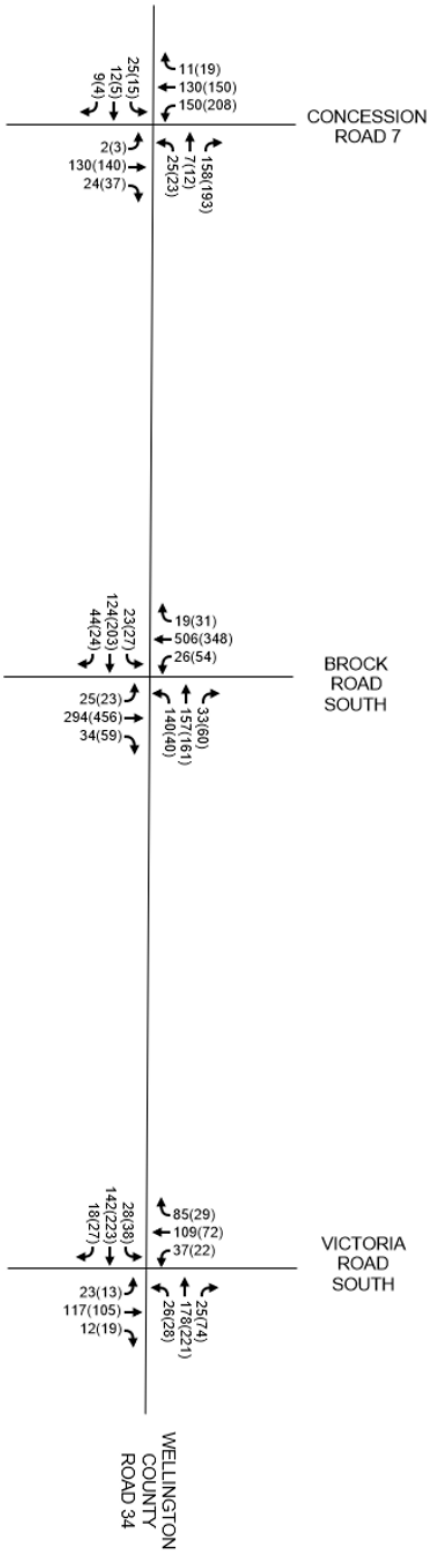

Figure 10: 2025 Buildout Volume Figures

5.3 2030 Future Total

Table 8 illustrates the results of the 2030 future total operational analysis for the intersection of Victoria Road South and Wellington County Road 34.

Within this scenario, signal timing and splits were optimized. the intersection operates well through all movements, with no observable constraints during the AM Peak Hour and PM Peak Hour.

This scenario is shown to have almost identical operational results to the 2030 future background operational analysis. During both periods it is expected to operate at an LOS B, with little delay and reasonable queues.

The Synchro/SimTraffic outputs are provided in **Appendix B.**

Table 8: 2030 Future Total Operational Analysis

Approach/Movement		Delay (sec)	LOS	v/c	95th Q
2030 Total: AM Peak Hour					
EB	EBLTR	10.9	B	0.35	40.3
WB	WBLTR	11.1	B	0.38	35.7
NB	NBLTR	10.1	B	0.27	31
SB	SBLTR	10.9	B	0.35	34.3
Overall Intersection		**10.8**	**B**	**0.37**	-
2030 Total: PM Peak Hour					
EB	EBLTR	12.8	B	0.5	55.1
WB	WBLTR	13.1	B	0.53	62.5
NB	NBLTR	9.6	A	0.22	29
SB	SBLTR	9.3	A	0.18	25.3
Overall Intersection		**11.9**	**B**	**0.37**	-

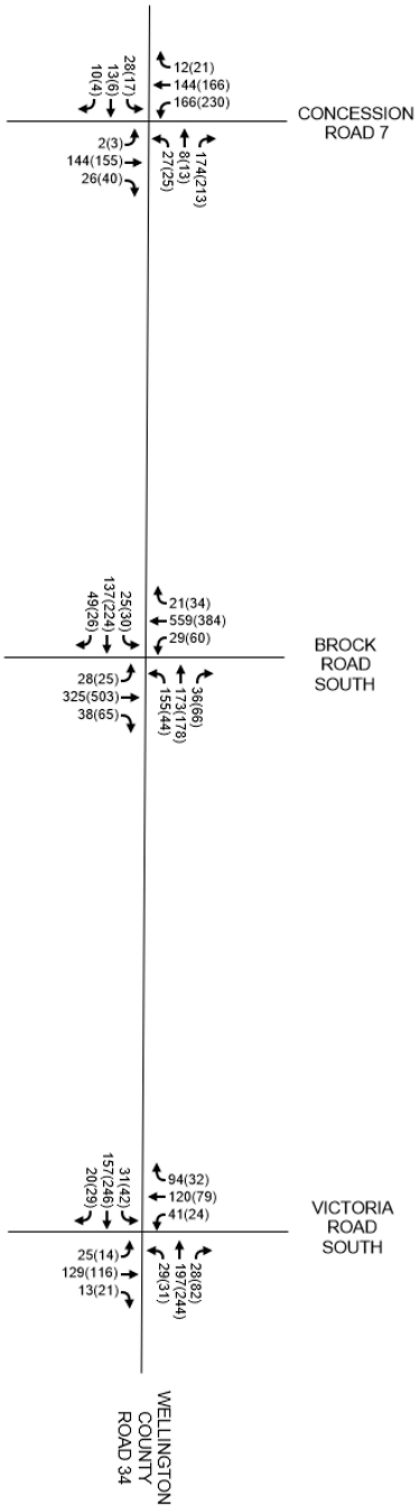

Figure 11: 2030 Future Total Volume Figures

5.4 2035 Future Total

Table 9 highlights the results of the 2035 future total operational analysis for the intersection of Victoria Road South and Wellington County Road 34. Within this scenario, signal timing and splits were optimized. The intersection operates well through all movements, with no observable constraints during the AM Peak Hour and PM Peak Hour.

This scenario is shown to have almost identical operational results to the 2035 future background operational analysis.

During both periods it is expected to operate at an LOS B, with little delay and reasonable queues. The Synchro/SimTraffic outputs are provided in **Appendix B.**

Table 9: 2035 Future Total Operational Analysis

Approach/Movement		Delay (sec)	LOS	v/c	95th Q
2035 Total: AM Peak Hour					
EB	EBLTR	11.4	B	0.39	40.9
WB	WBLTR	11.6	B	0.42	38.1
NB	NBLTR	10.4	B	0.3	35.2
SB	SBLTR	11.5	B	0.4	36.4
Overall Intersection		**11.3**	**B**	**0.41**	-
2035 Total: PM Peak Hour					
EB	EBLTR	13.7	B	0.56	55.1
WB	WBLTR	14.2	B	0.59	62.5
NB	NBLTR	9.8	A	0.24	29
SB	SBLTR	9.5	A	0.2	25.3
Overall Intersection		**12.7**	**B**	**0.41**	-

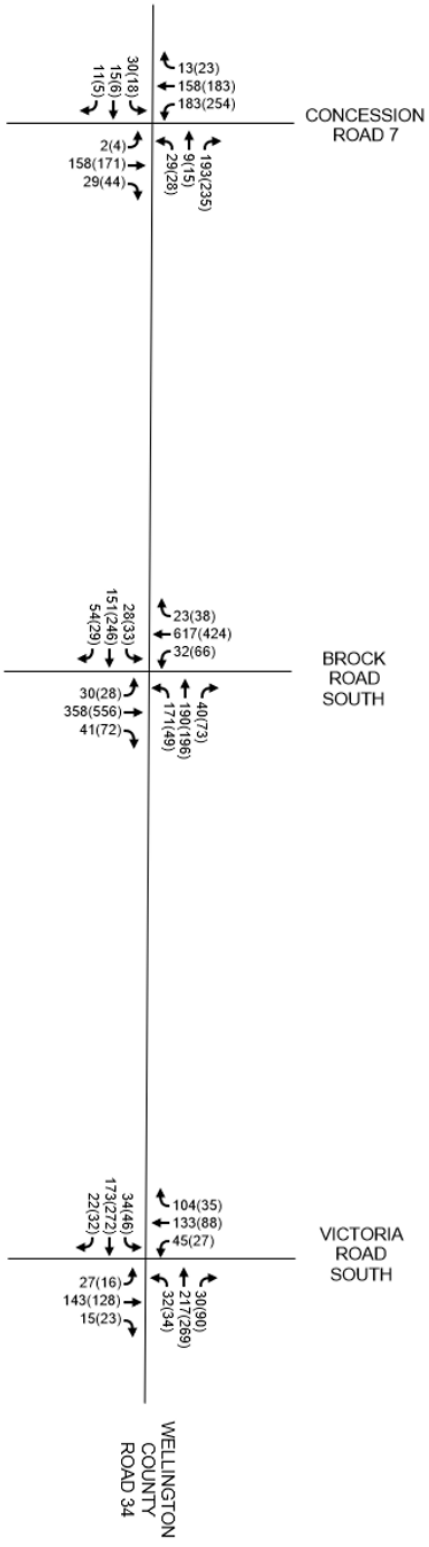

Figure 12: 2035 Future Total Volume Figures

6. ARCADY Analysis Summary

As aforementioned within this document, ARCADY was used to conduct the operational analysis for the roundabouts of; Wellington Road 34 and Concession Road 7, and Wellington Road 34 and Brock Road.

Like the Victoria Road South intersection, these roundabouts are expected to operate well, with little delay, an LOS A and reasonable queues during both the AM and PM peak periods. The Roundabout volumes, geometry and analysis results are provided below for the 2035 future total.

6.1 Wellington Road 34 and Brock Road

1 Traffic Volumes

2035 – 10 Year Total, AM Peak Hour

From \ To	1st exit	2nd exit	3rd exit	U-Turn	Total
SB - Brock Rd	23	617	32	0	672
EB - Wellington Rd 34	54	151	28	0	233
NB - Brock Rd	41	358	30	0	429
WB - Wellingotn Rd 34	40	190	171	0	401
Total	158	1316	261	0	-

2035 – 10 Year Total, PM Peak Hour

From \ To	1st exit	2nd exit	3rd exit	U-Turn	Total
SB - Brock Rd	38	424	66	0	528
EB - Wellington Rd 34	29	246	33	0	308
NB - Brock Rd	72	556	28	0	656
WB - Wellingotn Rd 34	73	196	49	0	318
Total	212	1422	176	0	-

2 Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage intercept adjustment (%)
SB - Brock Rd	7.85	8.00	10.0	30.0	54.0	20.0	☐	☐	95.00
EB - Wellington Rd 34	3.75	4.25	10.0	25.0	54.0	20.0	☐	☐	95.00
NB - Brock Rd	7.85	8.00	10.0	30.0	54.0	20.0	☐	☐	95.00
WB - Wellingotn Rd 34	3.75	4.25	10.0	25.0	54.0	20.0	☐	☐	95.00

3 Analysis Results

	AM							PM						
	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity
3x2 Roundabout - 2035 - 10 Yr Total														
SB - Brock Rd	2.7	2.76	0.36	A	4.08	A	54 % [EB - Wellington Rd 34]	1.5	2.30	0.27	A	3.91	A	59 % [WB - Wellingotn Rd 34]
EB - Wellington Rd 34	2.3	7.27	0.34	A				2.7	6.24	0.37	A			
NB - Brock Rd	1.0	2.09	0.22	A				2.4	2.65	0.35	A			
WB - Wellingotn Rd 34	2.7	6.58	0.45	A				2.9	6.92	0.40	A			

6.2 Wellington Road 34 and Concession Road 7

1 Traffic Volumes

2035 – 10 Year Total, AM Peak Hour

From \ To	1st exit	2nd exit	3rd exit	U-Turn	Total
SB - Concession Rd 7	13	158	183	0	354
EB - Wellington Rd 34	11	15	30	0	56
NB - Concession Rd 7	29	158	2	0	189
WB - Wellingotn Rd 34	193	9	29	0	231
Total	246	340	244	0	-

2035 – 10 Year Total, PM Peak Hour

From \ To	1st exit	2nd exit	3rd exit	U-Turn	Total
SB - Concession Rd 7	23	183	254	0	460
EB - Wellington Rd 34	5	6	18	0	29
NB - Concession Rd 7	44	171	4	0	219
WB - Wellingotn Rd 34	235	15	28	0	278
Total	307	375	304	0	-

2 Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage intercept adjustment (%)
SB - Concession Rd 7	3.75	4.25	10.0	20.0	46.0	20.0	☐	☐	95.00
EB - Wellington Rd 34	3.75	4.25	10.0	20.0	46.0	20.0	☐	☐	95.00
NB - Concession Rd 7	3.75	4.25	10.0	20.0	46.0	20.0	☐	☐	95.00
WB - Wellingotn Rd 34	3.75	4.25	10.0	20.0	46.0	20.0	☐	☐	95.00

3 Analysis Results

	AM							PM						
	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity
3x2 Roundabout - 2035 - 10 Yr Total														
SB - Concession Rd 7	2.1	4.46	0.33	A	4.28	A	174 % [SB - Concession Rd 7]	2.5	5.25	0.42	A	4.83	A	112 % [SB - Concession Rd 7]
EB - Wellington Rd 34	0.5	3.86	0.06	A				0.5	3.99	0.03	A			
NB - Concession Rd 7	0.8	4.13	0.19	A				1.3	4.45	0.23	A			
WB - Wellingotn Rd 34	1.3	4.24	0.23	A				1.4	4.52	0.28	A			

7. Recommendations

Based on the results of our review of the Study Area as well as the operational analysis completed for existing and future scenarios, it is recommendable that the following activities should be considered as part of the Site Plan:

- Remove the excess coverage located along the shoulder of the roadway to provide enough visual clearance at the site access on Victoria Road South. Vegetation clearance is recommended to meet required stopping sight distance standards, particularly for heavy vehicles
- Install a “slippery when wet” road signs at key locations prone to adverse weather effects to warn drivers ahead of time about expected road conditions.

8. Conclusion

The Transportation Impact Study (TIS) for the proposed mineral aggregate operation at 4454 Victoria Road South evaluated the impact of additional site-generated traffic on the surrounding road network under existing, 2025 buildout, and future (2030 and 2035) total conditions. The analysis considered peak hour traffic volumes, geometric configurations, operational performance, sightline adequacy, and collision history along the designated haul route and key intersections.

The operational analyses indicate that all studied intersections, including both signalized and roundabout-controlled locations, are expected to operate at an acceptable Level of Service (LOS B or better) during both AM and PM peak periods, across all scenarios evaluated. Site-generated truck traffic is not anticipated to result in any significant degradation of intersection performance or capacity constraints. The ARCADY-based assessments of the roundabouts at Wellington Road 34 & Brock Road and Wellington Road 34 & Concession Road 7 further confirm efficient performance with minimal delays and queuing under future conditions.

Sightline assessments revealed one area of concern due to obstructive foliage at the site access on Victoria Road South. Mitigating this issue through vegetation clearance is recommended to meet required stopping sight distance standards, particularly for heavy vehicles.

Collision analysis over a five-year period did not reveal systemic safety concerns but did identify repeated weather-related incidents. As a precaution, it is recommended that “Slippery When Wet” signage be installed at key locations prone to adverse weather effects.

In summary, the proposed development can be accommodated by the existing and future road network without the need for major infrastructure improvements. With mitigative measures in place, the site traffic is expected to integrate safely and efficiently within the existing transportation system.

A

Appendix A: Terms of Reference

NOTE

TO	:	**Don Kudo (County of Wellington)**
FROM	:	**Jaime Garcia, P.Eng., Ph.D. (CIMA+)**
DATE	:	**December 13, 2024**
SUBJECT	:	**TRAFFIC IMPACT STUDY - TERMS OF REFERENCE (REVISED)**

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1. Introduction

CBM Aggregates (CBM) seeks to expand the current property at 4454 Victoria Road South, which functions as a quarry for concrete and cement aggregates to be processed at CBM's Aberfoyle North plant. The need for a Traffic Impact Study (TIS) is a result of the *Aggregate Resources Act* and its requirement for a TIS for new aggregate sites.

The purpose of this document is to provide you with a summary of our proposed approach for the completion of the requested Traffic Impact Study for your review and comments.

2. Study Area

The following **Figure 1** outlines the preliminary boundaries of the study area. The study area will include roads under the jurisdiction of the Town of Puslinch and the County of Wellington. Under these limits, six intersections are to be analyzed. The study area follows comments provided by the County of Wellington dated December 02, 2024, with intersections of interest highlighted with a blue circle.

Figure 1 - Study Area Limits

2.1 Road Network Existing Conditions

The key properties of the existing road network will be identified in the TIS, including street names, jurisdictions, speed limits, classifications, lane configurations, and intersections (both signalized and unsignalized).

2.2 Development Land Use Type and Site Plan

The TIS will contain a detailed description of the proposed development, including existing land use, any official plan designation and the surrounding lands and their uses.

CBM plans to utilise the lands shown in **Figure 2** as another aggregate pit for their production, with CBM vehicles delivering the aggregate to the Aberfoyle North Plant.

Figure 2 – Proposed Pit Expansion

3. Data Collection

3.1 Field Work

CIMA+ will confirm existing conditions including:

- Traffic Controls
- Lane Assignments
- Non-auto mode facilities

- Adjacent Land Uses
- Queue Lengths
- Driver Behaviour

Documentation will be in the form of descriptive text and photographs when appropriate.

3.2 Collision Data

Collision data will be requested from the relevant jurisdiction(s) at signalized intersections within the study area once the need and scope of the safety analysis are confirmed. As required by the County of Wellington, collision data will analyze the last 5 years of data should it be required.

3.3 Traffic Counts and Traffic Signal Timing

As part of the analysis, weekday AM and PM peak hour turning movement counts (including vehicle classifications and non-auto volumes, taken over 3 weekdays), and a detailed signal timing plan will be required at the following intersections:

Intersection	Traffic Control	Traffic Data to be Requested	Jurisdiction/Responsible Contact
Victoria Road South @ Access to the proposed pit	Unsignalized – Minor street stop controlled	Turning Movement Counts/Vehicle quantity estimates Vehicle type	CBM
Wellington County Road 34 @ Victoria Road South	Signalized	Signal Control Plan Turning Movement Counts	County of Wellington
Wellington County Road 34 @ Brock Road South (County Road 46)	Unsignalized – Roundabout	Turning Movement Counts	County of Wellington
Wellington County Road 34 @ Concession Road 7	Unsignalized – Roundabout	Turning Movement Counts	County of Wellington
Concession Road 7 @ Access to North Plant	Unsignalized – Minor street stop controlled	Turning Movement Counts/Vehicle quantity estimates Vehicle type	CBM

Due to the COVID-19 outbreak, it is not certain if recently recorded traffic data will reflect expected historical growth. Historical counts will be requested to the extent possible and demand trends will be compared to achieve a reasonable growth rate or an ATR historical growth rate.

4. Horizon Years

As per County of Wellington TIS guidelines (Appendix G of Wellington's Road Master Action Plan), CIMA+ will assume that weekday AM and PM peak hour traffic forecasts will be developed for the following horizon years: existing condition (2024), opening/build-out date (to be determined), and 5 or 10 years after the full build-out. Horizon years will be confirmed in a pre-consultation stage with the County of Wellington.

5. Background Traffic Projections

Background traffic projections will be determined based on historical growth rates determined via:

- Historical ATR Counts
- Regional TMP data
- Or any approved growth rate assumption if appropriate data is unavailable.

The methodology behind background traffic trip generation will be confirmed in a pre-consultation stage with the County of Wellington.

Within the study area, there does not exist any other major developments that would require significant traffic consideration. Our approach considers that the Town will indicate proposed/approved developments that may need to be considered.

6. Trip Generation

In pre-consultation with the County of Wellington, the following trip generation methodologies and adjustments will be confirmed. However, the generated volumes from the proposed development will be assumed to be entirely composed of CBM vehicles accessing the new aggregate pit, following the provided haul route by CBM.

6.1 Mode Choice Assumptions

For CBM site traffic, assumptions of employee mode choice will be provided by CBM.

6.2 ITE Values

CBM site trips are not anticipated to require ITE Trip Generation manual, as vehicle site access data is expected to be provided by CBM. Land use changes outside of the CBM site will be assessed based on their corresponding ITE land use code.

6.3 Origin-Destination Data

CBM is expected to provide general locations of vehicles and employees' origins, which we will review to inform our assumption, and make modifications as necessary.

7. Trip Distribution

In a pre-consultation stage with the County of Wellington, trip distribution methodologies and variations will be confirmed as required. Projected site traffic will be allocated along the roadway network within the study area. Once CBM provides employee and vehicle origin data, our assumptions will be confirmed and modified as necessary.

8. Trip Assignment and Travel Forecasts

Trips will be assigned for the various years of the traffic forecasts as follows:

- Existing (Base Year) – Existing (2024) vehicle traffic volumes for the weekday AM and PM peak hours will be developed from available counts in the study area.
- Opening Day/Build-Out Day Background – Opening Day Background Volumes for weekday AM and PM peak hours will be forecasted by applying a growth rate to existing volumes and adding a percentage of the traffic generated by the proposed pit expansion in -.
- Opening Day/Build-Out Day Total – Opening Day Total Volumes will be generated by summing the opening day background volumes and site vehicle trips generated and distributed as described in sections 7 and 8.
- Horizon Year Background – Horizon Year Background Volumes for weekday AM and PM peak hours will be forecasted by applying a growth rate to existing volumes and adding a percentage of the traffic generated by the proposed pit expansion in -.
- Horizon Year Total – Horizon Year Total Volumes will be generated by summing the horizon year background volumes and site vehicle trips generated and distributed as described in sections 7 and 8.

9. Operational Analysis

CIMA+ will evaluate the operations of the study area intersections under all forecasted conditions. Based on said evaluation, CIMA+ will identify any existing transportation issues, as well as the overall impact of the proposed development on the surrounding road network. Road improvements and modifications (such as adding auxiliary turning lanes) may be recommended to address any determined deficiencies. An assessment of whether these measures are required due to non-site traffic or resulting from the traffic generated directly from the proposed development.

In a pre-consultation stage with the County of Wellington, the following will be confirmed:

- Analysis and Design Standard/Guidelines/Reference Materials

- Analysis Methodology and Software
- Analysis Periods

Confirmation of the software version (assumed Trafficware Synchro/Simtraffic V. 12) as well as the capacity analysis will be obtained from the County of Wellington. It will be used to assess the nine significant signalized and unsignalized intersections within the study area, providing an assessment of volume-to-capacity (v/c) ratios, Level of Service (LOS) and queuing conditions.

10. Safety

The need and scope of the Safety Analysis, or any site-specific safety concerns, will be confirmed in pre-consultation with the County of Wellington. If required, we will conduct the analysis following a Road Safety Audit approach. Collision analysis will be conducted to determine if there are any concerns in the study area. As required in the County of Wellington's TIS guidelines and in our proposal to CBM, we will also conduct a sight distance assessment to identify any potential sight distance restrictions.

11. Geometric Improvement

The need for geometric improvements will be reviewed at all locations identified by the traffic and (if required) safety analysis.

12. Assessment of Haul Route

As requested by CBM, the haul route proposed (which corresponds to the study area shown in **Figure 1**) will also be assessed for its potential impacts on traffic operations and public safety.

13. Conclusion and Recommendations

The interpretation of traffic analysis results into road improvements will follow the County of Wellington's practices and policies. The recommendations will include key findings and summaries of required infrastructure improvements.

B

Appendix B: Synchro/SimTraffic Outputs

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	143	18	26	179	25	17	117	12	37	109	85
Future Volume (vph)	28	143	18	26	179	25	17	117	12	37	109	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.95	
Flt Protected		0.99			0.99			0.99			0.99	
Satd. Flow (prot)		1675			1823			1747			1740	
Flt Permitted		0.93			0.95			0.95			0.93	
Satd. Flow (perm)		1570			1744			1672			1639	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	33	171	22	31	214	30	20	140	14	44	130	102
RTOR Reduction (vph)	0	8	0	0	10	0	0	7	0	0	47	0
Lane Group Flow (vph)	0	218	0	0	265	0	0	167	0	0	229	0
Heavy Vehicles (%)	11%	10%	20%	4%	1%	8%	29%	2%	25%	3%	2%	4%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		628			697			668			655	
v/s Ratio Prot												
v/s Ratio Perm		0.14			c0.15			0.10			c0.14	
v/c Ratio		0.35			0.38			0.25			0.35	
Uniform Delay, d1		9.4			9.6			9.0			9.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.5			1.6			0.9			1.5	
Delay (s)		10.9			11.1			9.9			10.9	
Level of Service		B			B			A			B	
Approach Delay (s)		10.9			11.1			9.9			10.9	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	53.1	40.7	36.6	39.9
Average Queue (m)	21.9	20.2	17.0	20.8
95th Queue (m)	40.0	34.2	30.8	35.4
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	224	21	28	222	82	13	105	19	22	72	29
Future Volume (vph)	38	224	21	28	222	82	13	105	19	22	72	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.98			0.97	
Flt Protected		0.99			1.00			1.00			0.99	
Satd. Flow (prot)		1826			1810			1788			1823	
Flt Permitted		0.91			0.95			0.97			0.94	
Satd. Flow (perm)		1679			1731			1745			1728	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	110%	110%	110%	110%	110%	100%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	45	268	25	33	265	89	16	126	23	26	86	35
RTOR Reduction (vph)	0	7	0	0	24	0	0	13	0	0	21	0
Lane Group Flow (vph)	0	331	0	0	363	0	0	152	0	0	126	0
Heavy Vehicles (%)	3%	2%	5%	4%	1%	1%	15%	3%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		671			692			698			691	
v/s Ratio Prot												
v/s Ratio Perm		0.20			c0.21			c0.09			0.07	
v/c Ratio		0.49			0.52			0.22			0.18	
Uniform Delay, d1		10.1			10.3			8.9			8.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.6			2.8			0.7			0.6	
Delay (s)		12.7			13.1			9.6			9.3	
Level of Service		B			B			A			A	
Approach Delay (s)		12.7			13.1			9.6			9.3	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	62.3	59.0	34.3	28.2
Average Queue (m)	27.9	26.2	14.9	12.7
95th Queue (m)	51.4	44.8	27.7	23.8
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	143	18	26	179	25	25	117	12	37	109	85
Future Volume (vph)	28	143	18	26	179	25	25	117	12	37	109	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.95	
Flt Protected		0.99			0.99			0.99			0.99	
Satd. Flow (prot)		1675			1823			1731			1740	
Flt Permitted		0.93			0.95			0.93			0.93	
Satd. Flow (perm)		1570			1744			1628			1637	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	110%	110%	110%	110%	110%	110%	100%	110%	110%	110%	110%	110%
Adj. Flow (vph)	33	171	22	31	214	30	27	140	14	44	130	102
RTOR Reduction (vph)	0	8	0	0	10	0	0	7	0	0	47	0
Lane Group Flow (vph)	0	218	0	0	265	0	0	174	0	0	229	0
Heavy Vehicles (%)	11%	10%	20%	4%	1%	8%	29%	2%	25%	3%	2%	4%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		628			697			651			654	
v/s Ratio Prot												
v/s Ratio Perm		0.14			c0.15			0.11			c0.14	
v/c Ratio		0.35			0.38			0.27			0.35	
Uniform Delay, d1		9.4			9.6			9.1			9.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.5			1.6			1.0			1.5	
Delay (s)		10.9			11.1			10.1			10.9	
Level of Service		B			B			B			B	
Approach Delay (s)		10.9			11.1			10.1			10.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	53.6	46.8	36.6	39.9
Average Queue (m)	21.7	20.3	17.3	20.9
95th Queue (m)	40.3	35.7	31.0	34.3
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	224	29	28	222	82	13	105	19	22	72	29
Future Volume (vph)	38	224	29	28	222	82	13	105	19	22	72	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.98			0.97	
Flt Protected		0.99			1.00			1.00			0.99	
Satd. Flow (prot)		1820			1810			1788			1823	
Flt Permitted		0.92			0.95			0.97			0.94	
Satd. Flow (perm)		1677			1729			1745			1728	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	110%	110%	100%	110%	110%	100%	110%	110%	110%	110%	110%	110%
Adj. Flow (vph)	45	268	32	33	265	89	16	126	23	26	86	35
RTOR Reduction (vph)	0	8	0	0	24	0	0	13	0	0	21	0
Lane Group Flow (vph)	0	337	0	0	363	0	0	152	0	0	126	0
Heavy Vehicles (%)	3%	2%	5%	4%	1%	1%	15%	3%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		670			691			698			691	
v/s Ratio Prot												
v/s Ratio Perm		0.20			c0.21			c0.09			0.07	
v/c Ratio		0.50			0.53			0.22			0.18	
Uniform Delay, d1		10.1			10.3			8.9			8.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.7			2.8			0.7			0.6	
Delay (s)		12.8			13.1			9.6			9.3	
Level of Service		B			B			A			A	
Approach Delay (s)		12.8			13.1			9.6			9.3	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	62.9	59.2	34.3	27.5
Average Queue (m)	28.3	26.1	14.4	13.1
95th Queue (m)	51.4	45.1	27.9	23.4
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	173	18	26	217	30	17	117	12	37	109	85
Future Volume (vph)	28	173	18	26	217	30	17	117	12	37	109	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.95	
Flt Protected		0.99			0.99			0.99			0.99	
Satd. Flow (prot)		1675			1823			1744			1741	
Flt Permitted		0.92			0.95			0.94			0.93	
Satd. Flow (perm)		1558			1738			1658			1630	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	122%	100%	122%	122%	100%	100%	122%	122%	122%	122%	122%	122%
Adj. Flow (vph)	37	188	24	34	236	33	23	155	16	49	145	113
RTOR Reduction (vph)	0	8	0	0	10	0	0	7	0	0	47	0
Lane Group Flow (vph)	0	241	0	0	293	0	0	187	0	0	260	0
Heavy Vehicles (%)	11%	10%	20%	4%	1%	8%	29%	2%	25%	3%	2%	4%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		623			695			663			652	
v/s Ratio Prot												
v/s Ratio Perm		0.15			c0.17			0.11			c0.16	
v/c Ratio		0.39			0.42			0.28			0.40	
Uniform Delay, d1		9.6			9.7			9.1			9.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.8			1.9			1.1			1.8	
Delay (s)		11.4			11.6			10.2			11.5	
Level of Service		B			B			B			B	
Approach Delay (s)		11.4			11.6			10.2			11.5	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	55.4	45.4	43.7	47.3
Average Queue (m)	21.9	21.3	19.7	21.9
95th Queue (m)	39.1	36.5	34.2	38.9
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	272	21	28	269	90	13	105	19	22	72	29
Future Volume (vph)	38	272	21	28	269	90	13	105	19	22	72	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.98			0.97	
Flt Protected		0.99			1.00			1.00			0.99	
Satd. Flow (prot)		1825			1810			1789			1824	
Flt Permitted		0.91			0.95			0.97			0.93	
Satd. Flow (perm)		1680			1720			1745			1719	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	122%	100%	122%	122%	100%	100%	122%	122%	122%	122%	122%	122%
Adj. Flow (vph)	50	296	28	37	292	98	17	139	25	29	95	38
RTOR Reduction (vph)	0	7	0	0	24	0	0	13	0	0	23	0
Lane Group Flow (vph)	0	367	0	0	403	0	0	168	0	0	139	0
Heavy Vehicles (%)	3%	2%	5%	4%	1%	1%	15%	3%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		672			688			698			687	
v/s Ratio Prot												
v/s Ratio Perm		0.22			c0.23			c0.10			0.08	
v/c Ratio		0.55			0.59			0.24			0.20	
Uniform Delay, d1		10.4			10.6			9.0			8.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		3.2			3.6			0.8			0.7	
Delay (s)		13.5			14.2			9.8			9.5	
Level of Service		B			B			A			A	
Approach Delay (s)		13.5			14.2			9.8			9.5	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	73.1	84.2	33.9	32.0
Average Queue (m)	29.7	35.8	16.0	13.7
95th Queue (m)	56.1	66.9	29.6	25.1
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	173	18	26	217	30	27	117	12	37	109	85
Future Volume (vph)	28	173	18	26	217	30	27	117	12	37	109	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.95	
Flt Protected		0.99			0.99			0.99			0.99	
Satd. Flow (prot)		1675			1823			1732			1741	
Flt Permitted		0.92			0.95			0.93			0.93	
Satd. Flow (perm)		1558			1738			1621			1628	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	122%	100%	122%	122%	100%	100%	100%	122%	122%	122%	122%	122%
Adj. Flow (vph)	37	188	24	34	236	33	29	155	16	49	145	113
RTOR Reduction (vph)	0	8	0	0	10	0	0	7	0	0	47	0
Lane Group Flow (vph)	0	241	0	0	293	0	0	193	0	0	260	0
Heavy Vehicles (%)	11%	10%	20%	4%	1%	8%	29%	2%	25%	3%	2%	4%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		623			695			648			651	
v/s Ratio Prot												
v/s Ratio Perm		0.15			c0.17			0.12			c0.16	
v/c Ratio		0.39			0.42			0.30			0.40	
Uniform Delay, d1		9.6			9.7			9.2			9.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.8			1.9			1.2			1.8	
Delay (s)		11.4			11.6			10.4			11.5	
Level of Service		B			B			B			B	
Approach Delay (s)		11.4			11.6			10.4			11.5	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	55.5	49.2	42.8	41.4
Average Queue (m)	22.6	22.2	20.8	21.3
95th Queue (m)	40.9	38.1	35.2	36.4
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	272	32	28	269	90	13	105	19	22	72	29
Future Volume (vph)	38	272	32	28	269	90	13	105	19	22	72	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.98			0.97	
Flt Protected		0.99			1.00			1.00			0.99	
Satd. Flow (prot)		1820			1810			1789			1824	
Flt Permitted		0.92			0.95			0.97			0.93	
Satd. Flow (perm)		1678			1719			1745			1719	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	122%	100%	100%	122%	100%	100%	122%	122%	122%	122%	122%	122%
Adj. Flow (vph)	50	296	35	37	292	98	17	139	25	29	95	38
RTOR Reduction (vph)	0	8	0	0	24	0	0	13	0	0	23	0
Lane Group Flow (vph)	0	373	0	0	403	0	0	168	0	0	139	0
Heavy Vehicles (%)	3%	2%	5%	4%	1%	1%	15%	3%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		671			687			698			687	
v/s Ratio Prot												
v/s Ratio Perm		0.22			c0.23			c0.10			0.08	
v/c Ratio		0.56			0.59			0.24			0.20	
Uniform Delay, d1		10.4			10.6			9.0			8.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		3.3			3.6			0.8			0.7	
Delay (s)		13.7			14.2			9.8			9.5	
Level of Service		B			B			A			A	
Approach Delay (s)		13.7			14.2			9.8			9.5	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	73.1	78.7	34.4	32.0
Average Queue (m)	29.4	34.7	15.7	13.8
95th Queue (m)	55.1	62.5	29.0	25.3
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	142	18	26	178	25	23	117	12	37	109	85
Future Volume (vph)	28	142	18	26	178	25	23	117	12	37	109	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.95	
Flt Protected		0.99			0.99			0.99			0.99	
Satd. Flow (prot)		1675			1823			1729			1741	
Flt Permitted		0.94			0.96			0.94			0.94	
Satd. Flow (perm)		1579			1751			1633			1645	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	154	20	28	193	27	25	127	13	40	118	92
RTOR Reduction (vph)	0	8	0	0	10	0	0	7	0	0	47	0
Lane Group Flow (vph)	0	196	0	0	238	0	0	158	0	0	203	0
Heavy Vehicles (%)	11%	10%	20%	4%	1%	8%	29%	2%	25%	3%	2%	4%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		631			700			653			658	
v/s Ratio Prot												
v/s Ratio Perm		0.12			c0.14			0.10			c0.12	
v/c Ratio		0.31			0.34			0.24			0.31	
Uniform Delay, d1		9.2			9.4			9.0			9.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.3			1.3			0.9			1.2	
Delay (s)		10.5			10.7			9.9			10.5	
Level of Service		B			B			A			B	
Approach Delay (s)		10.5			10.7			9.9			10.5	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	38.7	39.4	45.8	42.3
Average Queue (m)	18.5	17.8	15.8	18.3
95th Queue (m)	35.0	31.6	29.6	33.5
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	223	27	28	221	74	13	105	19	22	72	29
Future Volume (vph)	38	223	27	28	221	74	13	105	19	22	72	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.98			0.97	
Flt Protected		0.99			1.00			1.00			0.99	
Satd. Flow (prot)		1820			1811			1789			1822	
Flt Permitted		0.92			0.96			0.97			0.94	
Satd. Flow (perm)		1690			1737			1750			1733	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	242	29	30	240	80	14	114	21	24	78	32
RTOR Reduction (vph)	0	8	0	0	24	0	0	13	0	0	19	0
Lane Group Flow (vph)	0	304	0	0	326	0	0	136	0	0	115	0
Heavy Vehicles (%)	3%	2%	5%	4%	1%	1%	15%	3%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.0			18.0			18.0			18.0	
Effective Green, g (s)		18.0			18.0			18.0			18.0	
Actuated g/C Ratio		0.40			0.40			0.40			0.40	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Lane Grp Cap (vph)		676			694			700			693	
v/s Ratio Prot												
v/s Ratio Perm		0.18			c0.19			c0.08			0.07	
v/c Ratio		0.45			0.47			0.19			0.17	
Uniform Delay, d1		9.9			10.0			8.8			8.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.2			2.3			0.6			0.5	
Delay (s)		12.0			12.3			9.4			9.2	
Level of Service		B			B			A			A	
Approach Delay (s)		12.0			12.3			9.4			9.2	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	61.4	56.3	40.5	26.2
Average Queue (m)	22.8	25.1	14.9	11.6
95th Queue (m)	44.2	44.4	28.0	21.6
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	142	18	26	178	25	17	117	12	37	109	85
Future Volume (vph)	28	142	18	26	178	25	17	117	12	37	109	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.95	
Flt Protected		0.99			0.99			0.99			0.99	
Satd. Flow (prot)		1675			1823			1747			1741	
Flt Permitted		0.94			0.96			0.94			0.92	
Satd. Flow (perm)		1580			1752			1659			1612	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	154	20	28	193	27	18	127	13	40	118	92
RTOR Reduction (vph)	0	7	0	0	8	0	0	6	0	0	38	0
Lane Group Flow (vph)	0	197	0	0	240	0	0	152	0	0	212	0
Heavy Vehicles (%)	11%	10%	20%	4%	1%	8%	29%	2%	25%	3%	2%	4%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		29.0			29.0			14.0			14.0	
Effective Green, g (s)		29.0			29.0			14.0			14.0	
Actuated g/C Ratio		0.53			0.53			0.25			0.25	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		833			923			422			410	
v/s Ratio Prot												
v/s Ratio Perm		0.12			c0.14			0.09			c0.13	
v/c Ratio		0.24			0.26			0.36			0.52	
Uniform Delay, d1		7.0			7.1			16.8			17.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.7			0.7			2.4			4.6	
Delay (s)		7.7			7.8			19.2			22.2	
Level of Service		A			A			B			C	
Approach Delay (s)		7.7			7.8			19.2			22.2	
Approach LOS		A			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 3: Victoria Road South & Wellington County Road 34

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	47.9	40.6	44.2	74.1
Average Queue (m)	17.6	16.8	18.1	27.8
95th Queue (m)	35.3	30.2	32.7	53.2
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	223	21	28	221	74	13	105	19	22	72	29
Future Volume (vph)	38	223	21	28	221	74	13	105	19	22	72	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.97			0.98			0.97	
Flt Protected		0.99			1.00			1.00			0.99	
Satd. Flow (prot)		1825			1811			1789			1822	
Flt Permitted		0.92			0.96			0.96			0.92	
Satd. Flow (perm)		1692			1739			1731			1695	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	242	23	30	240	80	14	114	21	24	78	32
RTOR Reduction (vph)	0	5	0	0	19	0	0	10	0	0	21	0
Lane Group Flow (vph)	0	301	0	0	331	0	0	139	0	0	113	0
Heavy Vehicles (%)	3%	2%	5%	4%	1%	1%	15%	3%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		29.0			29.0			14.0			14.0	
Effective Green, g (s)		29.0			29.0			14.0			14.0	
Actuated g/C Ratio		0.53			0.53			0.25			0.25	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Lane Grp Cap (vph)		892			916			440			431	
v/s Ratio Prot												
v/s Ratio Perm		0.18			c0.19			c0.08			0.07	
v/c Ratio		0.34			0.36			0.31			0.26	
Uniform Delay, d1		7.5			7.6			16.6			16.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		1.0			1.1			1.9			1.5	
Delay (s)		8.5			8.7			18.5			17.9	
Level of Service		A			A			B			B	
Approach Delay (s)		8.5			8.7			18.5			17.9	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 3: Victoria Road South & Wellington County Road 34

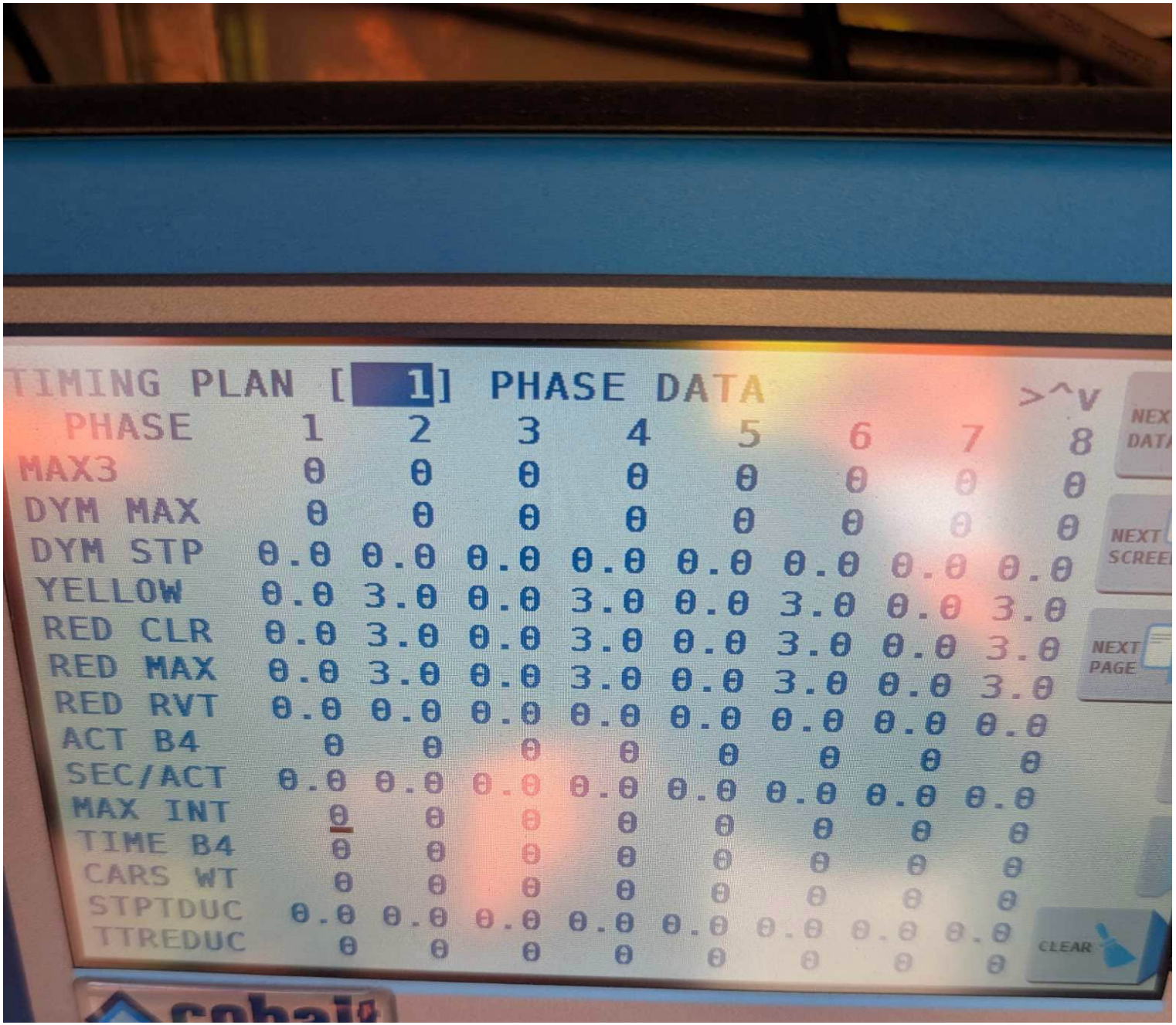
Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	49.8	43.1	44.7	30.1
Average Queue (m)	20.7	21.5	18.7	15.1
95th Queue (m)	39.2	36.3	34.9	26.4
Link Distance (m)	401.3	386.2	385.0	391.0
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

C

Appendix C: Signal Timing Plan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DYM MAX 0 0 0 0 0 0 0 0
DYM STP 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
YELLOW 0.0 3.0 0.0 3.0 0.0 3.0 0.0 3.0
RED CLR 0.0 3.0 0.0 3.0 0.0 3.0 0.0 3.0
RED MAX 0.0 3.0 0.0 3.0 0.0 3.0 0.0 3.0
RED RVT 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
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MAX INT 0 0 0 0 0 0 0 0
TIME B4 0 0 0 0 0 0 0 0
CARS WT 0 0 0 0 0 0 0 0
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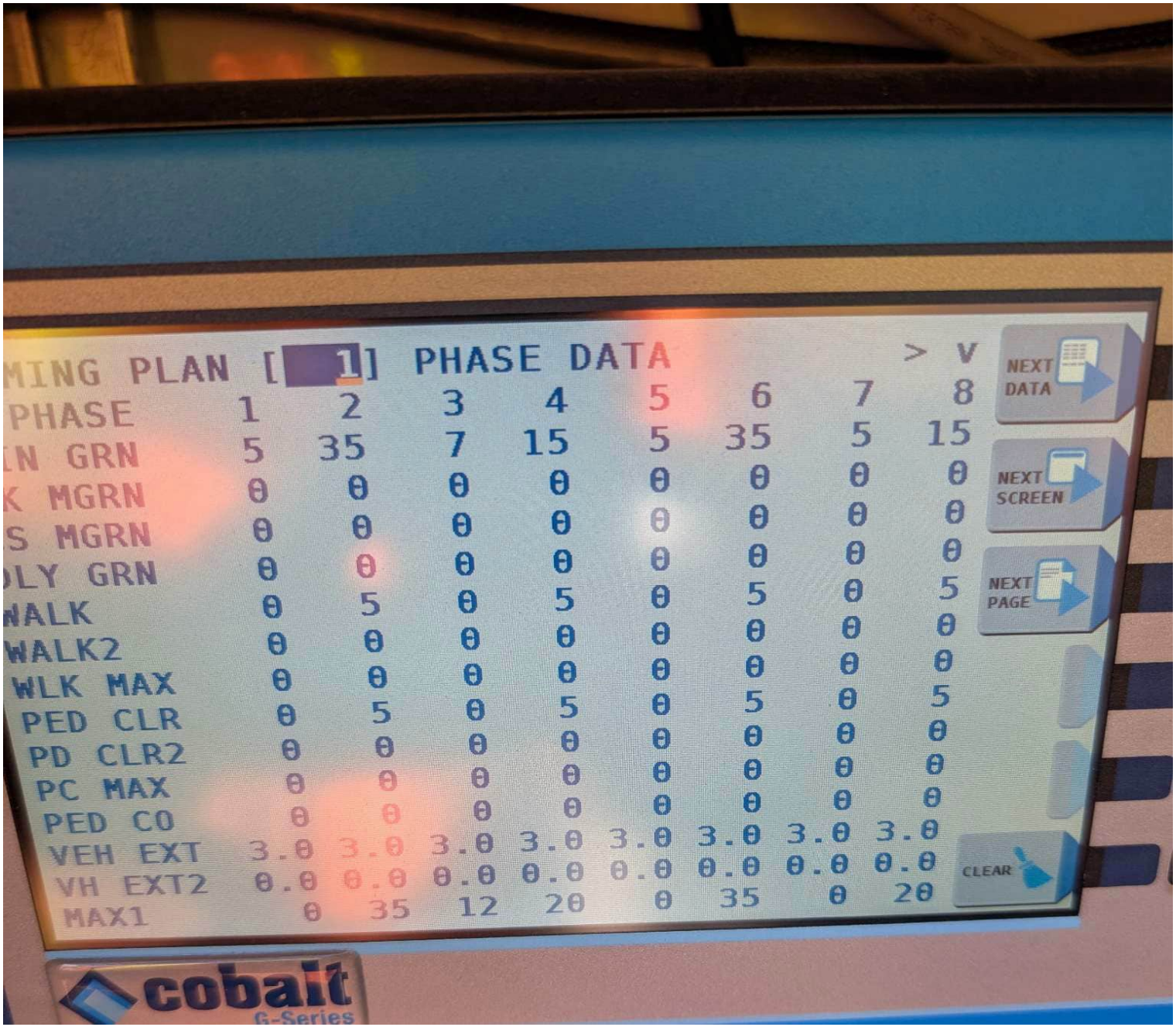
TTREDUC 0 0 0 0 0 0 0 0

G-Series
SDLC Port 1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S MGRN 0 0 0 0 0 0 0 0
LY GRN 0 0 0 0 0 0 0 0
WALK 0 5 0 5 0 5 0 5
WALK2 0 0 0 0 0 0 0 0
WLK MAX 0 0 0 0 0 0 0 0
PED CLR 0 5 0 5 0 5 0 5
PD CLR2 0 0 0 0 0 0 0 0
PC MAX 0 0 0 0 0 0 0 0
PED CO 0 0 0 0 0 0 0 0
VEH EXT 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0
VH EXT2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
MAX1 0 35 12 20 0 35 0 20
cobalt
G-Series

D

Appendix D: Curriculum Vitae

Engineering
for people

Michael Jarrett

Technologist, Transportation

EDUCATION

Diploma, Transportation Engineering Technology, Mohawk College, 2020

CAREER

CIMA+ (since 2021)

City of Mississauga (2019)

Town of Halton Hills (2018)

City of Burlington (2018)

Profile

Michael is a Transportation Engineering Technologist specializing in traffic operations, transportation planning and transportation impact study peer reviews. At CIMA+, Michael is highly involved in a variety of projects related to transportation impact studies, in which he provides traffic operations analyses and assessments. He is proficient in software applications Synchro/SimTraffic, Vissim and T.E.S.

Relevant Experience

Traffic Impact Studies

Peer Review of Traffic Impact Studies; Halton Region

Ontario, 2021-2025

Conducted over one-hundred traffic impact study peer reviews as part of retainer with Halton Region. Assess trip generation, modal split, distribution, assignment, Synchro/Simtraffic analysis, parking assessments, safety reviews, access assessments, and ensure traffic impact study fully complies with guidelines required by respective road authority.

The reviews include Type 1 - Initial TIS review, Type 2 - Review of revised TIS, Type 3 - Comprehensive reassessment of TIS and Type 4 - Terms of reference review. Examples of recent project experience includes:

- Plains Road East, Halton – Type 1+3, 2025
- Bronte Creek, Halton – Type 1+3, 2025
- 777 Guelph Line – Type 1, 2025
- Vision Georgetown – Type 1+3, 2025
- 13584 Steeles Avenue – Type 1, 2025
- Toronto Premium Outlets – Type 1, 2025

Transportation Technologist

Traffic Operations

Traffic Impact Assessment; CBM Aggregates

Wellington, ON, 2025

Conducted and oversaw a comprehensive traffic impact assessment which analyses the impact of an open pit mine on various roadways within the network.

Transportation Technologist

Left-Turn Queue Study; City of Toronto

Toronto, ON, 2025

As part of a retainer with the City of Toronto – left-turn analyses are conducted at identified intersections to provide improved measures of effectiveness.

Transportation Technologist

Signal Coordination; Region of Halton

Burlington, ON, 2025

Conducted field reviews of existing traffic conditions and took field measurements. Reviewed and updated existing clearance timings, signal timing plans and programming sheets to coordinate the corridor. Performed in-field implementation and verification of coordination.

Transportation Technologist

Traffic Calming Treatments; Town of Whitchurch Stouffville

Stouffville, ON, 2023

Provided information of the various types of traffic calming available to the client, along with their feasibility, applications, expected outcomes, and intended usage.

Transportation Technologist

Traffic & Speed Management; City of Vaughan

Vaughan, ON, 2022

Conducted spot-speed studies at various roadways within the network. Reviewed on-street parking patterns at locations within proximity to certain schools.

Transportation Technologist

Traffic Safety

Roadway Safety Audit; City of Mississauga

Mississauga, ON, 2019

Conducted a safety audit of a major downtown corridor in the City of Mississauga. Assessed collision data to determine problematic areas and intersections. Reviewed active transportation and public transportation infrastructure across the network. Provided comments/suggestions based on findings.

Traffic Services Student

Corridor Operations Assessment; Town of Halton Hills

Georgetown, ON, 2018

Assisted in updating the traffic accident database, and collision analysis. Installed A.T.R counters, while also interpreting the data provided from these counts. Undertake traffic control signal and pavement markings inventory. Conduct parking studies to establish the parking demands of various networks. Investigate local roads for the feasibility of traffic calming devices.

Traffic Analyst Student

Roadway Safety Analysis; City of Burlington

Burlington, ON, 2018

Reviewed collision data to identify problematic intersections and corridors, in the City of Burlington's downtown core. Reviewed motor vehicle accident reports for validity, and inputted collisions in T.E.S to create a 2D Map. Conducted a road safety assessment based on any applicable data, such as; intersection/corridor geometry, collision location and collision frequency.

Traffic Services Student

Jaime Garcia

Ph.D., P.Eng.

Associate Partner

Senior Project Manager, Transportation

EDUCATION

Ph.D. Transportation Engineering, Carleton University, Ottawa, 2004

M.Sc. Environmental Engineering, Instituto Tecnologico y de Estudios Superiores de Monterrey, 1997

B.Sc. Civil Engineering, Universidad Autonoma de San Luis Potosi, 1987

ASSOCIATIONS

Association of Professional Engineers of Ontario (PEO), 2005 (#100087279)

CAREER

CIMA+ (2010 to Present)

The Corporation of the County of Essex (2006 to 2010)

Carleton University (2000 to 2005)

International Experience (prior to 1999)

Profile

Jaime Garcia is a Registered Professional Engineer in Ontario with 36 years of transportation planning, environmental engineering, and project management experience. He joined CIMA in 2010 as a Project Manager - Transportation Planning, with responsibilities in Transportation Studies and Environmental Assessments for transportation projects in Ontario. In this capacity, he has been managing several transportation studies, policy development, active transportation initiatives, traffic calming studies, cost-benefit analysis, parking studies, municipal environmental assessments, and public and agency consultation activities.

Jaime's previous experience as a Manager of Transportation Planning (2006-2010) at the Corporation of the County of Essex included provincial and municipal environmental assessments and multi-modal transportation planning projects and strategies. Jaime was also involved in the Environmental Assessment and Preliminary Design process for the Detroit River International Crossing and the related Let's Get Windsor Essex Moving Initiatives.

Jaime Garcia has an above par experience managing teams in charge of updating or developing Municipal, Provincial and National policies and guidelines including the Ontario Traffic Manual (OTM) Book 15 Pedestrian Crossing Facilities, Book 6 Warning Signs, the Ministry of Transportation Traffic Impact Study Guidelines and Highway Corridor Management Manual, as well as the Transportation Association of Canada's Canadian Guide to Traffic Calming.

Relevant Experience

Traffic Calming and Transportation Safety

Complete Streets Design and Construction Standards and Standard Drawings, City of Edmonton

Edmonton, AB (In Progress)

The City of Edmonton retained CIMA+ to provide expert advice on the existing design standards and guidelines to determine areas of overlap, inconsistency, and conflict as well as on proposed revisions to the documents. To this purpose, the scope of work considered a comprehensive review of the City's standards and design regulations to ensure that the mobility system enables the efficient movement of people and goods within Edmonton and the Metropolitan Region while support inviting and inclusive transportation options for Edmontonian of all ages, abilities, and incomes. Responsibilities under this assignment included the update of the Engineering Measures to Address Speeding Issues previously prepared for the City of Edmonton in 2016.

Senior Project Manager

Traffic Calming Consulting Services, City of Barrie

Barrie, ON. 2024

The City of Barrie retained CIMA+ to update its current Traffic Calming Policy to manage the increased needs for traffic calming as well as to secure the highest return on investment in terms of improving traffic safety. To this purpose, the scope of work not only included the preparation of a Traffic Calming Policy and Implementation Process but also the development of a Greenfield Traffic Calming Policy and Measures, a Speed Limit Reduction Assessment, as well as Recommendations for the Implementation of Vision Zero Policies as part of traffic calming. Responsibilities under this assignment included managing all phases of the assignment including meetings with General Public and Stakeholders following the accessibility requirements of the City of Barrie.

Senior Project Manager

Traffic Calming/Traffic Management Studies Policy Update, City of Sault Ste. Marie

Sault Ste. Marie, ON 2023

As part of our Traffic Advisory Services Retainer, the City requested CIMA+ a review and update of the current content of the Traffic Calming/Traffic Management Studies Policy into a Traffic Calming Guidelines that can be used for all types, classes, and cross-sections of roadways within the City. The main goal of these guidelines is to provide a toolkit for City Staff to respond consistently and objectively to speed complains, implement appropriate traffic calming measures where warranted, and proactively identify areas in the community that would benefit from traffic calming. Responsibilities under this assignment included managing all phases of the assignment including internal meetings with City Staff well as the development of a Traffic Calming Guideline tailored to satisfy the needs of the City of Sault Ste. Marie.

Senior Project Manager

Burkholder Street EA and Traffic Calming Detail Design; Town of Whitchurch-Stouffville

Whitchurch-Stouffville, ON, 2022 – 2023

Municipal Class Environmental Assessment (Class EA) study to explore how Burkholder Street and the Leisure Centre Driveway should function as access points to the Burkholder Neighbourhood. The traffic calming measures identified and designed included curb extensions, a PXO, upgrading sidewalk to multi-use path, a gateway feature, and speed cushions. CIMA+ was subsequently retained to complete the traffic calming review and selection of preferred countermeasures, and their detail design and preparation of tender packages.

Senior Project Manager

Traffic Calming Guidelines, Town of Orangeville

Orangeville, ON. 2022

CIMA was retained by the Town of Orangeville to determine a suitable set of traffic calming measures that can be implemented in the roadway network under the Town's jurisdiction in support of the recent introducing of a 40 kilometres per hour speed limit town wide. This assignment also included the development of a comprehensive implementation process and the evaluation of innovative traffic calming measures such as Traffic Dampening Signs. Responsibilities under this assignment included managing all phases of the assignment including Public Engagement and Consultation as well as the development of a Toolkit of Traffic Calming Measures tailored to satisfy the needs of the Town of Orangeville.

Senior Project Manager

Traffic and Speed Management Study, City of Vaughan

Vaughan, ON. 2022

CIMA was retained by the City of Vaughan, to support City Staff to provide an adequate response to the residents of the Athabasca Community that considers speeding traffic as a threat to the wellbeing of their community and – as such, they are reaching to the City for alternative solutions to this safety issue that goes beyond the standardized approach provided by the City's Neighbourhood Traffic Committee Policy and Procedure. Responsibilities under this assignment included managing all phases of the assignment including Public Engagement and Consultation as well as the development of a Toolkit of Traffic Calming Measures tailored to satisfy the needs of the Town of Orangeville.

Senior Project Manager

Traffic Calming Guidelines and Update of Pedestrian Crossings Guidelines, City of Kingston

Kingston, ON. 2021

CIMA was retained by the City of Kingston to determine a suitable set of traffic calming measures that can be implemented in phases and/or incrementally depending on the characteristics of the study area as well as to determine the necessary changes to the current Traffic Calming Policy. This assignment also included a full review of the current Pedestrian Crossing Guidelines to support an adequate implementation of pedestrian crossovers Type B and Type D city-wide. Responsibilities under this assignment included managing all phases of the assignment including Public Engagement and Consultation as well as the development of a Toolkit of Traffic Calming Measures tailored to satisfy the needs of the neighbourhoods composing the City of Kingston.

Senior Project Manager

Traffic Calming Strategy, Town of Caledon

Caledon, ON. 2020

CIMA was retained by the Town of Caledon to develop a Traffic Calming Strategy that incorporates best practices in traffic calming with local context to provide a more appropriate, efficient, flexible and systematic framework through which to address traffic safety issues relating to excessive speeding, traffic infiltration, and collision frequency. Responsibilities under this assignment included managing all phases of the assignment including Public Engagement and Consultation as well as the development of a Toolbox of Traffic Calming Measures tailored to satisfy the needs of the urban and rural communities composing the Town of Caledon.

Senior Project Manager

Traffic Management Process Update and Traffic Calming Design Guidelines, City of Ottawa

Ottawa, ON. 2018

CIMA was retained by the City of Ottawa to update their current ATM process and traffic calming design guidelines. The main objective of this assignment is to update and streamline their current process for reviewing concerns reported by the public and determining the most appropriate traffic calming solution. Responsibilities under this assignment included coordination and management of all technical aspects during the completion of the literature review and update of the Guidelines.

Project Manager

Canadian Guide to Neighbourhood Traffic Calming Update, TAC

Canada, 2018

CIMA was retained by the Transportation Association of Canada (TAC) to review and update the content and approach of the Guide with the latest "best practices" with a focus on a national and consistent application of traffic calming techniques/policies for all types of roadways in both rural and urban environments. Responsibilities under this assignment included coordination and management of all technical aspects during the completion of the literature review and update of the Guide.

Project Manager

Traffic Calming Warrant Update, Town of Ajax

Ajax, ON. 2015

CIMA was retained by the Town of Ajax to review the 2007 Traffic Calming Warrant and evaluate the existing warrant process, confirm if it was sufficiently responsive to local conditions and traffic calming priorities or, if changes were required, to provide a more appropriate, efficient and flexible framework to address the variety of traffic complaints relating to excessive speeding, traffic infiltration and collisions. Responsibilities under this assignment included coordination and management of all technical aspects that would be included as part of the review and evaluation process including project scope; data needs analysis; and recommendations in order to issue the revised version of the warrant.

Project Manager

Traffic Calming Design Services – Emperor Street and Seward Drive, Town of Ajax

Ajax, ON. 2015

CIMA was retained by the Town of Ajax to complete a detailed design, specifications, and drawings for traffic calming measures for Emperor Street between Harwood Avenue South and Pickering Beach Road, and for Seward Drive south of Williamson Drive, and the preparation of public notices and material for two Public Information Centre (PIC) meetings. Responsibilities under this assignment included coordination and management of all technical aspects including project management, data collection, identification of the most suitable set of traffic calming measures, detailed design and costing, and public consultation.

Project Manager

Road Safety Strategy Program, City of London

London, ON. 2014

The purpose of this assignment was to identify and target the most critical road safety issues in London with efforts and programs from a number of key stakeholders. To this purpose CIMA was required to set out the targets, policies and actions to guide the City of London and its partners to create safer roads and reduce the number of traffic collisions on the roads of London and the surrounding communities. Responsibilities included Project Team coordination, management and coordination with sub-consultants, budget, and quality control. Responsibilities under this assignment included Project Team coordination during the preparation of both reports, management and coordination of sub-consultants and budget control.

Project Manager

Traffic Calming Design Services – Clements Road West, Town of Ajax

Ajax, ON. 2014

CIMA was retained by the Town of Ajax to complete a detailed design, specifications, and drawings for traffic calming measures along a 520 m segment of Clements Road W. from Monarch Avenue to Harwood Avenue South in Ajax. Responsibilities under this assignment included coordination and management of all technical aspects including project management, data collection, identification of the most suitable set of traffic calming measures, detailed design and costing, and public consultation.

Project Manager

Active Transportation

Implementation of Complete Streets on 11 Neighbourhoods in Ward 14, City of Hamilton

Hamilton, ON. 2022

As part of a Retainer contract with the City of Hamilton, CIMA was requested to complete a study, focused on transportation safety, of 11 neighbourhoods in Ward 14, with a focus on identifying potential safety-related improvements based on best practices related to Vision Zero and Complete Streets principles. The study included public engagement and stakeholder consultation, including the City's various divisions, to ensure that all recommendations are in line with all stakeholders' needs and expectations. Responsibilities under this assignment included overseeing the review of existing pedestrian and cycling network, gap analysis and determination of potential network improvements.

Senior Project Manager

University Avenue & Victoria Avenue Environmental Assessment, The Corporation of the City of Windsor

Windsor, ON. 2022

CIMA was retained by the City of Windsor to complete a Municipal Class Environmental Assessment Study (Schedule C) for the University Avenue West/East corridor between Huron Church Road and McDougall Street and Victoria Avenue from Chatham Street West to Park Street West with the goal of optimizing the available right-of-way and to achieve a safe, efficient, comfortable, and convenient travel for roadway users of all ages, abilities and modes. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget, and quality control.

Senior Project Manager

Operational Review and Design of Pedestrian and Cycling Crossings, Niagara Parks

Niagara Region, ON. 2020

CIMA was selected by Niagara Parks to provide recommendations regarding the location, type, signing, marking and potential reconstruction of the existing roadway elements to support the design and future development of pedestrian and cycling crossings consistent with current provincial guidelines at two different locations along the Niagara Parkway. Responsibilities under this assignment included Project Team coordination and expert advise regarding appropriate consideration of Ontario Traffic Manuals and related standards.

Senior Project Manager

Pedestrian and Bicycle Master Plan Update, City of Vaughan

Vaughan, ON. 2020

CIMA was retained by the City of Vaughan to update the City's Pedestrian and Bicycle Master Plan and establish policies to create a two-pronged implementation framework for active transportation supporting infrastructure. As a result, the City's new plan mandates the accommodation of AT infrastructure as a routine part of any planning construction, operation and maintenance projects within the road allowance and open space system. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget, and quality control.

Senior Project Manager

Transportation and Pedestrian Safety Action Plan, Corporation of the Town of Whitby

Whitby, ON. 2020

CIMA was retained by the Town of Whitby to develop an Action Plan that considers all modes of transportation and all users groups with and emphasis on the creation of a walkable Downtown that supports the Town's Goal of building pedestrian-focused destinations. Responsibilities under this assignment included the development of an innovative approach in which urban characteristics, roadway element requirements and context zones suitable to Downtown Whitby commercial and residential environment provided the bases for the detailed evaluation and selection of strategic concepts.

Senior Project Manager

St. David's Road EA and Preliminary Design, Niagara Region

St. Catharines & Thorold, ON. 2018

CIMA was retained for the Region of Niagara to prepare a Municipal Class Schedule B Environmental Assessment Study Report with Preliminary Design for the reconstruction of Regional Road 71 between Highway 58 Ramp and Regional Road 56 using a Complete Streets approach and full consideration for active transportation facilities. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget and quality control.

Senior Project Manager

Cycling Master Plan Update, City of Burlington

Burlington, ON. 2018

Working in collaboration with Alta Planning + Design Canada Inc., CIMA is completing an update of the City of Burlington Cycling Master Plan. The purpose of the assignment is to identify the necessary modifications to the existing plan to respond to the new realities and projections identified by the City's Official Plan.

Senior Project Manager

Downtown Transportation Strategy, City of Windsor

Windsor, ON. 2016

CIMA was retained by the City of Windsor to develop a strategy for a transportation system that supports Council Strategic Vision for a vibrant and inviting Downtown Windsor focusing on place making and supporting active transportation choices. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget, and quality control.

Project Manager

OTM Book 15, Pedestrian Crossing Devices Update, Ministry of Transportation Ontario

Ontario, 2016

In a partnership with MORR Transportation Consulting (formerly Montufar Group) CIMA was retained by the Ministry of Transportation to create a revised version of OTM Book 15. Responsibilities under this assignment are to coordinate the activities of the Transportation Team to (1) identify and develop pedestrian crossing treatment systems suitable for use in Ontario; (2) identify and recommend changes to the Regulations in the Highway Traffic Act; and (3) production of a "publication ready" document.

Project Manager

Transportation Studies

Transportation Development Application Services, Region of Peel – Retainer contract

Peel Region, ON. 2024-2025

The Region receives TISs and site plans, on a regular basis, as part of the Region's (and/or as part of the local municipality's) site plan review and approval process. Essentially all developments and redevelopments that take place within the Region that have the potential to have an effect on the Regional road system must have supporting studies submitted by the proponent and reviewed by the Region. Since these development applications have multiple facets, and therefore multiple types of studies that need to be reviewed, CIMA developed a methodology to receive, review and respond to TISs and site plans on an as-needed basis on behalf of the Region's Transportation Development Section. Responsibilities included Project Team coordination during the completion of an independent evaluation of each TIS such that a consistent and supportable direction can be offered to the developer's consultant team.

Senior Project Manager

Traffic Impact Assessment – London Street, City of Sarnia

Sarnia, ON. (In Progress)

The City of Sarnia retained CIMA+ to complete a Traffic Impact Assessment that consider the opportunity for road diet or other platform changes on London Road between Front Street and Russell Street North to enhance pedestrian safety and promote safe travel for all modes. The final deliverable of this assignment included recommendations with respect to potential changes for each of the five segments on London Road as well as signal and lane configurations at the intersections of London Road with Front Street, Christina Street, Brock Street, Mitton Street and Russell Street. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget and quality control.

Senior Project Manager

Traffic Impact Study – Russell Street and Devine, City of Sarnia

Sarnia, ON. (In Progress)

The purpose of this assignment was the completion of an operational and safety review of the intersection of Russell Street and Devine, locate in the City of Sarnia. The intersection uses tight geometry and has a history of collisions and high levels of pedestrian activities. In March 2024, the Tecumseh Park Traffic Calming report prepared by the City's Engineering and Operations Division identified several pedestrian enhancements and traffic calming measures that the City could implement; however, while it is currently understood that the City are proceeding with these improvements, City Staff retainer CIMA+ to identify potential solutions given the current layout of the road system. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget and quality control.

Senior Project Manager

Traffic Study – ARC Fairgrounds, Town of Ajax

Ajax, ON. (In Progress)

CIMA+ was retained by the Town of Ajax to undertake a Traffic Study covering the area surrounding the proposed Ajax Fairgrounds at the Audley Recreation Centre (the ARC). The study considered a comprehensive evaluation of the parking supply and infrastructure servicing the area under study. Responsibilities under this assignment

included Project Team coordination, management and coordination with sub-consultants, budget and quality control.

Senior Project Manager

Peer Review of Traffic Impact Studies, Regional Municipality of Halton – Retainer contract

Halton Region, ON. 2015-2025

The Region receives TISs and site plans, on a regular basis, as part of the Region's (and/or as part of the local municipality's) site plan review and approval process. Essentially all developments and redevelopments that take place within the Region that have the potential to have an effect on the Regional road system must have supporting studies submitted by the proponent and reviewed by the Region. Since these development applications have multiple facets, and therefore multiple types of studies that need to be reviewed, CIMA developed a methodology to receive, review and respond to TISs and site plans on an as-needed basis on behalf of the Region's Infrastructure Planning and Policy Section. Responsibilities included Project Team coordination during the completion of an independent evaluation of each TIS such that a consistent and supportable direction can be offered to the developer's consultant team.

Senior Project Manager

Sherman Access and Sherman Cut Needs Assessment Study, City of Hamilton

Hamilton, ON. 2023

As part of our retainer contract with the City of Hamilton, CIMA+ was requested the completion of a needs assessments of the current operations along the Sherman Access and the Sherman Cut during 3 different operations periods. The purpose of this assessment was to provide an adequate respond to the following questions: If operations along Sherman Access/Sherman Cut changes - What are the effects on travel time? How delay, emissions and fuel consumption at a corridor-level may be affected? Do those changes have the potential to enhance or reduce safety conditions? What could be the effects on the communities surrounding those corridors? Responsibilities under this assignment included Project Team coordination, management and coordination or data collection and operational analysis including the completion of travel time and benefit-cost analysis.

Senior Project Manager

Peer Review of Traffic Impact Studies, Regional Municipality of Halton, Nelson Quarry

Burlington, ON. 2023

In addition to our role as Peer Reviewer for the Region of Halton as part of our Retainer contract, the Region requested CIMA to peer review the information provided by the proponent in support of the proposed expansion of the Nelson Quarry. Responsibilities included Project Team coordination during the completion of an independent evaluation of the transportation related information as well as the participation during the meetings with the proponent and other agencies.

Senior Project Manager

Peer Review of Traffic Impact Studies, Regional Municipality of Halton, Milton Quarry

Milton, ON. 2023

In addition to our role as Peer Reviewer for the Region of Halton as part of our Retainer contract, the Region requested CIMA to peer review the information provided by the proponent in support of the proposed expansion of the Milton Quarry. Responsibilities included Project Team coordination during the completion of an independent evaluation of the transportation related information as well as the participation during the meetings with the proponent and other agencies.

Senior Project Manager

Thessalon North Development - Highway 17, Tulloch Engineering

Thessalon, ON. 2022

The purpose of this TIS was to evaluate impacts of the proposed development on Highway 17, and to investigate mitigation measures to address the impacts (in particular, the operational efficiency of traffic and ensured safety and convenience for all users). The TIS was undertaken and analyzed in accordance with the Ministry of Transportation's TIS Guidelines. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget and quality control.

Senior Project Manager

Corridor Management Services Retainer, Ministry of Transportation, Central Region

Ontario (In Progress)

The main objective of this retainer is the development and/or updating of MTO's Corridor Management policies, practices and guidelines, and the investigation and development of innovative product applications. Under this retainer the following services are expected to be completed in a regular basis: Municipal Planning, Highway Access Management, Highway Corridor Management Permits, support in Development Application Reviews, support for the Highway Corridor Management System (HCMS) and any related technical training. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget and quality control for each of the Work Orders included as part of the 3-year retainer.

Senior Project Manager

Peer Review of Traffic Impact Studies, Regional Municipality of Halton

Georgetown, ON. 2024

In addition to our role as Peer Reviewer for the Region of Halton as part of our Retainer contract, the Region requested CIMA to peer review the information provided by the proponent in support of the proposed Southwest Georgetown development. Responsibilities included Project Team coordination during the completion of an independent evaluation of the transportation related information as well as the role as Expert Witness (Transportation Planning).

Senior Project Manager

One-Way Conversion Study, City of Oshawa

Oshawa, ON. 2022

With Oshawa's downtown population due to increase by 6,000 to 8,000 new residents over the next 10 to 15 years, the need to improve the walkability of the downtown area will be essential. While this planned residential development will increase travel demand in the area, the City considered that there is currently an excess of road capacity on a couplet of one-way streets in the Downtown area. To determine the availability of converting Celina Street, Albert Street, Brock Street East and Colborne Street to two-way operations, the City retained CIMA to complete a full operational analysis study encompassing existing and future scenarios. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget and quality control.

Senior Project Manager

Peer Review of Traffic Impact Studies, Town of Oakville, Retainer contract

Oakville ON. 2022

The Town of Oakville receives TISs and site plans, on a regular basis, as part of the Town's site plan review and approval process. Essentially all developments and redevelopments that take place within the Town that have the potential to have an effect on the Town's road system must have supporting studies submitted by the proponent and reviewed by the Town. Since these development applications have multiple facets, and therefore multiple types of studies that need to be reviewed, CIMA developed a methodology to receive, review and respond to TISs and site plans on an as-needed basis on behalf of the Town. Responsibilities included Project Team coordination during the completion of an independent evaluation of each TIS such that a consistent and supportable direction can be offered to the developer's consultant team.

Senior Project Manager

Peer Review of Traffic Impact Studies, Regional Municipality of Halton, Glen Abbey

Oakville, ON. 2021

In addition to our role as Peer Reviewer for the Region of Halton as part of our Retainer contract, the Region requested CIMA to peer review the information provided by the proponent in support of the proposed Glen Abbey development. Responsibilities included Project Team coordination during the completion of an independent evaluation of the transportation related information as well as the role as Expert Witness (Transportation Planning).

Senior Project Manager

Peer Review of Traffic Impact Studies, Regional Municipality of Halton, Brampton Brick Quarry

Brampton, ON. in progress

In addition to our role as Peer Reviewer for the Region of Halton as part of our Retainer contract, the Region requested CIMA to peer review the information provided by the proponent in support of the proposed excavation of the shale quarry in the City of Brampton. Responsibilities included Project Team coordination during the completion of an independent evaluation of the transportation related information as well as the participation during the meetings with the proponent and other agencies.

Senior Project Manager

Peer Review of Traffic Impact Studies, County of Wellington, Solmar Development

Erin, ON. 2021

The County of Wellington retained the services of CIMA to complete a peer review of the information provided by the proponent in support of the proposed Solmar development. Responsibilities included Project Team coordination during the completion of an independent evaluation of the transportation related information as well as the participation during the meetings with the proponent and other agencies.

Senior Project Manager

Ontario Power Generation Traffic Impact Study, OPG

Ontario. 2022

The purpose of this TIS was to evaluate impacts of the proposed development on the surrounding transportation network, and to investigate mitigation measures to address the impacts (in particular, the operational efficiency of traffic and ensured safety and convenience for all users). The TIS was undertaken and analyzed in accordance with the Municipality of Clarington, the Region of Durham and the Ministry of Transportation's TIS Guidelines. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget and quality control.

Senior Project Manager

Access Management, Traffic Impact Studies and Road Safety Audits Guidelines, County of Essex

Essex County, ON. 2024

As part of a Retainer for Consulting Services with the County of Essex, CIMA was requested to complete a full review, update, and development of a set of Guidelines relevant to the development approval process implemented by the County. Preparation of the new Guidelines considered among others, the difficulties regarding the identification of each type of studies as part of the preliminary phases of the development approval process, the time since implementation of the existing Guidelines, and the perceived need for a more streamlined process that facilitates its discussion and acceptance by developers and lower-tier municipalities. Responsibilities included Project Team management and direction during the identification of current practices in other jurisdictions, identification and selection of best practices and integration of the revised Guidelines as part of the development approval process.

Senior Project Manager

Access Management Policy and Guidelines, Region of Niagara

Niagara Region, ON. 2023

CIMA was retained by the Region of Niagara to develop an Access Management Policy and corresponding Guidelines – including the update of the Traffic Impact Study Guidelines, that optimize and standardize the access management process, facilitate the integration of traffic impact studies as part of the access management approval and to reduce any duplication that might be happening between the upper and lower tier municipalities composing the Region. Responsibilities included Project Team management and direction during the identification of current practices in other jurisdictions, identification and selection of best practices and integration of the revised Traffic Impact Studies Guidelines as part of the access management process.

Senior Project Manager

General Guidelines for the Preparation of Traffic Impact Studies, Ministry of Transportation

Ontario. 2020

The overall objective of this project was to review the Ministry's current Traffic Impact Study Guidelines (TIS) and to provide recommendations for updates, additions, and any other changes to the TIS Guidelines to assist developers in improving the quality of these studies and to meet the objectives of the Ministry. Responsibilities included Project Team management and direction during the identification of current practices in other jurisdictions, identification and selection of best practices and integration of the revised Corridor Management Manual as part of the Ministry's TIS Guidelines.

Senior Project Manager

Transportation Engineering Services, Niagara College

St. Catharines, ON. 2021

CIMA was retained by Niagara College to complete a traffic operations study to assess transportation implications of the Niagara College Master Plan (NCMP) Vision under existing and future conditions (5, 10 and ultimate horizon year). Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget and quality control.

Senior Project Manager

Caledonia Servicing Master Plan, Haldimand County

Caledonia ON. 2020

As part of a consulting team retained by Haldimand County for the preparation of the Caledonia Master Servicing Plan Update, the CIMA Team was assigned with the preparation of the Transportation section of the Master Servicing Plan. Responsibilities under this assignment included coordination and management of all technical aspects required for the completion of a Traffic Operation Analysis for existing conditions and future scenarios.

Senior Project Manager

Sherwood Community Centre and Library Traffic Impact Study, Town of Milton

Milton, ON. 2017

The purpose of this TIS was to evaluate impacts of the proposed development on the surrounding transportation network, and to investigate mitigation measures to address the impacts (in particular, the operational efficiency of traffic and ensured safety and convenience for all users). The TIS was undertaken and analyzed in accordance with the Region's TIS Guidelines as well as the Town of Milton's TIS Guidelines. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget and quality control.

Senior Project Manager

Review of West End Developments, Town of Grimsby

Grimsby, ON. 2015

As part of our retainer with the Town of Grimsby, CIMA was requested to conduct a review of traffic operational scenarios including the old Planet Night Club property and the Fifth Wheel property, a re-assessment of the intersection needs at Winston Road & North Service Road/Hunter Road and an examination/determination of the

cross-sectional needs along the section of North Service Road between Winston Road/Hunter Road and Casablanca Boulevard. Responsibilities under this assignment included coordination and management of all technical aspects including: project management, data collection, identification of the most suitable set of infrastructure improvements and functional design.

Senior Planner

Peer Review of Merton Technical and Tertiary Plans, Town of Oakville

Oakville, ON. 2015

CIMA was retained by AMEC Earth & Environmental to support the Peer Review of the Transportation Study provided by the Landowners and the Town of Oakville for the Merton Study Area. The purpose of this assignment was to review and assess the document in the context of current Municipal and Provincial policies, objectives, goals, criteria, as well as governing regulations and statutes. Activities conducted as part of the assignment included Project Team coordination during the completion of an independent evaluation of the Transportation Report such that a consistent and supportable direction can be offered to the Landowner's Consultant team.

Project Manager

Peer Review of Traffic Impact Studies, Town of Oakville

Oakville, ON. 2014

As part of a Retainer for Consulting Services with the Town of Oakville, CIMA was requested to conduct a Peer Review of the Traffic Impact Studies prepared for the Lazy Pat Farm Property and the Upper Glen Abbey. The purpose of this assignment was to review and assess the documents in the context of current Municipal and Provincial policies, objectives, goals, criteria, as well as governing regulations and statutes. Activities conducted as part of the assignment included Project Team coordination during the completion of an independent evaluation of the TIS such that a consistent and supportable direction can be offered to the developer's consultant team.

Project Manager

Environmental Assessments and Transportation Planning

Ridley Road Realignment and Road Improvements, City of St. Catharines

St. Catharines, ON. 2022

Ridley Road functions as a neighbourhood collector roadway serving a residential neighbourhood as well as Ridley College. However, With a new subdivision and GO Station access being developed at the west end of Ridley Road, the use of Ridley Road may change. As such, CIMA was retained by the City of St. Catharines to determine the preferred cross-section that will be used as the basis for the detailed design of the project. Responsibilities under this assignment included the development and evaluation of a diverse set of alternative cross-sections following the requirements of the City with respect of pedestrian and cycling activities as well as established guidelines such as OTM Book 18 and Book 15.

Senior Project Manager

Transportation Planning and Preliminary Engineering Study DCP, The Regional Municipality of York

YZork Region, ON. 2022

CIMA was retained for the Region of York to prepare a Transportation Planning and Preliminary Engineering Study to confirm the final alignment of the new north-south Donald Cousens Parkway and east-west roadway network proposed to serve the approved FUA. Responsibilities under this assignment included the determination of project employment and land use scenarios, estimation of the projected traffic volumes and evaluation of alternatives for the medium (10 year) and long term (20 year) scenarios.

Senior Project Manager

Moffatt Street Secondary Access EA; City of St. Catharines

St. Catharines, ON, 2020 – 2021

Schedule C Municipal Class EA to identify a new road corridor to serve an isolated neighbourhood with only one access into/out of the community. A series of public, Indigenous, and agency stakeholder consultation events were

undertaken which resulted in community consensus for the preferred option of a new road corridor crossing the Old Canal and providing a secondary access to the community.

Transportation Planning and Traffic Engineering Lead

Burnhamthorpe Road West Improvements EA, The Corporation of the City of Mississauga

Mississauga, ON. 2020

CIMA was retained for the Corporation of the City of Mississauga to prepare a Class Environmental Assessment Study (Schedule C) and Preliminary Design for the improvements of Burnhamthorpe Road West from Loyalist Drive to the West City Limit following a comprehensive and sound planning process that recognizes and accommodates the infrastructure and multimodal transportation needs along the corridor. Responsibilities under this assignment included the determination and analysis of existing conditions, traffic projections and evaluation of alternatives for the 2021, 2031 and 2041 horizon years.

Senior Project Manager

Albion Vaughan Road and King Street EA, Region of Pee

Bolton, ON. 2020

CIMA was retained for the Region of Peel to prepare a Municipal Class Schedule B Environmental Assessment Study Report taking a multimodal approach and following the visions outlined in both the Town of Caledon and the Region of Peel Official Plans. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget and quality control.

Senior Project Manager

Mohawk Road Class Environmental Assessment, City of Hamilton

Hamilton, ON. 2019

CIMA was retained by the City of Hamilton to complete Phases 3 and 4 of the Class Municipal EA Process for Mohawk Road between Lime Kiln Road/McNiven Road and Highway 403. Responsibilities under this assignment included a review of existing data including the Ancaster Transportation Master Plan and to update the data to existing conditions to ensure that the recommendations of the ATMP are still valid.

Senior Project Manager

Highway 404 North Collector Roads EA, Corporation of the City of Markham

Markham, ON. 2019

CIMA was retained for the Corporation of the City of Markham to prepare a Class Environmental Assessment Study (Schedule C) to confirm the final alignment of the new north-south road and east-west road proposed to serve the approved OPA 149 Secondary Plan. Responsibilities under this assignment included the determination of project employment and land use scenarios, estimation of the projected traffic volumes and evaluation of alternatives for the medium (10 year) and long term (20 year) scenarios.

Senior Project Manager

Portage Parkway Class EA, City of Vaughan,

Vaughan, ON. 2016

CIMA was retained by the City of Vaughan for the completion of a Class EA Study to establish the preferred alternative design for the widening, extension and improvements for Portage Parkway Widening from Applewood Crescent to Jane Street (Part A) and the Portage Parkway Extension from Jane Street crossing the Black Creek channel to Creditstone Road (Part B). Responsibilities under this assignment included coordination and management of all technical aspects required for the completion of a Traffic Operation Analysis and a Safety Performance Review.

Project Manager

Heritage Road Class EA, City of Brampton

Brampton, ON. 2017

CIMA Canada Inc. (CIMA) has been retained by the City of Brampton to undertake the Municipal Class Environmental Assessment (Class EA) study for improvements to Heritage Road from Steeles Avenue to the future Riverview Heights Road, approximately 460 m north of Embleton Road, south of the Credit River valley. Responsibilities included as part of this assignment are coordination of the Transportation Team during the review and assessment of a number of alternatives to address the potential operational deficiencies and need for additional capacity within the corridor, such as road widening and intersection improvements.

Project Manager

Erin Mills Parkway Schedule B, Class EA for Intersection Improvements, Region of Peel

Mississauga, ON. 2014

CIMA Canada Inc. (CIMA) has been retained by the Region of Peel to undertake the Municipal Class Environmental Assessment (Class EA) study for improvements at Erin Mills Parkway/Dundas Street and Erin Mills Parkway/Burnhamthorpe Road following a context sensitive approach and considering multi-modes of transportation including pedestrian, cycling and transit. Responsibilities under this assignment included identification and comprehensive evaluation of proposed alternatives including transportation demand management, active transportation, and traffic safety improvements.

Project Manager

On and Off-Street Parking

Review of Off-Street Parking Requirements and On-Street and Public Parking Lots in Downtown, City of Sault Ste. Marie,

Sault Ste. Marie, ON 2023

CIMA was retained by the City of Sault Ste. Marie to provide planning services in relation to a review of off-street parking requirements within the City of Sault Ste. Marie Comprehensive Zoning By-law 2005-150, with the overall intent of reducing minimums and establishing maximums, as well as a detailed review of on-street parking and public parking lots in the downtown area. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget, and quality control.

Senior Project Manager

Hespeler Core Parking Study, City of Cambridge

Cambridge, ON. 2022

CIMA was retained by the City of Cambridge to complete a comprehensive assessment of existing of-street parking offered in the Hespeler area as well as the expected demand generated by future residential and commercial development. The study also includes a jurisdictional scan and best practices review of parking management strategies conducted by other national and international communities. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget, and quality control.

Senior Project Manager

Parking Technology and Implementation Metrics Study, City of Guelph

Guelph, ON. 2018

CIMA was retained by the City of Guelph to complete a comprehensive assessment of parking technology than can be considered during the implementation of paid on-street parking in Downtown Guelph. The study also includes a jurisdictional scan and best practices review of parking management strategies conducted by other national and international communities. The result of the assignment suggested that a Performance-Based Parking Management supported by smart metres and/or pay-and-display stations will adequately respond to the requirements of the Guelph Vision for Downtown.

Senior Project Manager

Downtown Parking Study, Town of Milton

Milton, ON. 2018

CIMA was retained by the Town of Milton to undertake a Parking Study of the Downtown Core. This Study is part of a larger exercise that has the purpose of revitalizing the downtown area through potential land use policy changes and identification of redevelopment opportunities. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget, and quality control.

Senior Project Manager

On-Street Parking Policy Update, City of Guelph

Guelph, ON. 2017

CIMA was retained by the City of Guelph to provide recommendations to address a variety of concerns regarding the current on-street parking practices and provide an update to existing City of Guelph On-street Parking Policies and Procedures documents. The study evaluates existing municipal practices in assessing on-street parking changes that are requested from the public and other stakeholder's and included a best practice review comparing the existing City of Guelph policies and procedures, provided new criteria for reviewing and implementing on-street parking restrictions and consolidated existing on-street parking policies and procedures. Responsibilities under this assignment included Project Team coordination, management and coordination with sub-consultants, budget, and quality control.

Project Manager

Manager of Transportation Planning (County of Essex)

Regional Transit Study (Needs Assessment and Implementation), The Corporation of the County of Essex

Essex County, ON. 2009 -2010

Oversee the work of the Consultant Project Team regarding transit planning process and requirements. Responsible for lower tier municipalities' consultation and engagement, including liaison with the local planning authorities and presentations (both verbal and written) to the Steering Committee, Stakeholder Group and Public. Documented the planning and consultation process and formal presentation to County Council. Recommendations addressed the need of a regional transit service, the use of County Road 22, County Road 20 and Highway 3 as the preferred transit routes and the allocation of an annual expenditure level of 1.95 million CAD.

Project Manager

Region Wide Active Transportation Study, The Corporation of the County of Essex

Essex County, ON. 2010

Oversee the work of the Consultant Project Team regarding Active Transportation alternatives and funding requirements. Responsible for lower tier municipalities' consultation and engagement, including liaison with the local planning authorities and presentations (both verbal and written) to the Steering Committee, Stakeholder Group and Public. Documented the planning and consultation process and formal presentation to County Council.

Project Manager

MHBC | PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

May 25, 2026

Meagan Ferris, RPP MCIP
Manager of Planning and Environment
County of Wellington Planning & Development
74 Woolwich Street
Guelph ON N1H 3T9

Justine Brotherston
Director of Corporate Services/Municipal Clerk
Township of Puslinch
7404 Wellington Rd 34, Puslinch ON N0B 2J0

Dear Meagan and Justine:

RE: CBM Aggregates, a Division of St. Marys Cement Inc. (Canada)
Proposed Anthony Pit
Part of Lot 22, Concession 7, Township of Puslinch, County of Wellington
County of Wellington Official Plan Amendment
Township of Puslinch Zoning By-law Amendment
OUR FILE Y321AU

CBM Aggregates, a Division of St. Marys Cement Inc. (Canada) ('CBM') is applying to amend the County of Wellington Official Plan and Township of Puslinch Zoning By-law to permit a below water pit on the lands located at Part of Lot 22, Concession 8 in the Township of Puslinch, County of Wellington. The subject lands are municipally addressed as 4454 Victoria Road South.

The area proposed to be licensed is approximately 18.0 hectares (44.5 acres) with 8.7 hectares (21.5 acres) proposed for extraction. The maximum annual tonnage is proposed to be 1 million tonnes. The subject lands contain approximately 1 million tonnes of high-quality sand and gravel resources within the proposed extraction area.

An application for a Class A Licence has been submitted to the Ministry of Natural Resources concurrently with these applications.

The subject lands are currently in agricultural use and contain a dwelling, detached garage and shed. The existing buildings are located outside of the proposed extraction area.

The subject lands are located within a larger property that is approximately 23.4 hectares in size. The property is owned by Laura Anthony and leased by CBM to operate the proposed Anthony Pit.

The proposed extraction area has been delineated to avoid natural features. The proposed extraction area is setback 30 metres from the Mill Creek Provincially Significant Wetland ('PSW').

The subject lands will be accessed through the existing entrance located along the eastern boundary of the subject lands on Victoria Road South. The proposed haul route is primarily heading north along Victoria Road South, west on Wellington Road 34, and south on Concession Road 7 to the CBM Aberfoyle Pit. Truck travel will not be permitted to head south on Victoria Road South or use Gilmour Road.

Lands that are not located within the proposed extraction area will be used for setbacks from environmental features and for landscaped visual and acoustic berms. The existing vegetation in these setbacks will be maintained, except where berms are required to be constructed. The setbacks from the licence boundary will be 15 metres with 30 metre setbacks from significant natural features.

The proposed hours of operation for the Anthony Pit are 7 am to 7 pm Monday to Friday, and 8 am to 4 pm on Saturdays.

The lands will be extracted to a maximum depth of 304 masl. The removal of aggregate resources from below the water table will result in the creation of two ponds that will be 3.9 ha in total size. Shallow shoreline areas are proposed around the perimeter of the created ponds.

A wetland is proposed to be created in the area in between the two ponds. In addition, approximately 3.9 ha of agricultural lands will be restored in the eastern portion of the extraction area, which is not proposed for below water extraction. Approximately 1.8 ha of nodal planting areas and 4.7 ha of terrestrial landform comprised of above water side slopes (0.8 ha) and the agricultural lands.

The Technical Reports prepared for the ARA licence and planning applications include the following:

- Planning Report & Aggregate Resources Act Summary Statement, MHBC, May 2026;
- Aggregate Resources Act Site Plans, MHBC, May 2026;
- Level 1 and 2 Water Report, Stantec, February 2026;
- Maximum Predicted Water Table Report, Stantec, February 2026;
- Natural Environment Report, Stantec, March 2026;
- Transportation Impact Assessment, CIMA+, October 2025;
- Cultural Heritage Report, Stantec, September 2025;
- Stage 1 and 2 Archaeological Assessment, Stantec, December 2024;
- Noise Assessment Report, Stantec, January 2026; and
- Best Management Plan for Fugitive Dust, Stantec, January 2026.

The following application materials are also being provided with the submission of the County Official Plan amendment and Township Zoning By-law amendment applications:

1. Minor County of Wellington OPA Application Form and Fees ($36,980)
2. Grand River Conservation Authority Review Fee ($42,850)
3. Source Water Protection Screening Form
4. Township of Puslinch ZBA Application Form and Fees ($81,360)

5. Public Consultation Strategy Form

The application materials and technical reports can be downloaded from the following link:
Anthony Pit - Planning Act Applications - May 2026

A hard copy of the application materials including technical reports are each being couriered to the County. The application material to the Township will be uploaded on the online application portal, Cloudpermit. The cheque for the County Official Plan Amendment application will be included in the hard copy submission package to the County.

Please note that to successfully submit the ZBA application on Cloudpermit.com, we confirmed that CBM would comply with the 'Site Alteration Activity Approved Time' in principle; recognizing that pit licences under the ARA are exempt from the Township's Site Alteration By-law 2023-057. The ARA site plans will regulate the timing for site alteration activities and the overall operation of the Anthony Pit.

We look forward to working with the Township and County on these applications. We will ensure that the Township and County are made aware of the status of the ARA application including potential timing for consultation.

Yours truly,

MHBC

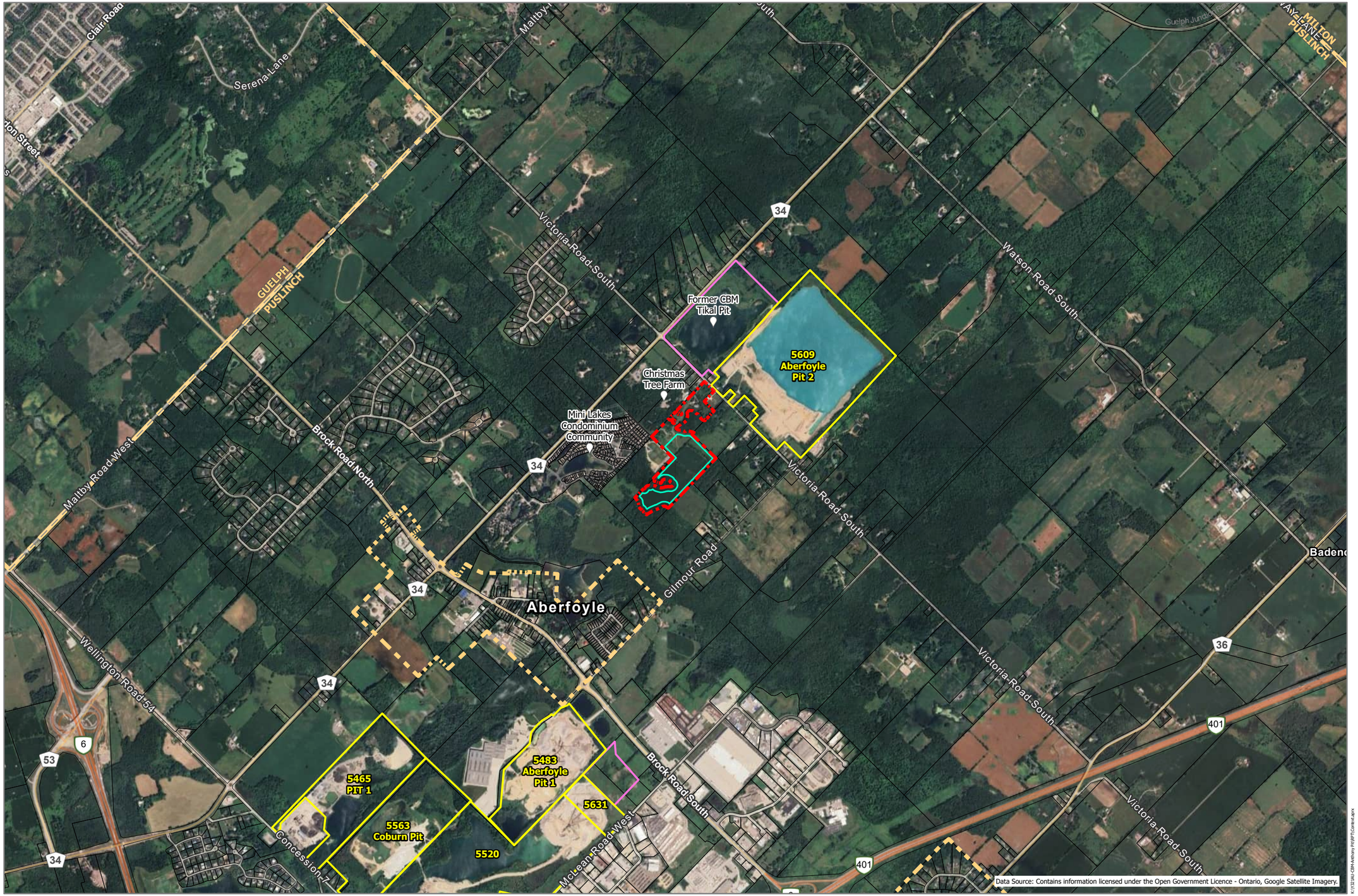
[redacted]

Neal DeRuyter, BES, MCIP, RPP

Yara Elmahdy, BES

cc. *Courtenay Hoytfox, Township of Puslinch*
Sarah Wilhelm / Jameson Pickard, County of Wellington
Andreanne Simard / Stephen May / Jennifer Deleemans, CBM Aggregates

Encl. *Location Map*



Location Map

- Boundary of Area to be Licensed
- Limit of Excavation
- Aggregate Site Authorized Active
- Innactive Aggregate Site
- Municipal Boundary
- Settlement Area

Ministry of Citizenship and Multiculturalism (MCM)

Archaeology Program Unit
Heritage Branch
Citizenship, Inclusion and Heritage Division
5th Floor, 400 University Ave.
Toronto ON M7A 2R9
Tel.: (613) 852-7942
Email: Stephen.Jarrett@Ontario.ca

Ministère des Affaires civiques et du Multiculturalisme (MCM)

Unité des programme d'archéologie
Direction du patrimoine
Division de la citoyenneté, de l'inclusion et du patrimoine
5e étage, 400 ave. University
Toronto ON M7A 2R9
Tél. : (613) 852-7942
Email: Stephen.Jarrett@Ontario.ca

Ontario

Jan 6, 2025

Parker S. Dickson (P256)
Stantec Consulting
1305 Riverbend London ON N6K 0J5

RE: Review and Entry into the Ontario Public Register of Archaeological Reports: Archaeological Assessment Report Entitled, "Stage 1-2 Archaeological Assessment: Proposed Anthony Pit (formerly Proposed Tikal Pit Expansion), Part of Lot 22, Concession 8, Puslinch Township, Wellington County, Ontario", Dated Dec 10, 2024, Filed with MCM on Dec 18, 2024, MCM Project Information Form Number P256-0721-2022, MCM File Number 0016690

Dear Mr. Dickson:

This office has reviewed the above-mentioned report, which has been submitted to this ministry as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18.[1] This review has been carried out in order to determine whether the licensed professional consultant archaeologist has met the terms and conditions of their licence, that the licensee assessed the property and documented archaeological resources using a process that accords with the 2011 *Standards and Guidelines for Consultant Archaeologists* set by the ministry, and that the archaeological fieldwork and report recommendations are consistent with the conservation, protection and preservation of the cultural heritage of Ontario.

The report documents the assessment of the study area as depicted in Figure 8 of the above titled report and recommends the following:

> Stage 2 archaeological assessment was not completed for the portion of the study area expected to be excluded from the developable area of the Project. This portion of the study area retains archaeological potential and Stage 2 archaeological assessment is required. Thus, in accordance with the MCM's 2011 Standards and Guidelines for Consultant Archaeologists (Government of Ontario 2011a), further archaeological assessment is required.

Based on the information contained in the report, the ministry is satisfied that the fieldwork and reporting for the archaeological assessment are consistent with the ministry's 2011 *Standards and Guidelines for Consultant Archaeologists* and the terms and conditions for archaeological licences. This report has been entered into the Ontario Public Register of Archaeological Reports. Please note that the ministry makes no representation or warranty as to the completeness, accuracy or quality of reports in the register.

Should you require any further information regarding this matter, please feel free to contact me.

Sincerely,

Stephen Jarrett
Archaeology Review Officer

cc. Archaeology Licensing Officer
David Hanratty,CBM Aggregates
Ella Fairbarn,Ontario Ministry of Natural Resources

[1] *In no way will the ministry be liable for any harm, damages, costs, expenses, losses, claims or actions that may result: (a) if the Report(s) or its recommendations are discovered to be inaccurate, incomplete, misleading or fraudulent; or (b) from the issuance of this letter. Further measures may need to be taken in the event that additional artifacts or archaeological sites are identified or the Report(s) is otherwise found to be inaccurate, incomplete, misleading or fraudulent.*

Stantec

Memo

To:	Stephen May and Andreanne Simard CBM Aggregates - Lands Manager - Western Region	From:	Aaron Warkentin / Stephen Di Biase Stantec Consulting Ltd.
Project/File:	160961457	Date:	February 13, 2026

Reference: Maximum Predicted Water Table Technical Memorandum, Proposed Anthony Aggregate Pit, 4454 Victoria Road South, Puslinch, Ontario

CBM Aggregates a division of St. Marys Cement Inc. (Canada) (CBM) retained Stantec Consulting Ltd. (Stantec) to provide environmental services in support of a proposed new aggregate pit near Aberfoyle, Ontario. The property for the proposed aggregate pit development, shown in purple on Figure 1 (Appendix A) is approximately 23.37 hectares (ha.) in size and located at 4454 Victoria Road South, in the Township of Puslinch, Wellington County. The area to be licensed as the Anthony Aggregate Pit (the Site) is approximately 18.03 ha and shown in red on Figure 1. The legal description of the Site is Lot 22, Concession 8, Geographic Township of Puslinch, Wellington County.

This technical memorandum has been prepared to:

- Assess applicable reporting requirements for an Aggregate Resources Act (Class A) license application.
- Assess the elevation of the maximum predicted water table at the Site based on available site monitoring data.

Figures and Tables referenced in this memorandum are provided in Attachments A and B, respectively. Curriculum Vitae for the report writers are provided in Attachment C.

1 Site Background

The Site is used currently for agricultural purposes and includes a private residential building near Victoria Road South, with existing wetlands and wooded areas situated on the Site (Figure 1).

The Site is situated southwest of Victoria Road South that borders the former CBM Tikal Pit (Tikal Pit) Site (28 hectares in size) that had been operated by CBM until 2011, and an existing aggregate pit owned and operated by Dufferin Aggregates (a division of CRH Canada Group Inc.), referred to as The Dufferin Pit Site. Additional gravel pit operations being operated under Class A Licenses are also located within Puslinch Township, located approximately 3 km southwest of the Site. Land use surrounding the remainder of the Site is mainly agricultural lands, with provincially significant wetland area situated to the west and south-southwest and private residential buildings to the east and west.

Reference: Maximum Predicted Water Table Technical Memorandum, Proposed Anthony Aggregate Pit, 4454 Victoria Road South, Puslinch, Ontario

Figure 1 shows the proposed above water table (AWT) and below water table (BWT) aggregate extraction plan for the Site. Two BWT pit ponds will result within the southwestern portion of the Site, with the small unevaluated wetland area in the central area of the southern portion of the Site to remain. The total area to be extracted and rehabilitated is 8.77 hectares, which will be organized to include two separate pit ponds (i.e., north pit pond 2.65 hectares and south pit pond 1.87 hectares). The total depth of the ponds will be approximately 17.5 m (304 masl). Excavated overburden will be stockpiled to allow for drainage of captured groundwater back to the resulting pit ponds.

2 Aggregate Resource Act

This technical memorandum has been prepared in accordance with the Provincial Standards in support of a Class A license application under the ARA, supporting an aggregate pit that intends to extract aggregate material from above and below the established groundwater table. A Class A license is required to remove more than 20,000 tonnes of aggregate annually from a private land pit under the ARA. An application must be filed with the Ministry of Natural Resources (MNR).

It is understood that the provincial standards of the ARA require that a summary statement accompanying an application for a Class A aggregate license involving an above and below water table pit site must be signed by the author and provide information on the following:

- Provide details of how the maximum predicted water table is identified in metres above sea level, relative to the proposed depth of excavation at the Site (approximately 17.5 m (304 masl)).
- Determine the number of drill holes and seasonal monitoring frequency by a qualified person based on site conditions.
- Determine the maximum predicted water table by monitoring the ground water table at the site for a minimum of one (1) year to account for seasonal variations and influences due to precipitation, unless alternative information already exists (e.g. previous hydrogeological study, existing well data) to support a determination of the maximum predicted water table by a qualified person.

This technical memorandum provides details of the maximum predicted water table based on the Site topography/drainage and groundwater monitoring results obtained over a 4-year monitoring period as detailed below.

3 Maximum Predicted Water Table

3.1 Topography And Drainage

Figure 2 provides the ground surface elevation contours within the vicinity of the Site. Local topography is hummocky to gently rolling. The Site straddles the upland area between two branches (North and South) of Aberfoyle Creek. Total topographic relief across the Site is approximately 7 m, ranging from approximately 329 masl at Victoria Road to approximately 322 masl at the southern limit of the Site.

3.2 Monitoring Well Installations

Stantec supervised the drilling of geological boreholes at five locations on the Site (MW21-1 through MW21-5; Figure 1), between November 1 and 8, 2021. Table 1 (Attachment B) summarizes the monitor completion details. Boreholes at the Site were advanced using 6-inch (152.4 mm) outer diameter sonic drill rods. The boreholes were advanced to depths ranging from 20.1 m to 23.8 m below existing grade.

Each borehole was instrumented with a 2-inch (50 mm) diameter PVC monitoring well. The base of the monitoring wells reflect a 1.5 m long, 10-slot well screen; seated at the base of the boreholes. The annular space of the monitoring wells were backfilled with silica sand to a height of approximately 1 m above the well screen. Above the sand pack, the annular space was backfilled with a bentonite slurry, up to ground surface. The monitoring wells were secured with a 4” x 4” lockable protective cover. Details of monitoring well construction are summarized in Table 1. The monitoring wells have been registered with the MECP in accordance with Ontario Regulation (O.Reg.) 903. It is noted that one additional shallow monitoring well (referred to as MW06-ORG; Figure 1) was observed to be pre-existing at the Site; located in the southeastern portion of the Site and completed to depth of 4.31 m BGS. Each monitoring well was instrumented with an automated water level recorder (datalogger) to develop a continuous record of water level monitoring. A monitoring program was established with quarterly monitoring for groundwater levels being conducted.

A total of four (4) shallow drive point piezometers were installed within wetland areas located across the Site and referred to as DP21-01 to DP21-04 (see Figure 1). Each piezometer was driven to a depth of approximately 1.5 m BGS and instrumented with a datalogger (GW) to monitor groundwater levels at the drive point. A perforated 25 mm diameter PVC pipe was installed next to each piezometer and equipped with a datalogger (SW) to monitor the elevation of ponded water within the wetland areas. Table 1 provides a summary of the drive point construction details.

Ground surface elevations and top of pipe reference point elevations at the five (5) monitoring wells and four (4) shallow drive point piezometers were surveyed by Stantec using a Trimble R10 GPS rover. Table 1 provides the GPS coordinate and elevation survey results.

3.3 Groundwater Monitoring Results

Groundwater elevation monitoring was carried out at the stations described above from November 2021 through November 2024. Automated water level recorders (dataloggers) were installed in each of the field study instruments, as described above, to provide a continuous record of water level measurements. Hydrographs for each monitoring location, inclusive of both manual and datalogger measurements and compared to precipitation and ambient temperature data from the nearby Waterloo Airport Climate Station No. 6144239 (Environment Canada, 2026), are shown on Figure 3.

All hydrographs show consistent trends, with approximately 1 m of seasonal variation annually. These seasonal fluctuations reflect a cyclical pattern that is common within shallow groundwater systems of southern Ontario. High water table conditions generally occur in the winter and spring (i.e., late December to mid-May) due to lower evapotranspiration losses and a melting snowpack, which provide a greater volume of water for recharge. Low water table conditions occur in the late summer to early fall as more water is drawn from the subsurface over this period to meet evapotranspiration demands. The hydrographs on Figure 3 also show a direct response to precipitation events. Hydrograph spikes are occasionally observed during the summer months, in response to major storm events (e.g., precipitation 30 mm or greater). The spikes themselves may not be representative of broad water table rise, but a reflection of increased infiltration due to localized ponding at surface. Stantec has therefore relied on manual readings to confirm the highest water table observed on record, which is July 25, 2024.

Groundwater elevation contours representing the highest water table observations (July 25, 2024) are shown on Figure 4. The maximum observed water table elevation (i.e., over the 4-year monitoring period) within the Site ranges from a high of about 322.7 masl as measured at MW21-03 to 320.3 masl as measured at MW21-02.

4 Summary And Closure

CBM is applying for a Class A license under the Aggregate Resources Act, for extraction of aggregate material from above and below the established groundwater table at the proposed Anthony Aggregate Pit.

Based on the above noted understanding, it is estimated that the maximum predicted groundwater table within the limit of extraction at the Site is about 322.7 m masl in the northeastern corner to 320.3 masl in the southwestern corner. These historical high results obtained on July 25, 2024 have been confirmed based on 4 years (from November 2021 through November 2025) of on-site monitoring data collection, as detailed above.

Should you have any questions, or require further information, please do not hesitate to contact the undersigned.

Reference: **Maximum Predicted Water Table Technical Memorandum, Proposed Anthony Aggregate Pit, 4454 Victoria Road South, Puslinch, Ontario**

5 Limitations

This document entitled, Maximum Predicted Water Table Technical Memorandum, Proposed Anthony Aggregate Pit, 4454 Victoria Road South, Puslinch, Ontario was prepared by Stantec Consulting Ltd. ("Stantec") for the account of CBM (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Sincerely,

Stantec Consulting Ltd.

Aaron Warkentin P.Eng.
Senior Hydrogeologist
Phone: 226-339-3175
Aaron.Warkentin@stantec.com

Stephen Di Biase P.Geo.
Senior Hydrogeologist
Phone: 647-282-0563
Stephen.dibiase@tantec.com

Attachment:

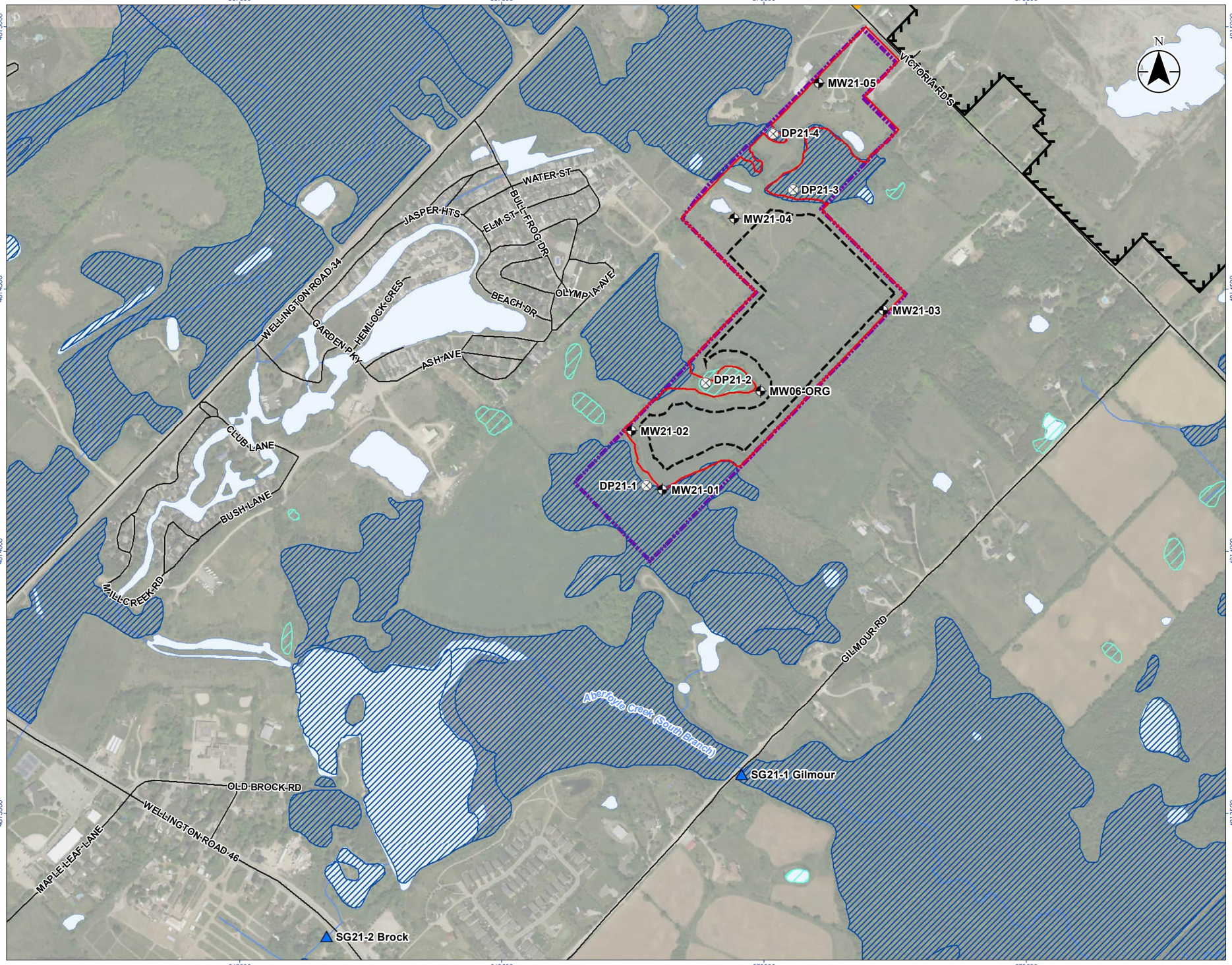
Attachment A Figures
Attachment B Tables
Attachment C Curriculum Vitae

c. Neal DeRuyter, MHBC

February 13, 2025
Stephen May, CBM Aggregates - Lands Manager -Western Region

Reference: **Maximum Predicted Water Table Technical Memorandum, Proposed Anthony Aggregate Pit, 4454 Victoria Road South, Puslinch, Ontario**

Attachment A Figures



Stantec

Legend

- Site
- 4454 Victoria Road South
- Monitoring Well
- Drive-point Piezometer
- Surface Water Monitoring Location
- Road
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System
- Dufferin Aggregate Pit
- Area of Extraction Footprint

0 100 200 metres
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Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Orthoimagery ©

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-13

Client/Project
MAXIMUM WATER TABLE TECHNICAL MEMORANDUM,
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
1

Title
Site Plan

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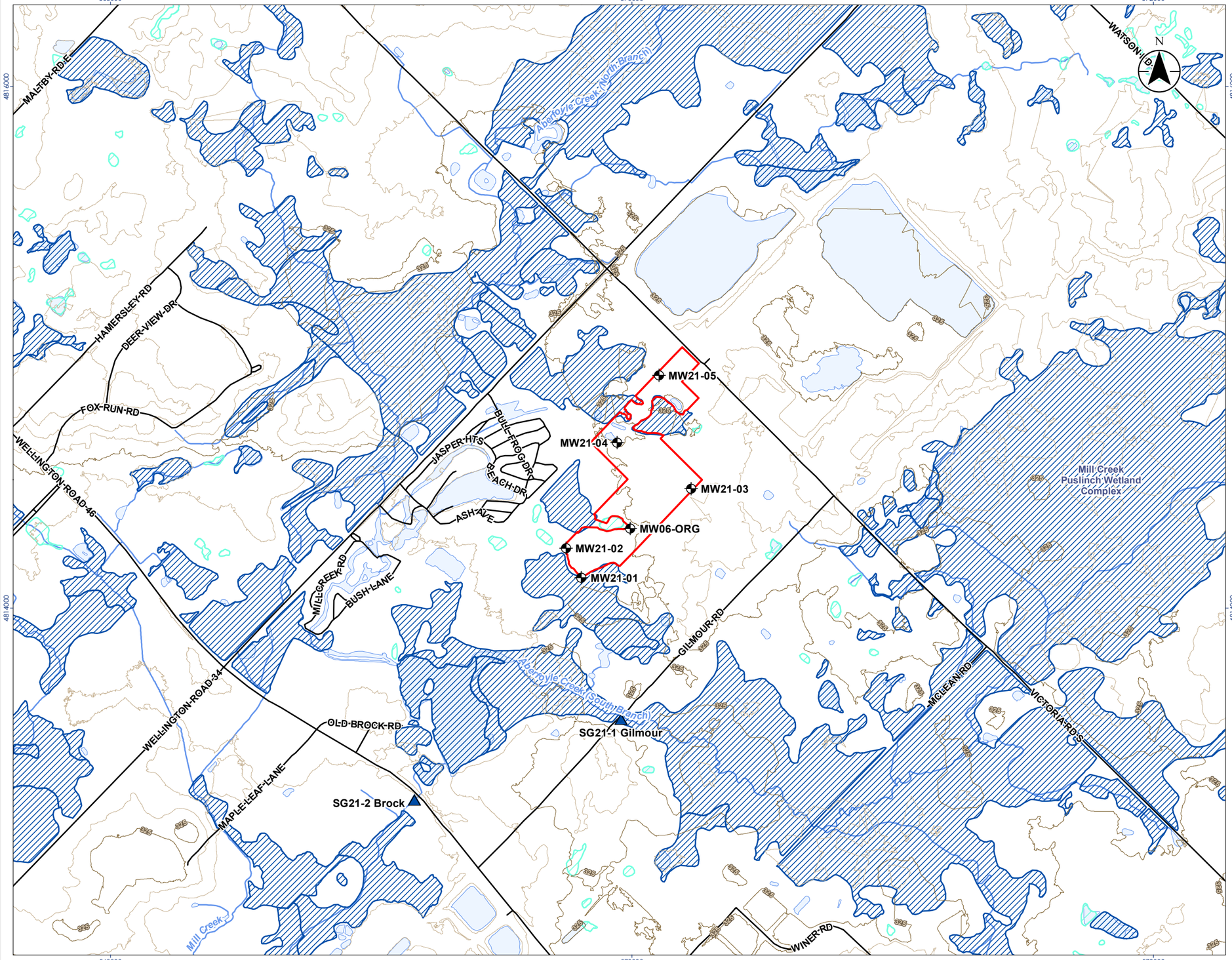

Stantec

Legend

- Site
- Monitoring Well
- Staff Gauge
- Road
- Topgraphic Contour (m AMSL) - 25m Interval
- Topgraphic Contour (m AMSL) - 5m Interval
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System

0 250 500 metres

1:15,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-13

Client/Project
MAXIMUM WATER TABLE TECHNICAL MEMORANDUM,
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
2

Title
Topography and Drainage

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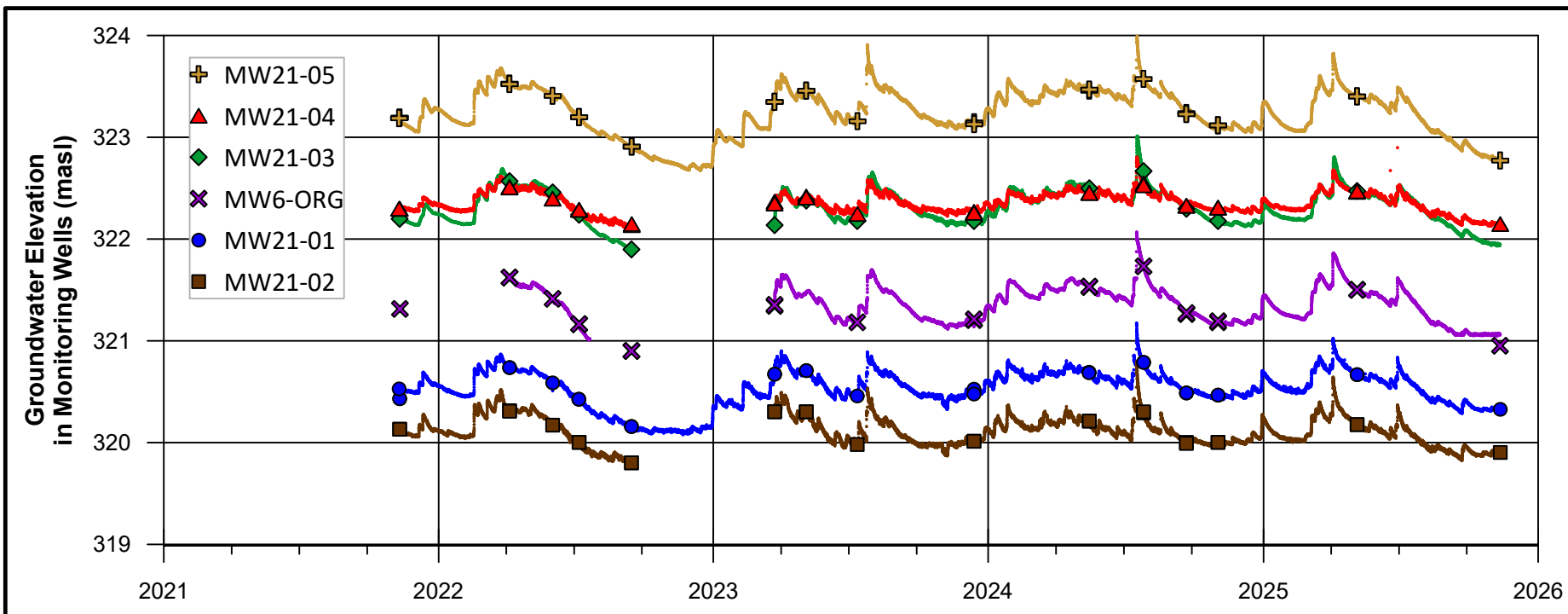
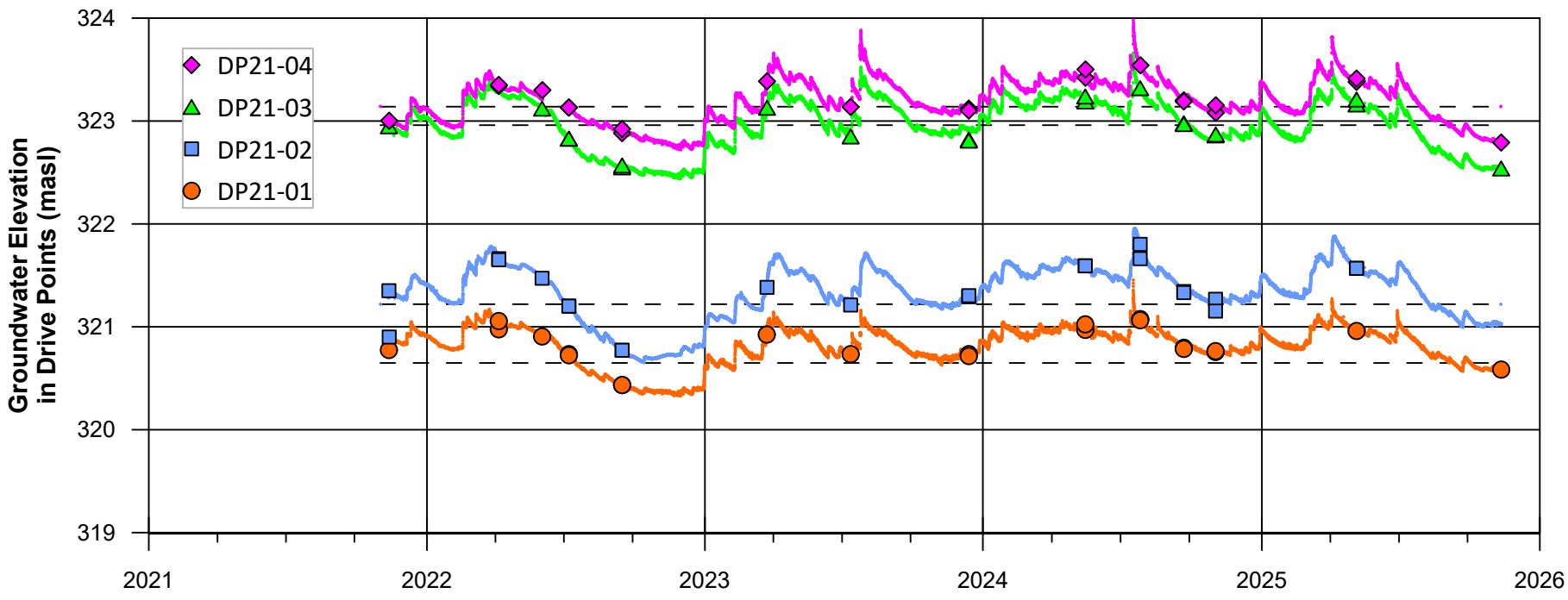
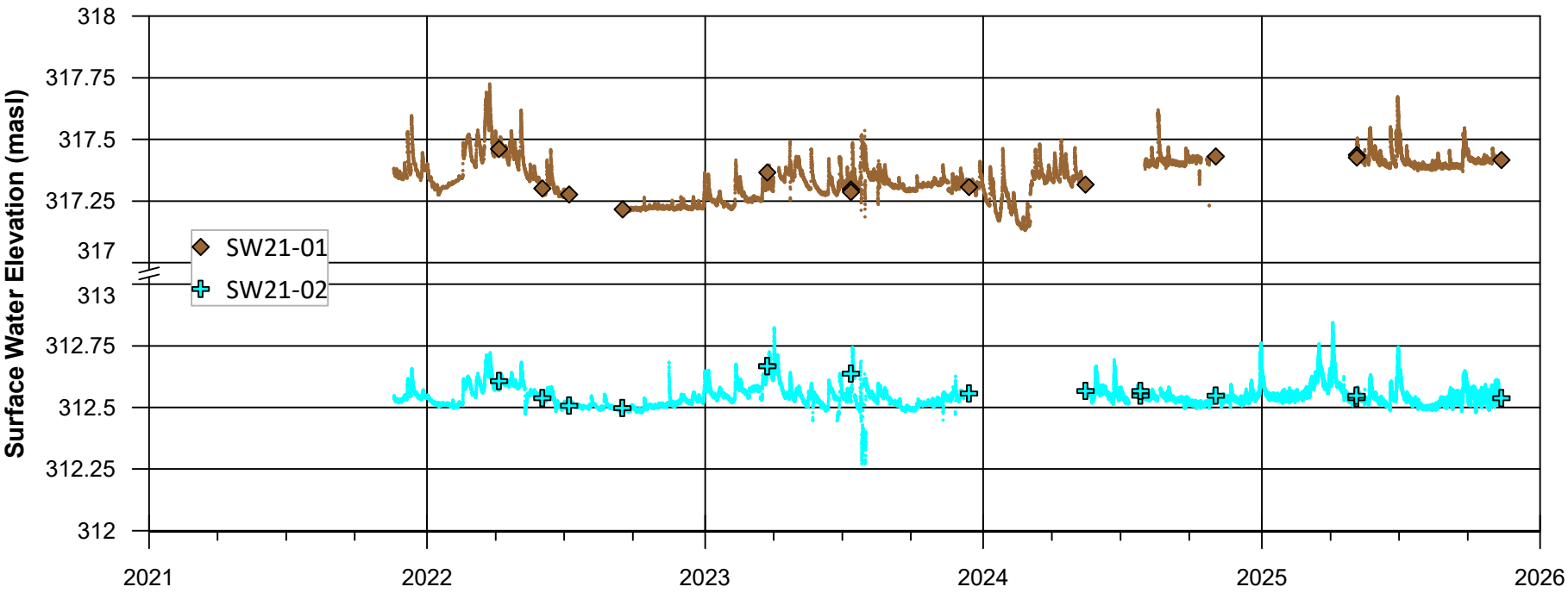
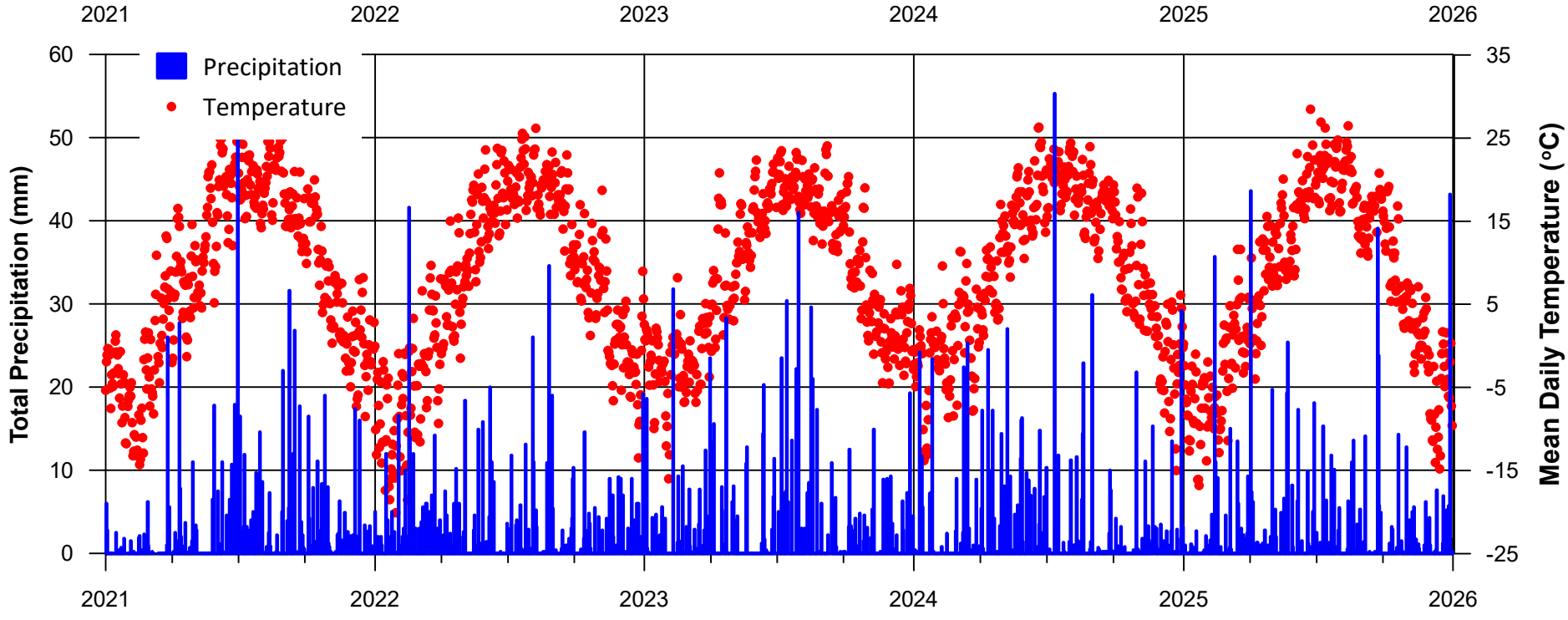






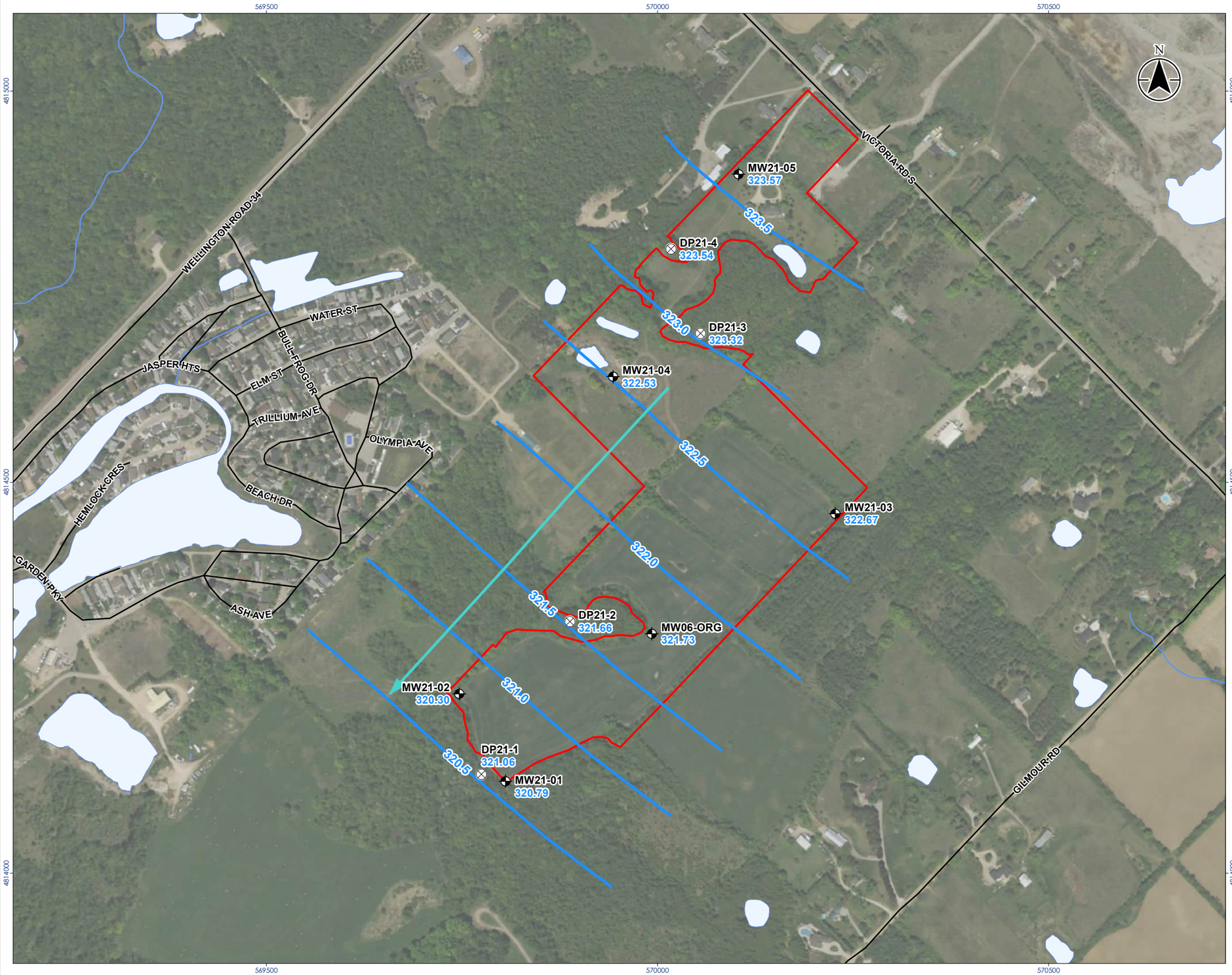


Notes:

- - - - - - indicates grade elevation at Drive Point locations (below which wetland areas are dry)

Precipitation / Temperature data obtained from the Environment Canada Station No. 6144239, Region of Waterloo Airport Climate Station

Water Level Monitoring Data	Stantec	
DRAWN: DG	APPROVED: SMD	DATE: Janary 2026
PROJECT NUMBER: 160961457		FIGURE: 3



Stantec

Legend

- Site
- 319.90 Observed Groundwater Elevation (masl), July 25, 2024
- Monitoring Well
- Drive-point Piezometer
- Road
- Interpreted Groundwater Flow Direction
- Interpreted Groundwater Elevation Contour (masl)
- Watercourse
- Waterbody

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
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Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-13

Client/Project
MAXIMUM WATER TABLE TECHNICAL MEMORANDUM,
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
4

Title
High Groundwater Table Elevations – July 25, 2024

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Attachment B Tables

Table 1
Monitor Completion Details
Maximum Water Table Technical Memorandum
Proposed Anthony Aggregate Pit

Monitor ID	Location	Installation Date	Coordinates		Elevation		Stick-up	Borehole Depth	Screen Diameter	Screened Interval				Screened Unit
			Easting	Northing	Ground Surface m AMSL	Top of Casing m AMSL	(m AGS)	(m BGS)	(mm)	Bottom of Screen/Open Hole (m BGS)	Bottom of Screen/Open Hole (m AMSL)	Top of Screen/Open Hole (m BGS)	Top of Screen/Open Hole (m AMSL)	
Monitoring Wells														
MW21-01	Aberfoyle, ON	2021	569805.7	4814118	322.27	323.05	0.78	23.77	50	20.42	301.85	18.90	303.37	Sand/Gravel
MW21-02	Aberfoyle, ON	2021	569746.8	4814230	322.48	323.27	0.79	20.88	50	18.59	303.89	15.54	306.94	Sand/Gravel
MW21-03	Aberfoyle, ON	2021	570227.5	4814460	326.6	327.5	0.90	23.77	50	16.76	309.84	13.72	312.88	Sand/Gravel
MW21-04	Aberfoyle, ON	2021	569943.3	4814635	323.85	324.63	0.78	21.03	50	20.73	303.12	17.68	306.17	Sand/Gravel
MW21-05	Aberfoyle, ON	2021	570103.8	4814894	326.53	327.37	0.84	20.12	50	8.23	318.30	5.18	321.35	Sand/Gravel
MW06-ORG	Aberfoyle, ON	unknown	569992.9	4814306	322.74	323.81	1.07	4.31	50	4.31	318.43	unknown	unknown	Sand/Gravel
Drive-Point Piezometers														
DP21-1	Aberfoyle, ON	2021	569774.9	4814127	320.65	321.73	1.08	1.47	25	1.47	319.18	1.05	319.60	Organics/Sand/Gravel
DP21-2	Aberfoyle, ON	2021	569888.2	4814322	321.22	322.35	1.13	1.42	25	1.42	319.80	1.00	320.22	Organics/Sand/Gravel
DP21-3	Aberfoyle, ON	2021	570055.1	4814690	322.96	323.97	1.01	1.54	25	1.54	321.42	1.12	321.84	Organics/Sand/Gravel
DP21-4	Aberfoyle, ON	2021	570017.5	4814798	323.14	324.2	1.06	1.49	25	1.49	321.65	1.07	322.07	Organics/Sand/Gravel
Staff Gauges														
SG21-1	Aberfoyle, ON	2021	569957.7	4813575	317.17	318.7	1.53	-	-	-	-	-	-	-
SG21-2	Aberfoyle, ON	2021	569165.7	4813266	312.31	313.53	1.22	-	-	-	-	-	-	-

Notes:

- not applicable
m AGS: metres above ground surface
m BGS: metres below ground surface
m AMSL: metres above mean sea level

February 13, 2025
Stephen May, CBM Aggregates - Lands Manager -Western Region

Reference: **Maximum Predicted Water Table Technical Memorandum, Proposed Anthony Aggregate Pit, 4454 Victoria Road South, Puslinch, Ontario**

Attachment C Curriculum Vitae

Stephen Di Biase M.Sc., P.Geo.

Senior Hydrogeologist

26 years of experience · Markham, Ontario

Stephen Di Biase is a Senior Hydrogeologist with the Environmental Services division. His 25 years of experience includes hydrogeological investigations in support of large-scale groundwater supply and dewatering projects. He brings extensive knowledge of groundwater exploration, drainage basin surveys, water balance calculations, aquifer mapping, GUDI assessments and development constraint mapping for projects located near sensitive wetlands, headwaters and kettle lake complexes in the vicinity of glacial moraines and the Niagara Escarpment.

EDUCATION

B.Sc. Earth Sciences, University of Waterloo, Waterloo, Ontario, 1999

M.Sc. Hydrogeology, University of Toronto, Toronto, Ontario, 2005

CERTIFICATIONS & TRAINING

Construction Dewatering and Groundwater Control (National Groundwater Assoc.), Waterloo, Ontario, 2005

Project Management (Golder Associates Internal Training Course), Markham, Ontario, 2005

Contracts and Liability (Golder Associates Internal Training Course), Markham, Ontario, 2004

Project Management, Queen's University School of Business, Ontario, 2001

Field Methods in Hydrogeology, University of Waterloo, Ontario, 2001

Ontario Ministry of Transportation Approved for Medium Complexity Hydrogeological Projects, Markham, Ontario, Canada, 2023

MEMBERSHIPS

Member, National Ground Water Association

Member, Ontario Ground Water Association

Canadian National Chapter, International Association of Hydrogeologists

Hydrogeologist, Professional Geoscientists Ontario

PROJECT EXPERIENCE

GROUNDWATER SUPPLY / WELLS

New Well Exploration Program | Township of Centre Wellington | Elora, ON, Canada | 2021 - | Project Manager

Construction of pilot test wells in four target areas surrounding the communities of Elora and Fergus. Field studies include bedrock coring, geophysical logging, packer testing, 7-day pumping tests, groundwater quality analysis and evaluation GUDI conditions.

Logan Well Feasibility Assessment | City of Guelph | Guelph, ON, Canada | 2021 - | Project Manager

Reconstruction and performance testing of a 306 mm diameter municipal test well. This project included management of drilling contractor, supporting permitting applications and supervision of a 3-day performance test. A feasibility study is being undertaken to determine if the Logan Well will be a viable groundwater supply source for the City of Guelph. Field study and reporting includes an assessment of GUDI conditions and effects of groundwater pumping on local environmental receptors.

Craighurst Groundwater Supply Investigation | Craighurst Partnership Limited | Craighurst, ON, Canada | 2020 - 2022 | Project Manager

Hydrogeology task manager responsible for developing a new groundwater supply source for the community of Craighurst. This project included the construction and performance testing of a new 306 mm diameter test production well at 36 L/s. Stantec's responsibilities for this study included contract tendering and administration, development of a groundwater monitoring network, securing provincial permits to take water, supervision of a 30-day performance test and a GUDI assessment of the new well.

Groundwater Supply Class Environmental Assessment | Town of Orangeville | Orangeville, Ontario, Canada | 2018 - 2022 | Project Manager

Project Manager for the Town of Orangeville Groundwater Supply Class Environmental Assessment. This project included the construction and performance testing of a new test production well along the Town's northeastern boundary. The field investigation included: installation of 1 cored bedrock borehole, downhole geophysical logging of 6 test wells, reconstruction of 3 open bedrock boreholes with multi-level monitoring well nests and a 30-day groundwater pumping test at 3,629 m3/day. The effects of groundwater pumping were monitored at a total of 34 locations, including 16 monitoring well nests, 3 surface water stations, 5 wetland piezometers and 10 private wells.

Guelph Water Supply Master Plan* | City of Guelph | Guelph, Ontario | 2013 - 2014 | Task Manager

Hydrogeology Task Manager responsible for the assessment of existing production well capacities. This project included a modelling analysis to assess the performance and effects of municipal well operation during conditions of drought and unforeseen well shut-downs.

Waterloo North Water Supply Class Environmental Assessment* | Region of Waterloo | Waterloo, Ontario | 2008 - 2010 | Task Manager

Hydrogeology task manager for the Waterloo North Water Supply Class Environmental Assessment. This project included the construction of a new test production well and performance testing of three test production wells within the Waterloo North Study Area. Golder's role in the Waterloo North Class EA includes management of the drilling and performance testing contracts, supporting the RMOW applications for access agreements, municipal sewer use permitting, MOE PTTWs, supervision of a 42-day performance test and preparation of an Environmental Study report supporting the test production wells through the EA process.

Southwest Quadrant Water Supply Class Environmental Assessment* | City of Guelph | Guelph, Ontario | 2008 - 2012 | Task Manager

Hydrogeology task manager for the City of Guelph Southwest Quadrant Water Supply Class Environmental Assessment. This project included the construction and performance testing of two new (15 inch diameter) test production wells in the City of Guelph. Performance testing of the new wells required a combined pumping rate of 134 L/s, a 3 km diversion of pumped groundwater, municipal sewer use permits, an Ontario Ministry of Environment Permit To Take Water, access agreements, an extensive groundwater and surface water monitoring program (including approximately 70 groundwater monitoring wells, 10 surface water monitoring stations and two private wells). A challenge during this complicated testing program was ensuring that performance testing of the new production wells did not adversely affect the operation of the existing municipal water supply system or impact surface water flow conditions in the receiving water courses.

Preliminary Design for Stage 2 Expansion of Aquifer Storage and Recovery (ASR) System * | Region of Waterloo | Kitchener, Ontario | 2008 - 2014 | Task Manager

Hydrogeology task manager supporting the preliminary design of the Stage 2 Expansion for the Regional of Waterloo Aquifer Storage and Recovery System. This project included the construction and performance assessment of six test wells at the Mannheim Water Treatment Plant. Groundwater modelling analysis was undertaken to develop a preliminary design plan that would optimize the performance of the expanded system.

Prospect Park Groundwater Supply Study* | Region of Halton | Acton, Ontario | 2011 - 2012 | Project Manager

Project Manager for the Region of Halton Prospect Park Groundwater Supply Study. This project included the analysis of data collected from the Prospect Park Well Field over a 5 year period to assess the potential to develop additional groundwater supply.

Baden-New Hamburg Water Supply Master Plan* | Regional Municipality of Waterloo | New Hamburg and Baden, Ontario | 2008 - 2010 | Task Manager

Hydrogeology Task Manager responsible for the assessment of existing production capacity of three well fields in proximity to the communities of Baden and New Hamburg.

Groundwater Supply Class Environmental Assessment* | Town of Shelburne | Shelburne, Ontario | 2009 - 2012 | Task Manager

Hydrogeology Task Manager responsible for the installation and performance testing of a new groundwater supply well in proximity to the Town of Shelburne. This project included negotiations with the Ontario Ministry of Environment regarding inter-basin transfer within the Great Lakes catchment area and a 72-hour groundwater pumping test. Golder completed an Environmental Study Report to satisfy a Federal Environmental Assessment process as well as a Provincial Class Environmental Assessment.

Aquafarms 93* | Ice River Springs | Feversham, Ontario | 2007 - 2009 | Project Manager

Carried out the field study and reporting requirements of a hydrogeological impact assessment for a commercial water supply operation. This project included aquifer performance testing, geophysical testing of water supply wells, monitoring of local domestic wells, and co-ordination of groundwater, surface water and ecological field studies.

Dagmar Ski Resort* | Dagmar Ski Resort | Glen Major, Ontario | 2003 - 2004 | Hydrogeologist

Evaluated the potential yield and hydrogeologic impact of two high-capacity water supply wells completed in the Oak Ridges Moraine Aquifer to support an application for a PTTW for the resort snow-making system.

DEWATERING AND PUMPING SYSTEMS

Toronto-York Spadina Subway Extension (TYSSE)* | Toronto Transit Commission | Toronto, Ontario, Canada | Hydrogeologist

Hydrogeologist for the Principal Engineering Consultant of the Toronto-York Spadina Subway Extension. This project included hydrogeology investigation and dewatering assessment at 6 proposed subway stations and 25 associated subsurface structures. Responsibilities included preparation of tender contract documents and specifications.

** denotes projects completed with other firms*

Eglinton Crosstown Light Rail Transit* | Toronto, Ontario | Hydrogeologist

Hydrogeologist responsible for preparation of dewatering assessment supporting the design of the Yonge and Allen Road Stations of the proposed Eglinton Crosstown Light Rail Transit.

Bayview Avenue Widening* | The Miller Group | Richmond Hill, Ontario | 2016 - 2018 | Project Manager

Installed forty (40) 152 mm diameter pressure relief wells to depressurize a confined aquifer and facilitate the construction of a regional sewer main.

Steeles Avenue Widening* | Fermar Paving Ltd. | Hornby, Ontario, Canada | 2016 - 2017 | Project Manager

Installed eight (8) 150 mm diameter pressure relief wells to depressurize a confined aquifer and facilitate the construction of bridge footings across water courses.

Nuclear Waste Management Organization* | Fox Construction Services | Darlington Nuclear Site , Ontario | Project Manager

Designed and installed dewatering system in support of upgrades at the Darlington Nuclear Plant

AGGREGATE SERVICES

Nelson Quarry Extension* | Nelson Aggregate Co | Burlington, ON, Canada | 2006 - 2011 | Project Hydrogeologist

Hydrogeologist responsible for the development of a field investigation to establish the potential impact of a proposed Quarry extension plan on locally significant environmental features. This field study required liaison with MOE officials, coordination of multi-disciplinary environmental investigations, procurement of testing permits and aquifer performance testing.

Lafarge Canada Inc.* | Lafarge Canada Inc. | Dundas, Ontario | 2008 - 2010 | Hydrogeologist

Hydrogeologist responsible for the development of a field investigation to establish the potential impact of a proposed Quarry extension plan on locally significant environmental features. This field study required liaison with MOE officials, coordination of multi-disciplinary environmental investigations, procurement of testing permits and aquifer performance testing.

Aaron Warkentin P. Eng.

Senior Hydrogeologist, Associate

23 years of experience · Waterloo, Ontario

Aaron is a results-oriented professional and project manager with over 20 years of consulting experience focusing on hydrogeological investigations, landfill compliance and mine/aggregate licensing monitoring and reporting, environmental impact assessment studies, hydrogeological permitting and compliance, and water resources engineering. Aaron possesses a sound understanding and is proficient in the application of hydrogeological principles and field techniques.

Aaron processes strong project management skills and has acted as project manager and/or project hydrogeologist for numerous projects involving water supply evaluations, groundwater management studies, large-scale multi-year monitoring programs, hydrogeological permitting and compliance, groundwater monitoring and hydrogeological impact investigations for construction development projects, landfill, mining and aggregate monitoring, licensing and compliance, throughout Ontario. Aaron is skilled in the analysis and interpretation of aquifer performance testing data, characterization and logging of geologic formations, evaluating groundwater-surface water interactions, developing groundwater and contaminant models, and has a working knowledge of groundwater protection legislation in Ontario.

Aaron has a strong working knowledge of the Earthsoft EQuIS data management system and portal development applications through project managing the develop of these types of custom knowledge management portal solutions. Aaron has extensive experience working on projects in support of proposed construction development and dewatering, including design and implementation of baseline and long-term groundwater monitoring program

EDUCATION

B.A.Sc., University of Waterloo Environmental (Civil) Engineering, Waterloo, Ontario, Canada, 2003

REGISTRATIONS

Professional Engineer #100144791, Professional Engineers Ontario, June 14, 2010

PROJECT EXPERIENCE

HYDROGEOLOGY

Cambridge East and Waterloo North Groundwater and Surface Water Monitoring Programs | Regional Municipality of Waterloo | Cambridge, Ontario | 2021-2023 | Project Hydrogeologist

Per the Region's Water Supply Master Plan and Class EA recommendations additional groundwater and surface water monitors were installed to be included in monitoring programs for the subject areas. Aaron acted as project hydrogeologist and assisted coordination of monitoring well construction and piezometer installations for the Region's Cambridge East and Waterloo North Groundwater and Surface Water Monitoring Program. Coordinated well geophysics and rehabilitation activities. An adaptive management plan is to be developed to document response related to future increased pumping.

Hydrogeologic Assessment, South Strasburg Trunk Sanitary Sewer | City of Kitchener | Kitchener, Ontario | 2017-2021 | Project Hydrogeologist

As part of the detailed design and construction of the South and Middle Strasburg Trunk Sanitary Sewer, Aaron acted as Project Hydrogeologist to prepare the required Hydrogeologic Assessments in support of PTTW and EASR applications for construction dewatering. The assessments detailed expected dewatering locations and volumes, discharge locations, and monitoring as required. Aaron also assisted in preparation of a wetland hydrogeological assessment as required by local conservation authority.

Eagles Nest Golf Course Irrigation Well Supply Assessment | Vaughan, Ontario | 2016-2017 | Project Manager / Project Hydrogeologist

Coordinated and completed new irrigation well installation at golf course, located within secondary buffer area of Keele Valley Landfill. Completion of a hydrogeologic investigation in support of a short term testing under a permit to take water for the irrigation well. Testing included a 72-hour pumping test and water level monitoring within adjacent monitoring wells. Coordinated and attended meetings with the Agencies (City of Toronto and MECP). Completed Permit to Take Water application for the short term pumping test.

Malahide Well Supply Assessment | IGPC | Aylmer, Ontario | 2017 | Project Hydrogeologist

Aaron acted as project hydrogeologist and assisted in a due-diligence assessment of the inactive Malahide Township well as a potential future water supply source for IGPC, Aylmer, ON. Coordinated well rehabilitation activities, and completion of a hydrogeologic investigation in support of a short term testing under a permit to take water for the Malahide Township supply well. Testing included a 24-hour pumping test and water level monitoring within adjacent monitoring wells. Aaron completed MECP permitting requirements for the project.

Greensville Backup Water Supply Project | City of Hamilton | Hamilton, Ontario | 2014 | Project Hydrogeologist

Aaron acted as project hydrogeologist in coordination and completion of production well drilling in bedrock near to the Niagara escarpment, 48-hour pumping tests, groundwater and surface water monitoring, coordination with City of Hamilton and Agencies, and hydrogeological assessment report preparation for permitting.

Fourth Line Well Field Hydrogeological Impact Assessment | Regional Municipality of Halton | Acton, Ontario | 2013-2014 | Project Hydrogeologist

The Region of Halton undertook a study to investigate the potential of expanding the taking from the Fourth Line well field by including a test well. The scope of work was to assess the impacts of increasing the daily taking from the well field above the then existing permitted rate. The environmental impact assessment included assessment of results of a comprehensive well pumping test to determine impacts to groundwater users, and an ecological review of nearby terrestrial and aquatic habitat to determine impacts to natural features. Aaron acted as project hydrogeologist and assisted in completion of the environmental impact assessment for the Region of Halton. Aaron completed background data review, analysis of pumping test data, and groundwater and surface water impact assessment report preparation.

Joe Sams Leisure Park Irrigation Supply Project | City of Hamilton | Waterdown, Ontario | 2011-2013 | Project Hydrogeologist

A water supply evaluation was completed for Joe Sam's Leisure Park within the City of Hamilton and confirmed the need for additional supply to meet sports field irrigation demands. Test drilling was completed in 2011 and an additional groundwater supply well was installed within the bedrock aquifer. Aaron acted as project hydrogeologist and assisted in a hydrogeologic investigation completed in support of a long-term permit to take water including a pumping test and water groundwater and surface water level monitoring.

Water Supply Assessment | City of Hamilton | Waterdown, Ontario | 2011-2013 | Project Hydrogeologist

In 2011, a water supply evaluation was completed for Joe Sam's Leisure Park within the City of Hamilton and confirmed the need for additional supply to meet sports field irrigation demands. Test drilling was completed in 2011 and an additional groundwater supply well was installed within the bedrock aquifer. Aaron acted as project hydrogeologist and assisted in a hydrogeologic investigation completed in support of a long-term permit to take water including a pumping test and water groundwater and surface water level monitoring.

PTTW Applications and Monitoring for Development Sites | Various, Ontario | 2012-present | Project Hydrogeologist / Permitting Coordinator

Aaron acted as Project Hydrogeologist and/or Permitting Coordinator to prepare groundwater permit to take water or environmental activity and sector registry permitting for water takings required as part of construction dewatering for various development projects in Ontario. Projects have included coordination of drilling and well monitoring, analysis of data to determine required permitting approach. The site conditions have ranged from industrial, commercial areas to residential areas, agricultural fields or shallow bedrock. As part of each application, an assessment of hydrogeological conditions was completed to evaluate construction dewatering requirements and evaluate potential interference concerns and mitigation measures. Water quality was reviewed, and discharge locations and a discharge plan determined. Consultation with clients and Agencies as required.

Pond Decommissioning | London, Ontario | Hydrogeologist

Assisted in preparation of MOECC Permit to Take Water reporting and application for dewatering during pond decommissioning in London, Ontario.

Fourth Line Well Field Hydrogeological Impact Assessment | Regional Municipality of Halton | Acton, Ontario | 2013-2014 | Project Hydrogeologist

The Region of Halton undertook a study to investigate the potential of expanding the taking from the Fourth Line well field by including a test well. The scope of work was to assess the impacts of increasing the daily taking from the well field above the then existing permitted rate. The environmental impact assessment included assessment of results of a comprehensive well pumping test to determine impacts to groundwater users, and an ecological review of nearby terrestrial and aquatic habitat to determine impacts to natural features. Aaron acted as project hydrogeologist and assisted in completion of the environmental impact assessment for the Region of Halton. Aaron completed background data review, analysis of pumping test data, and groundwater and surface water impact assessment report preparation.

Hespeler Waste Water Treatment Upgrades | Cambridge, Ontario | Project Hydrogeologist

Coordination of monitoring well testing for Region of Waterloo WWTP construction upgrades project, completed MOECC Permit to Take Water reporting and application.

MINING

Bissett Creek Mine Project | Northern Graphite Corporation | Ottawa, Ontario, Canada | 2018-2021 | Project Hydrogeologist

As part of the development of an open pit mine to access the graphite deposit, Aaron acted as Project Hydrogeologist to prepare the required Hydrogeologic Assessments in support of the PTTW application to facilitate the dewatering of the open pit. The assessments characterized groundwater flow and quality in relation to the open pit, detailed expected dewatering locations and volumes, discharge locations, assessment of potential effects of dewatering on the environment, and monitoring as required.

Greenstone Gold Mine Project | Equinox Gold Greenstone Mine | Geraldton, Ontario, Canada | 2024-Present | Project Manager

Aaron acted as project manager and assisted in coordination of work between multiple disciplines and consultants including hydrogeology, geochemistry, hydrology, terrestrial and aquatics as well as process, treatment plant, and mine engineers. Coordinated with discipline leads to complete agency monitoring and reporting requirements for the open pit mine. Groundwater Conceptual Modelling Hemlo Mine Property Expansion | Barrick Gold Corporation | Hemlo, Ontario, Canada | 2024-Present | Project Manager Aaron acted as project manager and assisted in coordination of work for a conceptual groundwater modelling for a feasibility study of the mine expansion project and intended to assist in permitting requirements.

OIL AND GAS PIPELINES

Hamilton to Milton Pipeline Project | Hamilton/Milton, Ontario | Project Hydrogeologist

Coordination of monitoring well testing and sampling for Union Gas pipeline installation near Milton, ON, attended and presented at meetings with Agencies, completed MOECC Permit to Take Water application and supporting hydrogeological assessment report preparation.

Brantford to Kirkwall Pipeline Project | Hamilton, Ontario | Project Hydrogeologist

Coordination of monitoring well drilling and sampling for Union Gas pipeline installation near Hamilton, ON, completed MOECC Permit to Take Water application and supporting hydrogeological assessment report preparation.

Thunder Bay Pipeline Project | Thunder Bay, Ontario | Project Hydrogeologist

Union Gas pipeline replacement/installation near Thunder Bay, ON, completed MOECC Permit to take Water application and supporting hydrogeological assessment report preparation.

Nanticoke Meter Station | Ancaster, Ontario | Project Hydrogeologist

Coordination of monitoring well testing for TransCanada Pipelines Limited meter station construction project, completed MOECC Environmental Activity and Sector Registry reporting and registration.

PTTW Applications and Monitoring | Various, Ontario | Hydrogeologist / Project Manager

Assisted in preparation of groundwater permit to take water applications for water takings required as part of construction dewatering and pipeline installation. The site conditions have ranged from industrial, commercial areas to residential areas, agricultural fields or shallow bedrock and have crossed creeks, rivers and lakes. As part of each application, an assessment of hydrogeological conditions was completed to evaluate construction dewatering requirements and evaluate potential interference concerns and mitigation measures. Water quality was reviewed and discharge locations considered.

Hydrogeological Report and EASR Application | Toronto, Ontario | Hydrogeologist

For Enbridge Gas Distribution (EGD) sites including Keele St. and Ashtonbee Stations, Assisted in the completion of hydrogeological assessments and Permit To Take Water application / Environmental Activity and Sector Registry (EASR) registration in support of construction dewatering. The hydrogeological review detailed available site conditions, proposed construction activity, dewatering estimates and discharge options. Potential interference concerns were evaluated and mitigation measures recommended.

Trans Mountain Expansion Project Knowledge Management Portal | Trans Mountain Corporation | Calgary, Alberta, Canada | 2021-Present | Project Manager

To facilitate data transfer, storage, and assessment Stantec assisted Trans Mountain in development of a knowledge management portal for the project. Aaron acted as project manager for the knowledge management portal development, coordinating with the various stakeholders, including 3rd party consultants and Stantec personnel. Aaron oversees and coordinates the development of the portal system and database to provide digital custom solutions for data transfer and visualization.

Stage 1-2 Archaeological Assessment: Proposed Anthony Pit (formerly Proposed Tikal Pit Expansion)

Part of Lot 22, Concession 8,
Puslinch Township, Wellington County,
Ontario

December 10, 2024

Prepared for:

CBM Aggregates
55 Industrial Street
Toronto, Ontario L3R 0B8

Prepared by:

Stantec Consulting Ltd.
400-1305 Riverbend Road
London, Ontario N6K 0J5

Licensee: Parker Dickson, MA
License Number: P256
Project Information Form Number:
P256-0721-2022
Project Number: 160961457

REVISED REPORT

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Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by CBM Aggregates (CBM), a division of St. Marys Cement Inc., to complete a Stage 1-2 archaeological assessment for the CBM Aberfoyle Tikal Pit Expansion (the Project). As of 2024, the Project has been renamed to the Anthony Pit. Further, a Site Plan for the Project is being completed by an independent engineering firm and has not been finalized or available for Stantec's use for this archaeological assessment. The Property Boundary associated with the Project is approximately 24.1 hectares of land, located in part of Lot 22, Concession 8, Geographic Township of Puslinch, Wellington County, Ontario. At the request of CBM, the Stage 1 portion of the archaeological assessment examines the entirety of the Property Boundary (the study area), while the Stage 2 portion of the archaeological assessment examines only the Maximum Extraction Limits for the Project and an associated access road (the survey area). Thus, the Stage 2 survey area, located within the Property Boundary, is smaller and comprises approximately 14.3 hectares of scrubland, woodlot, and agricultural field. The archaeological assessment is being completed during the preliminary planning phase of the Project in accordance with the *Aggregate Resources Act* (Government of Ontario 1990a) and the *Aggregate Resources of Ontario: Technical Reports and Information Standards* (Government of Ontario 2020).

The Stage 1-2 archaeological assessment was completed under Project Information Form number P256-0721-2022 issued to Parker Dickson, MA by the Ministry of Citizenship and Multiculturalism (MCM). The Stage 1 archaeological assessment determined that the study area retained potential for the identification of archaeological resources. The Stage 2 archaeological assessment of the survey area was conducted between May 18, 2022, and June 27, 2022.

One new archaeological location was identified during the Stage 2 assessment of the survey area. Location 1 is a piece of chipping detritus (a broken flake) manufactured from Onondaga chert. In accordance with Section 7.8.4 Standard 1.b and Standard 2 of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a), Location 1 retains no further cultural heritage value or interest. However, Stage 2 archaeological assessment was not completed for the portion of the study area expected to be excluded from the developable area of the Project. This portion of the study area retains archaeological potential and Stage 2 archaeological assessment is required. Thus, in accordance with the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a), **further archaeological assessment is required.**

Full and detailed recommendations are provided in the body of the report.

The MCM is asked to review the results presented and accept this report into the *Ontario Public Register of Archaeological Reports*.

The Executive Summary highlights key points form the report only; for complete information and findings, the reader should examine the complete report.

Project Personnel

Project Managers:	Daniel Eusebi, BES, MCIP, RPP Lisa Uskov, BA
Task Manager:	Parker Dickson, MA
Licensed Archaeologist:	Parker Dickson, MA (P256)
Licensed Field Directors:	Nathan Ng (R1223), Daniel Kearns (R499)
Field Crew:	Samuel Adams, Sebastian Alvarez, Tori Baginski, Tristan Cook, Chloe Doyle, Lorelyn Giese (R433), Heather Graham, Scott Graham, Kevin Hicks, Nathan Lofthouse, Olivia Micalef, Ryan Moon, Sltan Naeemi, Nicholas Salazer-Reid, Megan Switzer, Damieon Vella-Zarb, Tatjana Vieira, Alexandra Wilson-Hodge,
Mapping:	Paul Moser
Report Writer:	Creighton Avery, Ph.D.
Quality Review:	Parker Dickson, MA (P256)
Independent Review:	Colin Varley, MA, RPA (P002)

Acknowledgements

CBM Aggregates:	Stephen May, Lands Manager – Western Region David Hanratty, Director of Land, Resource & Environment
Ministry of Citizenship and Multiculturalism:	Robert von Bitter, Archaeological Data Coordinator Stephen Jarrett, Archaeology Review Officer
Mississaugas of the Credit First Nation:	Adam LaForme, Archaeological Operations Supervisor Joelle Williams, Field Coordinator

Six Nations of the Grand River Elected Council:	Tanya Hill-Montour, Archaeology Supervisor Dawn LaForme, Secretary/Receptionist
Haudenosaunee Development Institute:	Todd E. Williams, Monitoring Program Coordinator Sharann Martin, Archaeology Logistics Coordinator Owen Greene, Archaeology Supervisor

1.0 PROJECT CONTEXT

1.1 DEVELOPMENT CONTEXT

Stantec Consulting Ltd. (Stantec) was retained by CBM Aggregates (CBM), a division of St. Marys Cement Inc., to complete a Stage 1-2 archaeological assessment for the CBM Aberfoyle Tikal Pit Expansion (the Project). As of 2024, the Project has been renamed to the Anthony Pit. Further, a Site Plan for the Project is being completed by an independent engineering firm and has not been finalized or available for Stantec's use for this archaeological assessment. The Property Boundary associated with the Project is approximately 24.1 hectares of land, located in part of Lot 22, Concession 8, Geographic Township of Puslinch, Wellington County, Ontario (Figure 1). At the request of CBM, the Stage 1 portion of the archaeological assessment examines the entirety of the Property Boundary (the study area), while the Stage 2 portion of the archaeological assessment examines only the Maximum Extraction Limits for the Project and an associated access road (the survey area). Thus, the Stage 2 survey area, located within the Property Boundary, is smaller and comprises approximately 14.3 hectares of scrubland, woodlot, and agricultural field (Figure 2). The archaeological assessment is being completed during the preliminary planning phase of the Project in accordance with the *Aggregate Resources Act* (Government of Ontario 1990a) and the *Aggregate Resources of Ontario: Technical Reports and Information Standards* (Government of Ontario 2020).

The existing Aberfoyle – Tikal Aggregate Pit (Tikal Pit) is located on the southeast corner of Wellington Road 34 and Victoria Road South, in the Township of Puslinch, Wellington County. The Tikal Pit was operated until 2011 when available aggregate was removed, and operations ceased. The Tikal Pit, and a neighbouring aggregate pit (Dufferin Aggregate Pit) have been operated under Class A Licenses. As noted above, the proposed Anthony Pit was initially intended as an expansion site for the operations currently undertaken at the Tikal Pit; the Anthony Pit is now a separate and proposed aggregate pit.

1.1.1 Objectives

In compliance with the provincial standards and guidelines set out in the Ministry of Citizenship and Multiculturalism's (MCM) 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a), the objectives of Stage 1 are as follows:

- To provide information about the study area's geography, history, previous archaeological fieldwork, and current land conditions.
- To evaluate the study area's archaeological potential, which will support recommendations for Stage 2 survey for all or parts of the property.
- To recommend appropriate strategies for the Stage 2 survey.

To meet these objectives, Stantec archaeologists employed the following research strategies:

- A review of relevant archaeological, historical, and environmental literature pertaining to the study area.
- A review of the land use history, including pertinent historical maps.
- An examination of the *Ontario Archaeological Sites Database* to determine the presence of registered archaeological sites in and around the study area.
- A query of the *Ontario Public Register of Archaeological Reports* to identify any previous archaeological fieldwork within 50 metres of the study area.

In compliance with the provincial standards and guidelines set out in MCM's *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a), the objectives of the Stage 2 are as follows:

- Document archaeological resources within the study area.
- Determine whether the study area contains archaeological resources requiring further assessment.
- Recommend appropriate Stage 3 assessment strategies for archaeological sites identified.

CBM provided access to the study area to conduct the required archaeological fieldwork activities.

1.2 HISTORICAL CONTEXT

"Contact" is typically used as a chronological benchmark when discussing Indigenous archaeology in Canada and describes the contact between Indigenous and European cultures. The precise moment of contact is a constant matter of discussion. Contact in what is now the province of Ontario is broadly assigned to the 16th century (Loewen and Chapdelaine 2016).

1.2.1 Post-Contact Indigenous Resources

Broadly, the post-Contact Indigenous occupation of southern Ontario was heavily influenced by the dispersal of various Iroquoian-speaking communities by the New York State Iroquois and the subsequent arrival of Algonkian-speaking groups from northern Ontario at the end of the 17th century and the beginning of the 18th century (Konrad 1981; Schmalz 1991). Numerous Indigenous groups and communities are associated with the post-contact occupation of southern Ontario and the general area of the Project.

At the turn of the 17th century, the region of the study area was occupied by Iroquoian populations who are historically described as the *Neutre* (by the French), *Neutral* (by the English), or the *Atawandaron* (by the Huron-Wendat); their autonym is not conclusively known (Birch 2015). This group may be ancestral Haudenosaunee as they had similar culture, language, and ceremonies and were considered by the Haudenosaunee to be under the Great Law governance (Hill 2017). To the north was territory occupied by the Wendat-Tionontati (Huron-Petun) (Heidenreich 1978). The Five Nations Iroquois, located in present-day upstate New York, failed to convince the Wendat-Tionontati to join them in an alliance

(Warrick 2013). In 1649, the Seneca and the Mohawk led a campaign into southern Ontario and dispersed the Atawandaron and the Wendat-Tionontati, and the Seneca established dominance over the region (Heidenreich 1978; Konrad 1981).

In 1667, surviving Huron-Wendat warriors joined alliance with the French-allied Ojibwa and Mississaugas to counterattack the Iroquois who had settled along the north shore of Lake Ontario. By 1690, Ojibwa (Anishinaabe) speaking people had begun moving south into the lower Great Lakes basin (Konrad 1981; Rogers 1978). Mississauga oral traditions, as told by Chief Robert Paudash and recorded in 1905, indicate that after the Mississauga defeat of the Mohawk, the Mohawk retreated to their homeland south of Lake Ontario and a peace treaty was negotiated between those groups around 1695 (Paudash 1905). Upon the Mississaugas' return they decided to settle permanently in southern Ontario. The Mississaugas' settled and inhabited a large area at the western end of Lake Ontario throughout the 1700s and into the 1800s. Between 1695 and the mid-1820s the Mississaugas' continued to follow a yearly cycle of resource harvest and movement throughout their southern Ontario territory (Praxis Research Associates n.d.).

With the end of the American Revolutionary War in 1783, the Six Nations Iroquois (Haudenosaunee) were forced to leave their traditional homeland in New York State and elsewhere after the 1783 Treaty of Paris surrendered their lands to the Americans (Hill 2017). The Six Nations Iroquois (Haudenosaunee) therefore moved into their previous hunting grounds of southern Ontario in land provided by the British. The largest group settled in the Grand River valley near Brantford, Ontario, to become the Six Nations of the Grand River. The Indigenous economy from the turn of the 18th century focused on fishing and the fur trade, supplemented by agriculture and hunting.

Despite the differentiation among these groups in Euro-Canadian sources, there was a considerably different view by Indigenous groups concerning their self-identification during the first few centuries of European contact. These peoples relied upon kinship ties that cut across European notions of nation identity (Bohaker 2006:277-283). Many of the British-imposed names such as Chippewa, Ottawa, Potawatomi, or Mississauga artificially separated how self-identified Indigenous peoples' classified themselves; these groups were culturally and socially more alike than contemporary European documentation might indicate (Bohaker 2006:1-8).

The expansion of the fur trade led to increased interaction between European and Indigenous people, and ultimately intermarriage between European men and Indigenous women. During the 18th century, the progeny of these marriages began to identify as Métis and no longer identified directly with either their paternal or maternal cultures. The ethnogenesis of the Métis progressed with the establishment of distinct Métis communities along the major waterways in the Great Lakes of Ontario. Métis communities were primarily focused around the upper Great Lakes and along Georgian Bay, however Métis people have historically lived throughout Ontario (Métis Nation of Ontario 2023; Stone and Chaput 1978:607-608).

The study area falls within the historical and traditional territory of several Indigenous communities, including but not limited to the Mississaugas of the Credit First Nation (Wybenga and Dalton 2018), the Six Nations of the Grand River, and the Haudenosaunee Confederacy. Since contact with European explorers and immigrants, and, later, with the establishment of provincial and federal governments (the

Crown), the lands within Ontario have been included in various treaties, land claims, and land cessions. Though not an exhaustive list, Morris (1943) provides a general outline of some of the treaties within the Province of Ontario from 1783 to 1923. While it is difficult to exactly delineate treaty boundaries today, an approximate outline of the treaty lands described by Morris (1943) is provided in Figure 3. According to Morris (1943), the Project is situated within the limits of the 1792 indenture of the 1784 Between the Lakes Purchase between the Crown and the Mississaugas, later described as Treaty Number 3. Treaty Number 3 was:

> *...made with the Mississa[ug]a Indians 7th December, 1792, though purchased as early as 1784. This purchase in 1784 was to procure for that part of the Six Nation Indians coming into Canada a permanent abode. The area included in this Treaty is, Lincoln County excepting Niagara Township; Saltfleet, Binbrook, Barton, Glanford and Ancaster Townships, in Wentworth County; Brantford, Onondaga, Tusc[a]r[o]ra, Oakland and Burford Townships in Brant County; East and West Oxford, North and South Norwich, and Dereham Townships in Oxford County; North Dorchester Township in Middlesex County; South Dorchester, Malahide and Bayham Township in Elgin County; all Norfolk and Haldimand Counties; Pelham, Wainfleet, Thorold, Cumberland and Humberstone Townships in Welland County.*
>
> (Morris 1943:17-18)

As demonstrated above, the nature of Indigenous settlement size, population distribution, and material culture shifted as European settlers encroached upon their territory. Despite this shift, however, “written accounts of material life and livelihood, the correlation of historically recorded villages to their archaeological manifestations, and the similarities of those sites to more ancient sites have revealed an antiquity to documented cultural expressions that confirms a deep historical continuity to … systems of ideology and thought” (Ferris 2009:114). As a result, Indigenous peoples have left behind archaeological resources throughout southern Ontario which show continuity with past peoples, even if they have not been recorded in historical Euro-Canadian documentation.

1.2.2 Euro-Canadian Resources

In 1791, the Provinces of Upper Canada and Lower Canada were created from the former Province of Quebec by an act of British Parliament. At this time, Colonel John Graves Simcoe was appointed as the Lieutenant Governor of Upper Canada and was tasked with governing the new province, directing its settlement, and establishing a constitutional government modelled after that of Britain. In 1792, Simcoe divided Upper Canada into 19 counties consisting of previously settled lands, new lands opened for settlement, and lands not yet acquired by Crown. These new counties stretched from Essex in the west to Glengarry in the east.

Originally belonging to the District of Wellington formed in 1838, Wellington County was named after Arthur Wellesley, the First Duke of Wellington. In 1854, Wellington County became an individual entity incorporating 12 townships and towns, including the Township of Guelph and the Township of Puslinch, now the City of Guelph (Mika and Mika 1983).

The Township of Puslinch was surveyed by David Gibson between 1828 and 1831 and was named for Puslinch in Devonshire, England (Mika and Mika 1983). Originally a Clergy Reserve, the first clergy reserve lot was sold to William Carroll in 1829 (Mika and Mika 1983). European settlement had begun prior to 1828; however, it was not until the completion of the survey two years later that township lands were offered for sale at public auction. Puslinch Township's first school was erected in the early 1830s and later moved into a log building that also served as a church. The first township meeting was held in 1836 near Aberfoyle on Lot 18, Concession 7. From 1846 until 1849, Puslinch was represented on the Wellington district council and, in 1854, Puslinch became part of the newly formed independent County of Wellington (Mika and Mika 1983). The first council meeting took place in 1850 and in 1867 a township hall was erected; formerly, council meetings took place at various taverns throughout the township. Woolen and saw mills provided the base of early industry in the region, as well as agriculture, which continues to be an important component of the modern economy (Puslinch Historical Society 2018).

1.2.2.1 Lot 22, Concession 8

The 1861 map of the County of Wellington (Leslie and Wheelock 1861) depicts a portion of the village of Aberfoyle on the far west end of Lot 22, Concession 8 (Figure 4). The map also depicts a store and sawmill on the property associated with the village of Aberfoyle. Most of the west half of the lot depicts Patrick McMahan (Mahon) as the occupant. The east half of Lot 22 had been spilt into north and south parcels, with D. Kane on the north half, and Mrs. Haggerty on the south half (Figure 4). No structures are depicted in the east half of the lot. In the *Gazetteer and Directory of the County of Wellington 1867* (Irwin and Burnham 1867:79), Daniel Kane and Andrew Haggarty are listed as householders on Lot 22, Concession 8.

The 1877 Township of Puslinch map depicts P. Mahon on the west half, D. Cain on the north quarter of the east half, and H. Haggarty on the south quarter of the east half (Figure 5). On the west half, a structure is depicted fronting the roadway in the village of Aberfoyle. A large pond is also depicted on the property associated with the mill in Aberfoyle. On the east half, a structure is depicted on the southwest corner of Haggarty's property.

The 1906 Township of Puslinch map depicts the west half of the property associated with the development of the village of Aberfoyle along Brock Road, with the remainder of the west half of the lot, under the Peter Mahon estate (Figure 6). The large pond is depicted centrally on the west half. Philip Crumliss is depicted on the east half of the lot, with a structure off present-day Victoria Road South. The 20th century development of the west half of Lot 22 remained associated with the village of Aberfoyle.

It must be remembered that historical county atlases were produced primarily to identify factories, offices, residences, and landholdings of subscribers and were funded by subscription fees. Landowners who did not subscribe were not always listed on the maps (Caston 1997:100). As such, structures were not necessarily depicted or placed accurately (Gentilcore and Head 1984). Further, review of historical mapping, including treaty maps, also has inherent accuracy difficulties due to potential error in georeferencing. Geo-referencing is conducted by assigning spatial coordinates to fixed locations and using these points to spatially reference the remainder of the map. Due to changes in "fixed" locations

over time (e.g., road intersections, road/rail alignments, watercourses, etc.), errors/difficulties of scale and the relative idealism of historical cartography, historical maps may not translate accurately into real space points. This may provide obvious inconsistencies during historical map review.

1.2.3 20th and 21st Century Development

Aerial photography demonstrates that the study area was predominantly agricultural field and scrubland in the mid-20th century (Figure 7). Aerial photography from 2000 and 2010, however, demonstrates that a portion of the study area had been used as an informal aggregate pit and subject to deep and extensive land alteration (Figure 8).

1.3 ARCHAEOLOGICAL CONTEXT

1.3.1 The Natural Environment

The study area is situated within the Horseshoe Moraines physiographic region of southern Ontario. The physiographic region is characterized by a series of broad, horseshoe-shaped glacial moraines which flank the uplands that lie to the west of the Niagara Escarpment. Specifically, the study area is located just south of the Paris and Galt moraines that are part of an extensive moraine network in southern Ontario. The Paris Moraine was formed approximately 12,000 to 13,000 years ago by the Ontario ice-lobe as it retreated into the Lake Ontario basin. The Galt Moraine was deposited during a re-advance and stagnation of the Ontario ice lobe (Blackport Hydrogeology Inc. 2009:56).

The Paris moraine runs from Acton to Cambridge and is a high boulder ridge. Within the township of Puslinch, the Paris Moraine extends from Arkell, in the east, to Puslinch Lake, in the west. At the community of Arkell, the moraine is steep at an elevation of 388.62 metres, the highest point in the township, and is also the broadest with a width of approximately five kilometres. The moraine slopes to the southwest where it splits into two ridges (Head 1963:11-12). The Galt Moraine runs south and parallel to the Paris Moraine. The Galt Moraine has a height of 335.28 metres in the east and slopes to 304.8 metres in the west. Both moraines are composed mostly of Wentworth Till that is brown to reddish silty sand or sandy silt till (Blackport Hydrogeology Inc. 2009:56). Associated with the moraines is a system of old spillways with broad gravel and sand terraces and swampy floors. The study area is composed of a central spillway with peat and muck to the north and till moraines to the south. The study area includes, and is surrounded by, provincially evaluated wetlands (see Figure 2). In addition, an unevaluated wetland is also noted within the study area (see Figure 2).

Potable water is the single most important resource for any extended human occupation or settlement and since water sources in southwestern Ontario have remained relatively stable over time, current proximity to drinkable water is regarded as a useful index for the evaluation of archaeological site potential. In fact, distance to current water is one of the most used variables for predictive modeling of archaeological site location in Ontario. The closest extant source of potable water to the study area is Aberfoyle Creek, located approximately 300 metres to the south, and 600 metres to the northwest.

1.3.2 Pre-Contact Indigenous Resources

It has been demonstrated that Indigenous people began occupying southern Ontario as the Laurentide glacier receded as early as 11,000 years ago (Ellis and Ferris 1990:13). Much of what is understood about the lifeways of these Indigenous peoples is derived from archaeological evidence and ethnographic analogy. In Ontario, Indigenous material culture prior to the period of contact with European peoples has been distinguished into archaeological periods based on observed changes in material culture. These archaeological periods are largely based on observed changes in formal lithic tools and are separated into the Early Paleo, Late Paleo, Early Archaic, Middle Archaic, and Late Archaic periods. Following the advent of ceramic technology in the Indigenous archaeological record, archaeological periods are separated into the Early Woodland, Middle Woodland, and Late Woodland periods, based primarily on observed changes in formal ceramic decoration.

It should be noted that these archaeological periods do not necessarily represent specific cultural identities but are a useful paradigm for understanding changes in Indigenous material culture through time. Table 1 provides a general outline of the cultural chronology of the study area, summarized from Ellis and Ferris (1990). The provided periods are based on the “Before Present” (BP) calendar notation system, wherein BP stands for the years before the present. The “Present Year” is set in the calendar year 1950.

Table 1: Generalized Cultural Chronology of the Study Area

Period	Characteristics	Time Period	Comments
Early Paleo	Fluted Projectiles	10,950 – 10,350 BP	Spruce parkland, caribou hunters
Late Paleo	Hi-Lo Projectiles	10,350 – 9,950 BP	Smaller but more numerous sites
Early Archaic	Kirk and Bifurcate Base Points	9,950 – 7,950 BP	Slow population growth
Middle Archaic	Brewerton-like points	7,950 – 4,450 BP	Environment similar to present
Late Archaic	Narrow Points	4,450 – 3,750 BP	Increasing site size
	Broad Points	3,750 – 3,450 BP	Large chipped lithic tools
	Small Points	3,450 – 3,050 BP	Introduction of bow hunting
Terminal Archaic	Hind Points	3,050 – 2,900 BP	Emergence of true cemeteries
Early Woodland	Meadowood Points	2,900 – 2,350 BP	Introduction of pottery
Middle Woodland	Dentate/Pseudo-Scallop Pottery	2,350 – 1,400 BP	Increased sedentism
	Princess Point	1,400 – 1,050 BP	Introduction of corn
Late Woodland	Early Late Woodland	1050 – 650 BP	Emergence of agricultural villages
	Middle Late Woodland	650 – 550 BP	Long longhouses (100+ metres)
	Late Late Woodland	550 – 350 BP	Tribal warfare and displacement
Contact Indigenous	Various Groups	350 – 75 BP	Early written records and treaties
Late Historical	Euro-Canadian	200 BP – present	European settlement

Between 10,950 and 9,950 BP, Indigenous populations were sustained by hunting, fishing, and foraging and lived a relatively mobile existence across an extensive geographic territory. Despite these wide territories, social ties were maintained between groups. One method of maintaining social ties was through gift exchange, evident through exotic lithic material documented on many sites (Ellis 2013:35-40).

By approximately 9,950 BP, evidence existed and became more common for producing ground-stone tools such as axes, chisels, and adzes. These tools themselves are believed to be indicative specifically of woodworking. This evidence can be extended to indicate an increase in craft production and, arguably, craft specialization. This latter statement is also supported by evidence dating to approximately 8,950 BP of ornately carved stone objects which would be laborious to produce and have explicit aesthetic qualities (Ellis 2013:41). This is indirectly indicative of changes in the social organization which permitted individuals to devote time and effort to craft specialization. Since 9,950 BP, the Great Lakes basin experienced a low-water phase, with shorelines significantly below current lake levels (Stewart 2013: Figure 1.1.C). It is presumed that the majority of human settlements would have been focused along these former shorelines. At approximately 8,450 BP, the climate had warmed considerably since the recession of the glaciers, and the environment had grown more similar to the present day. By approximately 6,450 BP, evidence exists from southern Ontario for using native copper, i.e., naturally occurring pure copper metal (Ellis 2013:42). The recorded origin of this material along Lake Superior's north shore indicates extensive exchange networks across the Great Lakes basin.

At approximately 5,450 BP, the isostatic rebound of the North American plate following the melt of the Laurentide glacier had reached a point that significantly affected the Great Lakes basin watershed. Prior to this, the Upper Great Lakes had drained down the Ottawa Valley via the French River and Mattawa River valleys. Following this shift in the watershed, the drainage course of the Great Lakes basin changed to its present course. This also prompted a significant increase in water-level to approximately current levels (with a brief high-water period); this change in water levels is believed to have occurred catastrophically (Stewart 2013:28-30). This change in geography coincides with the earliest evidence for cemeteries (Ellis 2013:46). Between 4,850 and 4,450 BP, the earliest evidence exists for the construction of fishing weirs (Ellis et al. 1990, Figure 4.1; Stevens 2004). Construction of these weirs would have required a large amount of communal labour and are indicative of the continued development of the social organization and communal identity. The large-scale procurement of food at a single location also has significant implications for the permanence of settlement within the landscape. This period is also marked by further population increase, and by 3,450 BP, evidence exists for substantial permanent structures (Ellis 2013:45-46).

By approximately 2,900 BP, the earliest evidence exists for populations using ceramics. Populations are understood to have continued to exploit natural resources seasonally. However, this advent of ceramic technology correlated with the intensive exploitation of seed foods such as goosefoot and knotweed as well as mast such as nuts (Williamson 2013:48). The use of ceramics implies changes in the social organization of food storage, food cooking, and diet changes. Fish also continued to be an important facet of the economy at this time. Evidence continues to exist for the expansion of social organization (including hierarchy), group identity, ceremonialism (particularly in burial), interregional exchange throughout the Great Lakes basin and beyond, and craft production (Williamson 2013:48-54).

By approximately 1,400 BP, evidence emerged for the introduction of maize into southern Ontario. This crop would have initially only supplemented Indigenous people's diet and economy (Birch and Williamson 2013:13-14). Maize-based agriculture gradually became more important to societies. By approximately 1,050 BP, permanent communities emerged that were primarily focused on agriculture and the storage of crops, with satellite locations oriented toward procuring other resources such as hunting, fishing, and foraging. By approximately 700 BP, evidence exists for the common cultivation of historic Indigenous cultigens, including maize, beans, squash, sunflower, and tobacco. The extant archaeological record demonstrates many cultural traits similar to historical Indigenous nations (Williamson 2013:55).

The study area is located within the understood territory of the ancestral Neutral. Specifically, the study area is located between two well-documented settlement sequences (the Kitchener cluster and the Spencer-Bronte Creek cluster) which both include sites dating to the 15th century, i.e., the Moyer site and the Crawford Lake site (Lennox and Fitzgerald 1990: Table 13.1).

1.3.3 Registered Archaeological Sites and Surveys

In Canada, archaeological sites are registered within the Borden system, a national grid system designed by Charles Borden in 1952 (Borden 1952). The grid covers the entire surface area of Canada and is divided into major units containing an area that is two degrees in latitude by four degrees in longitude. Major units are designated by upper case letters. Each major unit is subdivided into 288 basic unit areas, each containing an area of 10 minutes in latitude by 10 minutes in longitude. The width of basic units reduces as one moves north due to the curvature of the earth. In southern Ontario, each basic unit measures approximately 13.5 kilometres east-west by 18.5 kilometres north-south. In northern Ontario, adjacent to Hudson Bay, each basic unit measures approximately 10.2 kilometres east-west by 18.5 kilometres north-south. Basic units are designated by lower case letters. Individual sites are assigned a unique, sequential number as they are registered. These sequential numbers are issued by the MCM who maintain the *Ontario Archaeological Sites Database*. The study area under review is located within Borden Block AiHa.

Information concerning specific site locations is protected by provincial policy and is not fully subject to the *Freedom of Information and Protection of Privacy Act* (Government of Ontario 1990b). The release of such information in the past has led to looting or various forms of illegally conducted site destruction. Confidentiality extends to media capable of conveying location, including maps, drawings, or textual descriptions of a site location. The MCM will provide information concerning site location to the party or an agent of the party holding title to a property, or to a licensed archaeologist with relevant cultural resource management interests.

A search of the *Ontario Archaeological Sites Database* has shown that six archaeological sites have been registered within a one-kilometre radius of the study area (Government of Ontario 2023). Table 2 provides a summary of the registered archaeological sites near the study area. Of these sites, none are located within the study area, or within a 50-metre radius of the study area.

Table 2: Registered Archaeological Sites within One Kilometre of the Study Area

Borden Number	Site Name	Temporal or Cultural Affiliation	Site Type
AiHa-39	Tikal 1	Indigenous	Campsite
AiHa-40	Hughson H1	Indigenous	Scatter
AiHa-41	Gillespie Site	Indigenous	Tool Manufacturing Site
AiHa-42	Tikal 4	Indigenous (Middle Archaic)	Scatter
AiHa-46	Cock Burn	Euro-Canadian	Homestead
AiHa-47	Audrey Meadows	Indigenous	Scatter

Based on a search of the *Ontario Public Register of Archaeological Reports* (Government of Ontario 2024), one previous archaeological assessment has been completed within 50 metres of the study area. However, as the MCM does not currently maintain an accessible or searchable geographical database of archaeological assessment areas or study areas by coordinates, and older archaeological assessments may be entered in the database with little geographic information, additional archaeological assessments and studies may have occurred, or are occurring, within or adjacent to the current study area.

L.R. Bud Parker completed a Stage 1 to 3 archaeological assessment for a proposed aggregate pit in the southwest half of Lot 21, Concession 9, Township of Puslinch, County of Wellington, Ontario (Parker 1998). Overall, 14 archaeological findspots were identified by Parker (1998), with four findspots registered with the MCM: AiHa-39, AiHa-40, AiHa-41, and AiHa-42. Stage 3 archaeological assessment of AiHa-39, AiHa-40, AiHa-41, and AiHa-42 was completed by Parker (1998) and no further archaeological assessment was recommended. None of the archaeological findspots or sites identified by Parker (1998) are within 50 metres of the current study area.

1.4 EXISTING CONDITIONS

The Property Boundary associated with the Project is approximately 24.1 hectares of land, located in part of Lot 22, Concession 8, Geographic Township of Puslinch, Wellington County, Ontario (see Figure 1). At the request of CBM, the Stage 1 portion of the archaeological assessment examines the entirety of the Property Boundary (the study area), while the Stage 2 portion of the archaeological assessment examines only the Maximum Extraction Limits for the Project and an associated access road (the survey area). Thus, the Stage 2 survey area, located within the Property Boundary, is smaller and comprises approximately 14.3 hectares of scrubland, woodlot, and agricultural field.

The Stage 1-2 archaeological assessment was conducted under Project Information Form (PIF) number P256-0721-2022 issued to Parker Dickson, MA, by the MCM. The study area comprises manicured lawn, agricultural fields, scrubland, residential properties, laneways, a protected wetland, and a former aggregate extraction pit.

Project Context
December 10, 2024

Prior to the start of the Stage 1-2 archaeological assessment, CBM provided preliminary mapping of the Project's proposed impacts which defined the assessment areas (i.e., the study area and the survey area). This mapping was geo-referenced by Stantec's Geographical Information Services (GIS) team and a digital file (i.e., a shape file) was created of the study area and survey area. The digital file was uploaded to handheld Global Positioning Service (GPS) devices for use in the field.

2.0 STAGE 1 ARCHAEOLOGICAL ASSESSMENT

2.1 ARCHAEOLOGICAL POTENTIAL

Archaeological potential is established by determining the likelihood that archaeological resources may be present within a study area. Stantec applied archaeological potential criteria commonly used by MCM (Government of Ontario 2011a) to determine areas of archaeological potential within the region under study. These variables include proximity to previously identified archaeological sites, distance to various types of water sources, soil texture and drainage, glacial geomorphology, elevated topography, and the general topographic variability of the area. Extensive land disturbance can eradicate archaeological potential (Government of Ontario 2011a).

Distance to modern or ancient water sources is generally accepted as the most important determinant of past human settlement patterns and considered alone, may result in a determination of archaeological potential. However, any combination of two or more other criteria, such as well-drained soils or topographic variability, may also indicate archaeological potential.

As discussed above, distance to water is an essential factor in archaeological potential modeling. When evaluating distance to water it is important to distinguish between water and shoreline, as well as natural and artificial water sources, as these features affect site locations and types to varying degrees. The Ministry categorizes water sources in the following manner:

- Primary water sources: lakes, rivers, streams, and creeks.
- Secondary water sources: intermittent streams and creeks, springs, marshes, and swamps.
- Past water sources: glacial lake shorelines, relic river or stream channels, cobble beaches, and shorelines of drained lakes or marshes.
- Accessible or inaccessible shorelines: high bluffs, swamp or marshy lake edges, and sandbars stretching into marsh.

The closest source of extant potable water is the tributaries of Aberfoyle Creek, located approximately 300 metres to the south and 600 metres northwest of the study area. Additional ancient and/or relic tributaries of other primary and secondary water sources may have existed but are not identifiable today. Soil texture can be an important determinant of past settlement, usually in combination with other factors such as topography. As indicated previously, soil within the study area, while not ideal, would be suitable for past agricultural uses.

An examination of the *Ontario Archaeological Sites Database* (Government of Ontario 2023a) has shown that there are six registered archaeological sites within one kilometre of the study area, including five Indigenous sites and one Euro-Canadian site.

Archaeological potential can be extended to areas of early Euro-Canadian settlement, including places of military or pioneer settlements; early transportation routes; and properties listed on the municipal register or designated under the *Ontario Heritage Act* (Government of Ontario 1990c) or property that local histories or informants have identified with possible historical events. No designated heritage properties exist within one kilometre of the study area. Review of historical mapping (Figure 4 and Figure 5) demonstrates that the study area has been occupied by Euro-Canadian settlers since the 19th century. Much of the established road system and agricultural settlement from the 19th century is still visible today.

When the above listed criteria are applied, the entirety (100%) of the study area retains archaeological potential. Thus, in accordance with Section 1.3.1 of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a), Stage 2 archaeological assessment is required.

3.0 STAGE 2 ARCHAEOLOGICAL ASSESSMENT

3.1 FIELD METHODS

As noted earlier, at the request of CBM, the Stage 1 portion of the archaeological assessment examines the entirety of the Property Boundary (the study area), while the Stage 2 portion of the archaeological assessment examines only the Maximum Extraction Limits for the Project and an associated access road (the survey area). Thus, the Stage 2 survey area, located within the Property Boundary, is smaller and comprises approximately 14.3 hectares of scrubland, woodlot, and agricultural field.

During the Stage 2 survey, conducted between May 18 and June 27, 2022, the weather was largely sunny, with one day of cloudy conditions, and temperatures ranged from cool to very hot. Overall, assessment conditions were adequate and at no time was the archaeological assessment conducted when the field, weather, or lighting conditions were detrimental to the identification and recovery of archaeological resources (Table 3). Photographic documentation in Section 8.1 of this report confirms that field conditions met the requirements for Stage 1-2 archaeological assessment as per the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Section 7.8.6 Standard 1.a; Government of Ontario 2011a). An overview of the archaeological assessment methodology, as well as photograph locations and directions, is depicted on Figure 9 in Section 9.0 of this report.

Table 3: Weather and Field Conditions

Date	Field Director	Activities	Weather	Conditions
May 18, 2022	Daniel Kearns (R499)	Pedestrian survey	Sunny, cool	Dry, visibility >80%
June 17, 2022	Nathan Ng (R1223)	Test pit survey	Sunny, hot	Dry and friable; soil screens well
June 20, 2022	Nathan Ng (R1223)	Test pit survey	Cloudy, hot	Dry and friable; soil screens well
June 22, 2022	Nathan Ng (R1223)	Test pit survey	Sunny, very hot	Dry and friable; soil screens well
June 24, 2022	Nathan Ng (R1223)	Test pit survey	Sunny, hot	Dry and friable; soil screens well
June 27, 2022	Nathan Ng (R1223)	Test pit survey	Sunny, warm	Dry and friable; soil screens well

Approximately 33.1% of the study area consisted of active and recently ploughed agricultural fields. This portion of the study area was subject to pedestrian survey at a five-metre interval in accordance with Section 2.1.1 of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a). The agricultural fields had been recently ploughed to a depth sufficient to provide total topsoil exposure and allowed to weather to improve visibility. Ground surface visibility during the pedestrian survey was greater than 80% and provided adequate conditions for identifying archaeological resources. Photos 1 to 4 illustrate the pedestrian survey of the study area. Please note that in-field training of new archaeological staff is illustrated in Photos 2 and 3, hence the 'pairing' of staff as part of the five-metre interval transect.

When archaeological resources were identified during the pedestrian survey, the survey transect was decreased to a one-metre interval and spanned a minimum 20-metre radius around the identified artifact. This approach was used to determine if the artifact was an isolated find or part of a larger surface scatter, as per Section 2.1.1 Standard 7 of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a). The identified artifact was collected, and a Universal Transverse Mercator (UTM) coordinate was taken as per Section 2.1 Standard 4.a of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a). The Stage 2 surface collection was conducted according to Stage 3 controlled surface pickup (CSP) standards, as allowed by the *Fieldwork: Stage 2 – Frequently Asked Questions* document issued by the MCM (Government of Ontario 2016). As the identified archaeological resource comprised a single isolated find (see Section 3.0 for record of finds for each archaeological location), no further UTM coordinates were required or recorded. The UTM coordinates were taken using ArcGIS Collector powered by ESRI, customized for archaeological survey and assessment, on a handheld mobile device paired with an R1 Receiver to an accuracy of less than one metre. The UTM coordinates are located in zone 17T and are based upon the North American Datum 1983 (NAD83). Maps illustrating the exact site locations and a listing of UTM coordinates recorded during the assessment are provided in the Supplementary Documentation to this report.

Approximately 19.2% of the study area consists of manicured lawn and scrubland that was inaccessible for ploughing. This portion of the study area was subject to test pit survey at a five-metre interval in accordance with Section 2.1.2 of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a). Included in this portion of the study area is northeastern most area (north of the northern most pedestrian survey area) that is an area of overgrown and abandoned farmland. Google Earth Imagery from 2004 suggests that this area is similar to other agricultural areas based on visual vegetive cover (Note - the imagery does not confirm that it had been ploughed) but, by 2009 (based on Google Earth Imagery), the vegetative cover differs from the other agricultural areas to the south and, like current conditions, is overgrown scrubland and no longer farmed. The current vegetative cover of the area in question is illustrated by Photos 13 to 16 in the report – the conditions are the same conditions as other areas inaccessible for ploughing (see vegetative cover in Photos 7 and 8). So, while the area may have been farmed at one time in the past (i.e., 20 years ago), it has not been actively or recently cultivated agricultural land and is "abandoned farmland with heavy brush and weed growth" and qualifies for test pit survey as per Section 2.1.2 Standard 1.c. Each test pit was at least 30 centimetres in diameter and excavated five centimetres into sterile subsoil The soils and test pits were then examined for stratigraphy, cultural features, or evidence of fill. Soil was screened through six-millimetre hardware cloth mesh to facilitate the recovery of artifacts. All test pits were backfilled. As no archaeological resources were encountered during the test pit survey, no additional test pit survey field methods were employed. Photos 5 to 8 and 13 to 16 illustrate the test pit survey of the study area.

Approximately 2.1% of the study area was identified as previously disturbed from laneways (Photo 9), an extraction pit used in the 1980s (Photo 10), and a man-made retention pond (Photo 11). Approximately 4.8% of the study area was identified as low and permanently wet (Photo 12) and is associated with an unevaluated wetland (see Figure 2). While these areas were not subject to Stage 2 survey, they are photographically documented to confirm that physical features affected the ability to survey portions of the

study area in accordance with Section 7.8.6 Standard 1.b of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a).

The remaining portion of the study area, approximately 40.7%, comprises land which is not anticipated to be part of the developable area for the Project. These lands are situated outside of the Maximum Extraction Limits and exclude the proposed access road. As noted earlier, CBM requested that these lands not be subject to Stage 2 assessment. Therefore, this portion of the study area retains archaeological potential.

4.0 RECORD OF FINDS

The Stage 2 archaeological assessment was conducted employing the methods described in Section 3.0. An inventory of the documentary record generated by fieldwork is provided in Table 4.

Table 4: Inventory of Documentary Record

Document Type	Current Location of Document Type	Additional Comments
Four pages of field notes	Stantec office, London, Ontario	In original field book and photocopied in project file
One map provided by the client	Stantec office, London, Ontario	Hard and digital copies in project file
224 digital photographs	Stantec office, London, Ontario	Stored digitally in project file

The material culture collected during the Stage 2 archaeological assessment is contained in one Bankers box, labeled by location and Borden number, and artifact class and type. The box will be temporarily housed at the Stantec London office until formal arrangements can be made for a transfer to an MCM collections facility.

4.1 LOCATION 1

Location 1 was identified during the pedestrian survey of a ploughed agricultural field. Location 1 is one piece of chipping detritus. The recovered artifact is illustrated on Plate 1 in Section 9.2.

Chert is a naturally occurring mineral found in sedimentary rocks that is a granular crystalline form of quartz, composed of cryptocrystalline and microcrystalline crystals (Eley and von Bitter 1989). Raw material acquisition and procurement strategies have long been theorized in academic literature. Some researchers suggest that raw material choices are purely utilitarian (e.g., Deller 1979; Ellis 1989; Parker 1986a, 1986b), while others suggest non-utilitarian reasons (e.g., Hall 1993; Simmons et al. 1984). Regardless of the reason, chert type identification and their respective quantities within a particular assemblage provide an opportunity to evaluate numerous archaeological variables, including group mobility and sedentism, lithic reduction strategy and technique, transportation, trade, and symbolism. Chert type identification was accomplished visually using reference materials located in the Stantec London office. The piece of chipping detritus from Location 1 is manufactured from Onondaga chert.

Onondaga formation chert is from the Middle Devonian age, with outcrops occurring along the north shore of Lake Erie between Long Point and the Niagara River (Eley and von Bitter 1989). Primary outcrops have also been reported along the banks of the Grand River (Ellis et al. 1990). It is a high-quality raw material frequently utilized and often found at archaeological sites in southern Ontario. Onondaga chert occurs in nodules or irregular thin beds. It is a dense non-porous rock that may be light to dark grey, bluish grey, brown or black and can be mottled with a dull to vitreous or waxy lustre (Eley and von Bitter 1989).

The piece of chipping detritus from Location 1 was subject to morphological analysis following the classification scheme described by Lennox et al. (1986:79-81) and expanded upon by Fisher (1997:41-49). Primary flakes feature dorsal surfaces that are either entirely covered with cortex or have substantial visible cortex present. Secondary flakes can also have a trace of cortex on the dorsal surface. Both varieties, along with shatter, are associated with early stages of lithic reduction as chert cores or flint nodules are converted into blanks or preforms. Tertiary flakes and micro flakes are produced during the further reduction of blanks and preforms into formal tool shapes. They are the result of precise flake removal through pressure flaking, where the maker applies direct pressure onto a specific part of the tool to facilitate flake removal. Pressure flaking generally produces smaller, thinner flakes than does percussion flaking. Broadly, primary, secondary, and shatter flakes indicate early stages of lithic reduction, while tertiary and micro flakes indicate later stages of the reduction sequence. Due to damage to the flake recovered from Location 1, morphological analysis cannot be conclusively made, and it is described a broken.

4.1.1 Location 1 Artifact Catalogue

Table 5 provides the complete artifact catalogue (Cat.) of the Stage 2 assemblage from Location 1.

Table 5: Location 1 Artifact Catalogue

Cat. #	Context	Depth (m)	Artifact	Quantity	Chert	Morphology
1	CSP1	0	Chipping Detritus	1	Onondaga	Broken

5.0 ANALYSIS AND CONCLUSIONS

Stantec was retained by CBM Aggregates to conduct a Stage 1-2 archaeological assessment for the study area, covering approximately 24.1 hectares in Lot 22, Concession 8, Geographic Township of Puslinch, Wellington County, Ontario.

5.1 STAGE 1 ARCHAEOLOGICAL ASSESSMENT

The Stage 1 archaeological assessment determined that the entirety (100%) of the study area retained archaeological potential. Thus, in accordance with Section 1.3.1 of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a), Stage 2 archaeological assessment was required.

5.2 STAGE 2 ARCHAEOLOGICAL ASSESSMENT

The Stage 2 archaeological assessment was completed between May 18, 2022, and June 27, 2022, and was limited to the survey area. During the Stage 2 pedestrian survey, one archaeological location was identified – Location 1.

5.2.1 Location 1

Location 1 is an isolated surface fine; a piece of chipping detritus made of Onondaga chert. Given the isolated nature of the non-diagnostic artifact, the cultural heritage value or interest of Location 1 is sufficiently documented, and it does not fulfill the criteria for Stage 3 archaeological investigation as per Section 2.2 of the MCM's *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a).

5.3 ARCHAEOLOGICAL POTENTIAL

Approximately 40.7% of the study area comprises land which is not anticipated to be part of the developable area for the Project. These lands are situated outside of the survey area. As noted earlier, CBM requested that these lands not be subject to Stage 2 assessment. As such, these areas were not subject to Stage 2 archaeological assessment but were included in the Stage 1 archaeological assessment. As noted in Section 2.0 and Section 5.1 of this report, the portions of the study area not subject to Stage 2 archaeological assessment retain archaeological potential in accordance with Section 1.3.1 of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a).

6.0 RECOMMENDATIONS

The Stage 1 archaeological assessment determined that the study area retained archaeological potential. As such, Stage 2 archaeological assessment was required. Stage 2 archaeological assessment for a portion of the survey area was completed between May 18, 2022, and June 27, 2022, and one new archaeological location was identified during the Stage 2 survey (see Section 4.1 and 5.2.1 of this report).

Stage 2 archaeological assessment was not completed for the portion of the study area expected to be excluded from the developable area of the Project. This portion of the study area retains archaeological potential and Stage 2 archaeological assessment is required. Thus, in accordance with the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a), **further archaeological assessment is required.**

It is anticipated that the further archaeological assessment will comprise Stage 2 archaeological assessment. The objective of the Stage 2 archaeological assessment will be to document archaeological resources within the study area and to determine whether these archaeological resources require further assessment. Given that the portion of the study area retaining archaeological potential comprises scrubland and woodlot and is not accessible for ploughing, the Stage 2 archaeological assessment will consist of a test pit survey.

Thus, the Stage 2 archaeological assessment will include test pit survey as outlined in Section 2.1.2 of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a). The MCM's standards require that each test pit be at least 30 centimetres in diameter, excavated to at least five centimetres into subsoil, and have soil screened through six-millimetre hardware cloth to facilitate the recovery of any cultural material that may be present. Prior to backfilling, each test pit will be examined for stratigraphy, cultural features, or evidence of fill.

If the archaeological field team judges any lands to be low and wet, steeply sloped, or disturbed during the course of the Stage 2 field work, those areas will not require physical survey, but will be photographically documented instead, in accordance with Section 2.1 of the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a).

It is recommended that Indigenous communities interested in the Project be engaged during Stage 2 archaeological assessment. Indigenous engagement practices must be completed in accordance with the MCM's 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011a) and the MCM's draft technical bulletin titled *Engaging Aboriginal Communities in Archaeology* (Government of Ontario 2011b).

The MCM is asked to review the results presented and to accept this report into the *Ontario Public Register of Archaeological Reports*.

7.0 ADVICE ON COMPLIANCE WITH LEGISLATION

In accordance with Section 7.5.9 of the Ministry's 2011 Standards and Guidelines for Consultant Archaeologists (Government of Ontario 2011a), the following standard statements are a required component of archaeological reporting and are provided from the MCM's 2011 Standards and Guidelines for Consultant Archaeologists (Government of Ontario 2011a).

This report is submitted to the Minister of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c. O.18 (Government of Ontario 1990c). The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection, and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Citizenship and Multiculturalism, a letter will be issued by the ministry stating that there are no further concerns regarding alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* (Government of Ontario 1990c) for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the *Ontario Public Register of Archaeological Reports* referred to in Section 65.1 of the *Ontario Heritage Act* (Government of Ontario 1990c).

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act* (Government of Ontario 1990c). The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48(1) of the *Ontario Heritage Act* (Government of Ontario 1990c).

The *Funeral, Burial and Cremation Services Act,* 2002, S.O. 2002, c. 33 (Government of Ontario 2002), requires that any person discovering or having knowledge of a burial site shall immediately notify the police or coroner. It is recommended that the Registrar, Funeral, Burial and Cremation Services Act and Manager, Burials Unit at the Ministry of Public and Business Service Delivery and Procurement is also immediately notified.

Archaeological sites recommended for further archaeological fieldwork remain subject to Section 48(1) of the *Ontario Heritage Act* (Government of Ontario 1990b) and may not be altered, or have artifacts removed, except by a person holding an archaeological license.

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9.0 IMAGES

9.1 PHOTOGRAPHS

Photo 1: General view of conditions during pedestrian survey of the study area, facing southeast

Photo 2: View of pedestrian survey of the study area, facing north

Photo 3: View of pedestrian survey of the study area, facing southwest

Photo 4: View of pedestrian survey of the study area, at a one-metre intervals, facing west

Photo 5: View of test pit survey of the study area, facing northwest

Photo 6: View of test pit survey of the study area, facing northeast

Photo 7: View of test pit survey of the study area, facing east-southeast

Photo 8: View of test pit survey of the study area, facing west-southwest

Photo 9: View of previous disturbance (existing laneways) within study area, facing southwest

Photo 10: View of previous disturbance (former aggregate pit and berm) within study area, facing north-northwest

Photo 11: View of previous disturbance (retaining pond associated with aggregate pit) within study area, facing west-northwest

Photo 12: View of low and permanently wet area (unevaluated wetland) within study area, facing northeast

Photo 13: View of test pit survey of the study area, facing northeast

Photo 14: View of test pit survey of the study area, facing east-southeast

Photo 15: View of test pit survey of the study area, facing southeast

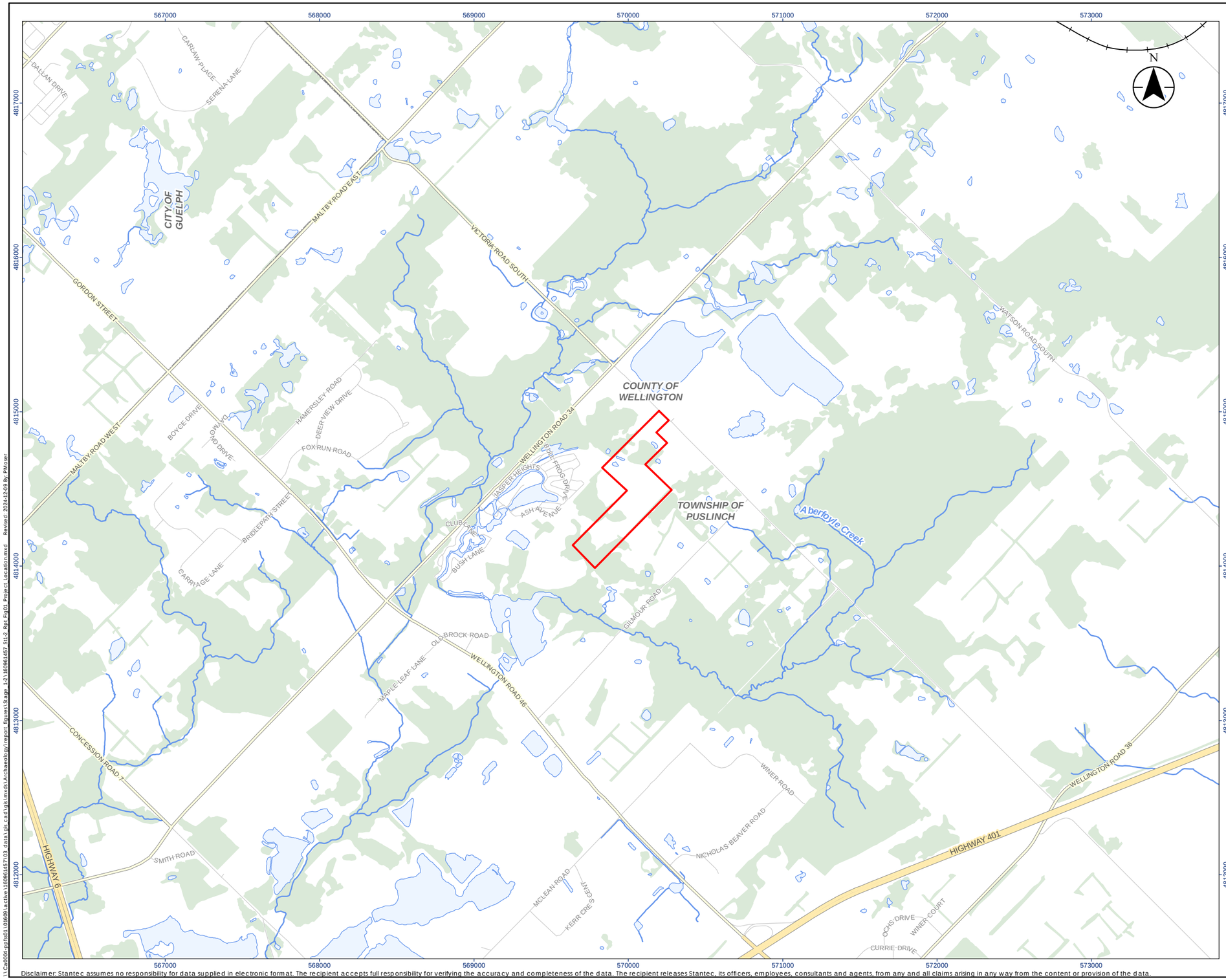
Photo 16: View of test pit survey of the study area, facing northwest

9.2 ARTIFACT PLATES

Plate 1: Artifact from Location 1

10.0 MAPS

General maps of the study area and archaeological assessment follow on succeeding pages. Maps illustrating the exact location of the identified archaeological site are found in the Supplementary Documentation to this report.



Stantec

Legend

- Property Boundary
- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Wooded Area
- Municipal Boundary - Lower Tier

0 0.5 1 km

1:25,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2024-12-09
Technical Review by PD on 2024-12-09

Client/Project
STAGE 1-2 ARCHAEOLOGICAL ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
1

Title
Project Location

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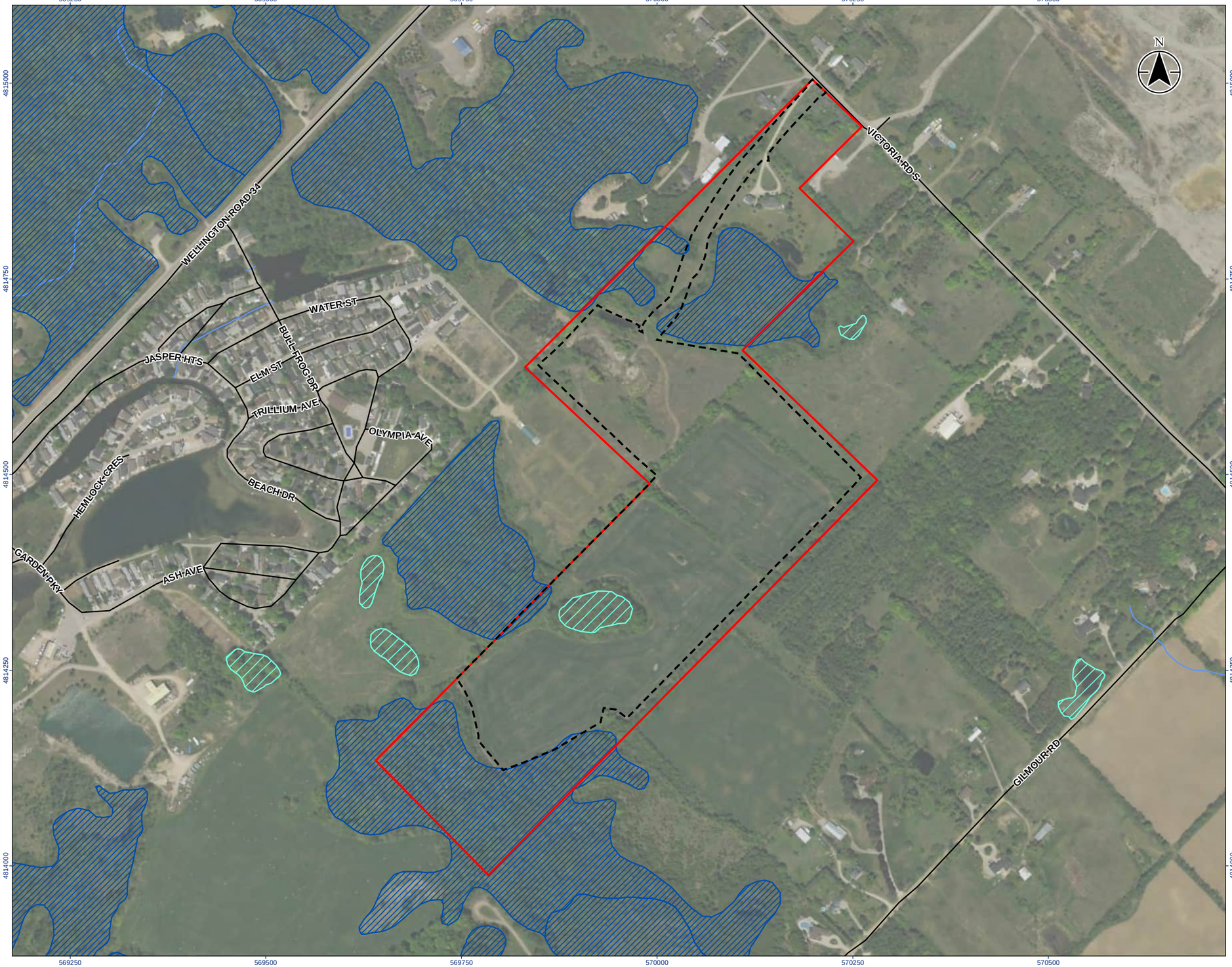

Stantec

Legend

- Property Boundary
- Road
- Watercourse
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System
- Survey Area

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
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Project Location
Township of Puslinch

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Client/Project
STAGE 1-2 ARCHAEOLOGICAL ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
2

Title
Detail of the Study Area

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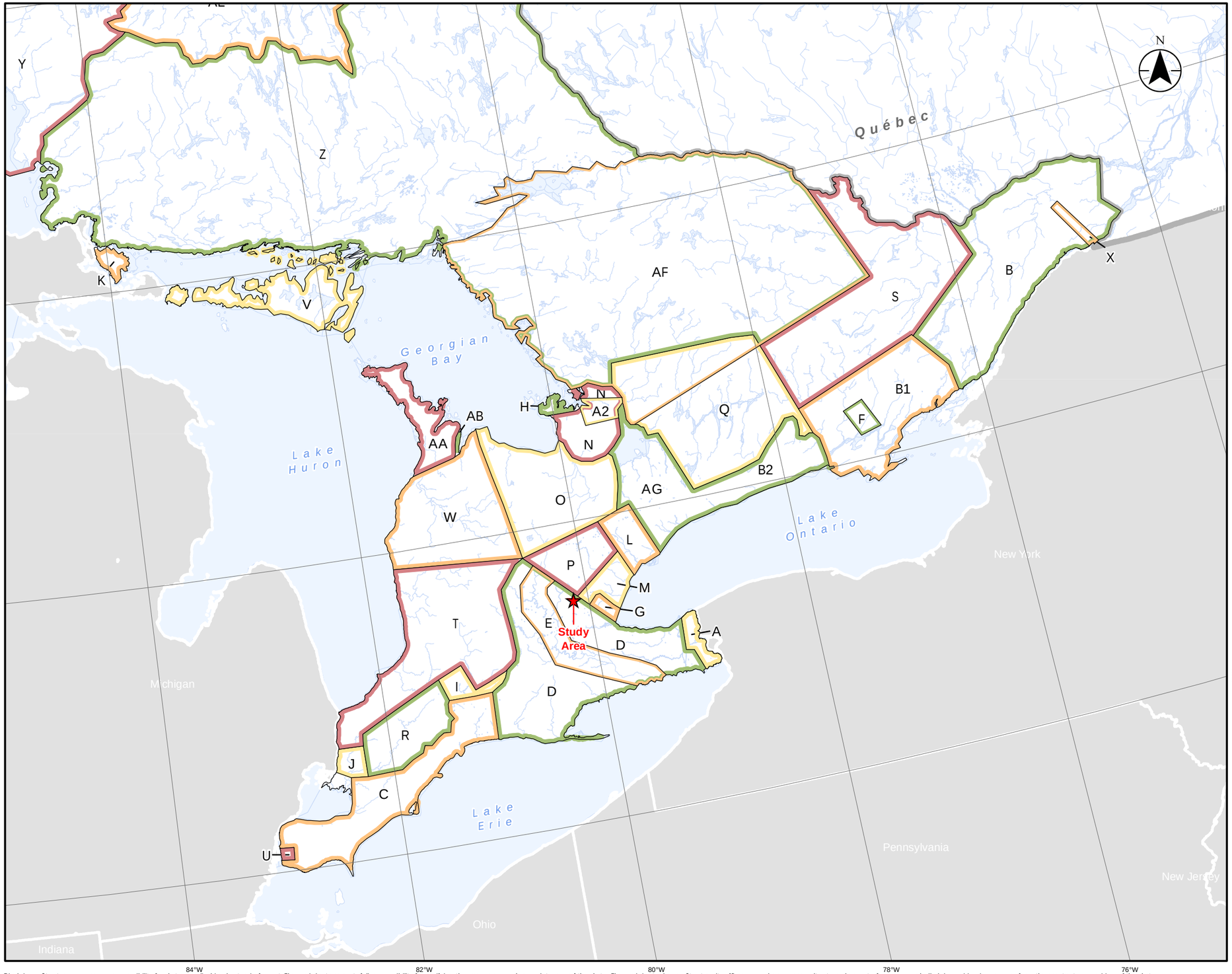

Legend

- Study Area
- Waterbody

A	Treaty No. 381, May 9th, 1781 (Mississauga and Chippewa)
AA	Treaty No. 72, October 30th, 1854 (Chippewa)
AB	Treaty No. 82, February 9th, 1857 (Chippewa)
AE	Treaty No. 9, James Bay 1905, 1906 (Ojibway and Cree)
AG	Williams Treaty, October 31st, 1923 (Chippewa)
A2	John Collins' Purchase, 1785 (Chippewa)
B	Crawford's Purchase, October 9th, 1783 (Algonquin and Iroquois)
B1	Crawford's Purchase, October 9th, 1783 (Mississauga)
B2	Crawford's Purchase, 1783, 1787, 1788 (Mississauga)
C	Treaty No. 2, May 19th, 1790 (Odawa, Chippewa, Pottawatomi, and Huron)
D	Treaty No. 3, December 2nd, 1792 (Mississauga)
E	Haldimand Tract: from the Crown to the Mohawk,
F	Tyendinaga: from the Crown to the Mohawk, 1793
G	Treaty No. 3 3/4: from the Crown to Joseph Brant, October 24th,
H	Treaty No. 5, May 22nd, 1798 (Chippewa)
I	Treaty No. 6, September 7th, 1796 (Chippewa)
J	Treaty No. 7, September 7th, 1796 (Chippewa)
K	Treaty No. 11, June 30th, 1798 (Chippewa)
L	Treaty No. 13, August 1st, 1805
M	Treaty No. 13A, August 2nd, 1805
N	Treaty No. 16, November 18th, 1815 (Chippewa)
O	Treaty No. 18, October 17th, 1818 (Chippewa)
P	Treaty No. 19, October 28th 1818 (Chippewa)
Q	Treaty No. 20, November 5th, 1818 (Chippewa)
R	Treaty No. 21, March 9th, 1819 (Chippewa)
S	Treaty No. 27, May 31st, 1819 (Mississauga)
T	Treaty No. 27½, April 25th, 1825 (Ojibwa and
U	Treaty No. 35, August 13th, 1833 (Wyandot or
W	Treaty No. 45½, August 9th, 1836
X	Treaty No. 57, June 1st, 1847 (Iroquois of St. Regis)
Y	Treaty No. 60, Robinson, Superior, September 7th, 1850 (Ojibwa)
Z	Treaty No. 61, Robinson, Huron, September 9th, 1850 (Ojibwa)

0 50 100 Km

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Notes

1. Coordinate System: NAD 1983 Statistics Canada Lambert
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Treaty boundaries adapted from Morris 1943 (1964 reprint). For cartographic representation only.

Project Location
Township of Puslinch

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Technical Review by PD on 2024-12-03

Client/Project
STAGE 1-2 ARCHAEOLOGICAL ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
3

Title
Treaties and Purchases (Adapted from Morris 1943)

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Stantec

Legend

Property Boundary

Figure Not to Scale

Notes

1. Leslie, Guy and Charles J. Wheelock. 1861. *Map of the County of Wellington, Canada West.* Orangeville: Guy Leslie and Charles J. Wheelock.

Project Location
Township of Puslinch

160961457 REVA
Prepared by PRM on 2024-12-09
Technical Review by PD on 2024-12-09

Client/Project
STAGE 1-2 ARCHAEOLOGICAL ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
4

Title
Portion of 1861 Map of Wellington County

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Stantec

Legend

Property Boundary

Figure Not to Scale

Notes

1. Walker and Miles. 1877. *Illustrated Historical Atlas of the County of Wellington, Ontario.* Toronto: Walker and Miles.

Project Location
Township of Puslinch

160961457 REVA
Prepared by PRM on 2024-12-09
Technical Review by PD on 2024-12-09

Client/Project
STAGE 1-2 ARCHAEOLOGICAL ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
5

Title
Portion of 1877 Map of the Township of Puslinch

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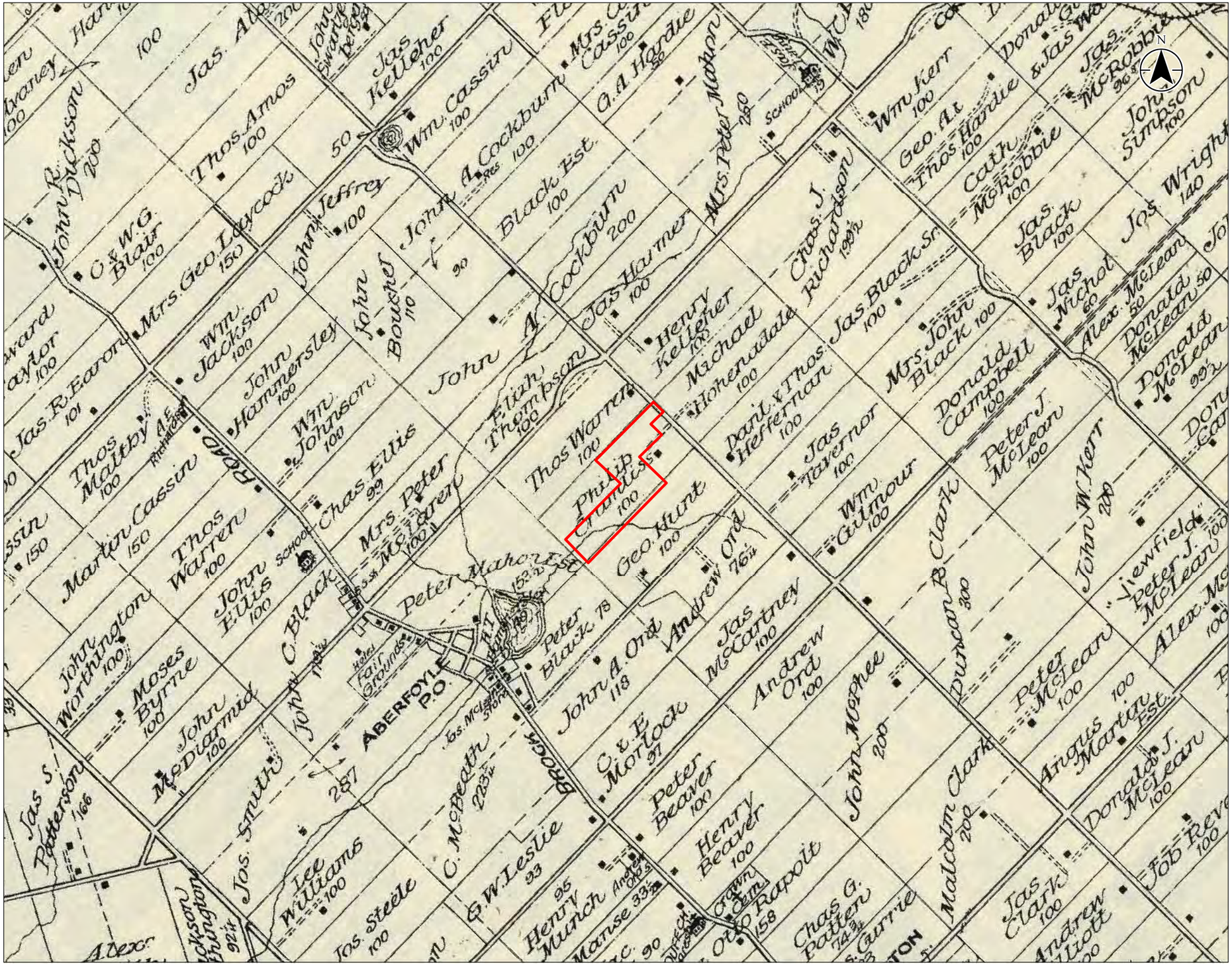

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Legend

Property Boundary

Figure Not to Scale

Notes

1. Historical Atlas Publishing Co. 1906. *Wellington County 1906.* Toronto: Historical Atlas Publishing Co.

Project Location
Township of Puslinch

160961457 REVA
Prepared by PRM on 2024-12-09
Technical Review by PD on 2024-12-09

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PROPOSED ANTHONY PIT

Figure No.
6

Title
Portion of 1906 Historical Atlas of Township of Puslinch

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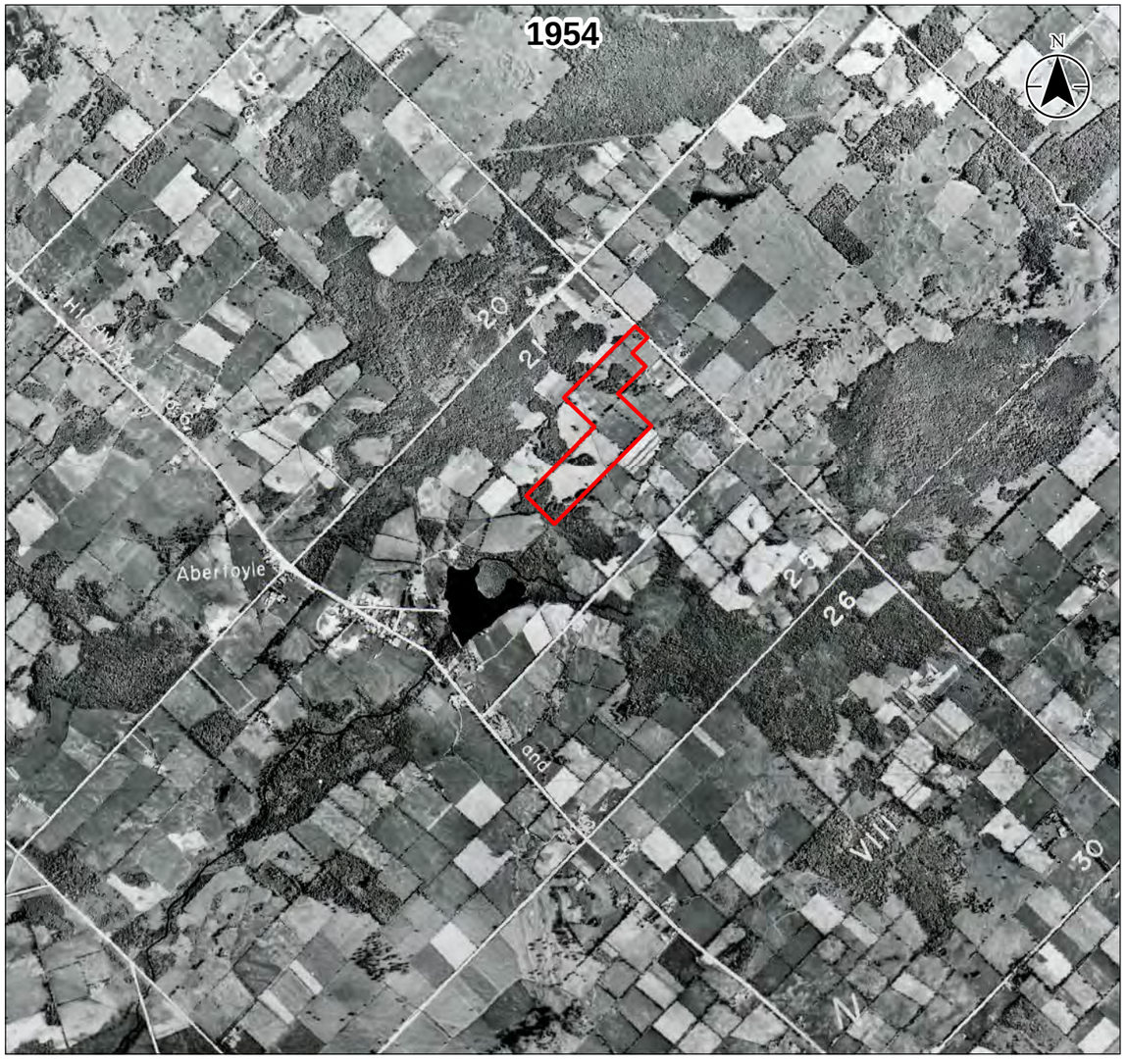

Legend

Property Boundary

Figure Not to Scale

Notes

1. University of Toronto Libraries. N.d. Map and Data Library: 1954 Air Photos of Southern Ontario. Accessed electronically: https://mdl.library.utoronto.ca/collections/air-photos/1954-air-photos-southern-ontario/index. Last accessed 6 February 2023.
2. Capital Air Surveys Ltd. 1966. Kitchener – Brantford Area, 1966. Flight A19411-Photo 39. Accessed electronically: https://digitalarchive.mcmaster.ca/islandora/object/macrepo%3A80569. Last accessed 6 February 2023.

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Township of Puslinch	Prepared by PRM on 2024-12-09
	Technical Review by PD on 2024-12-09

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STAGE 1-2 ARCHAEOLOGICAL ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.

7

Title

Historical Aerial Photographs

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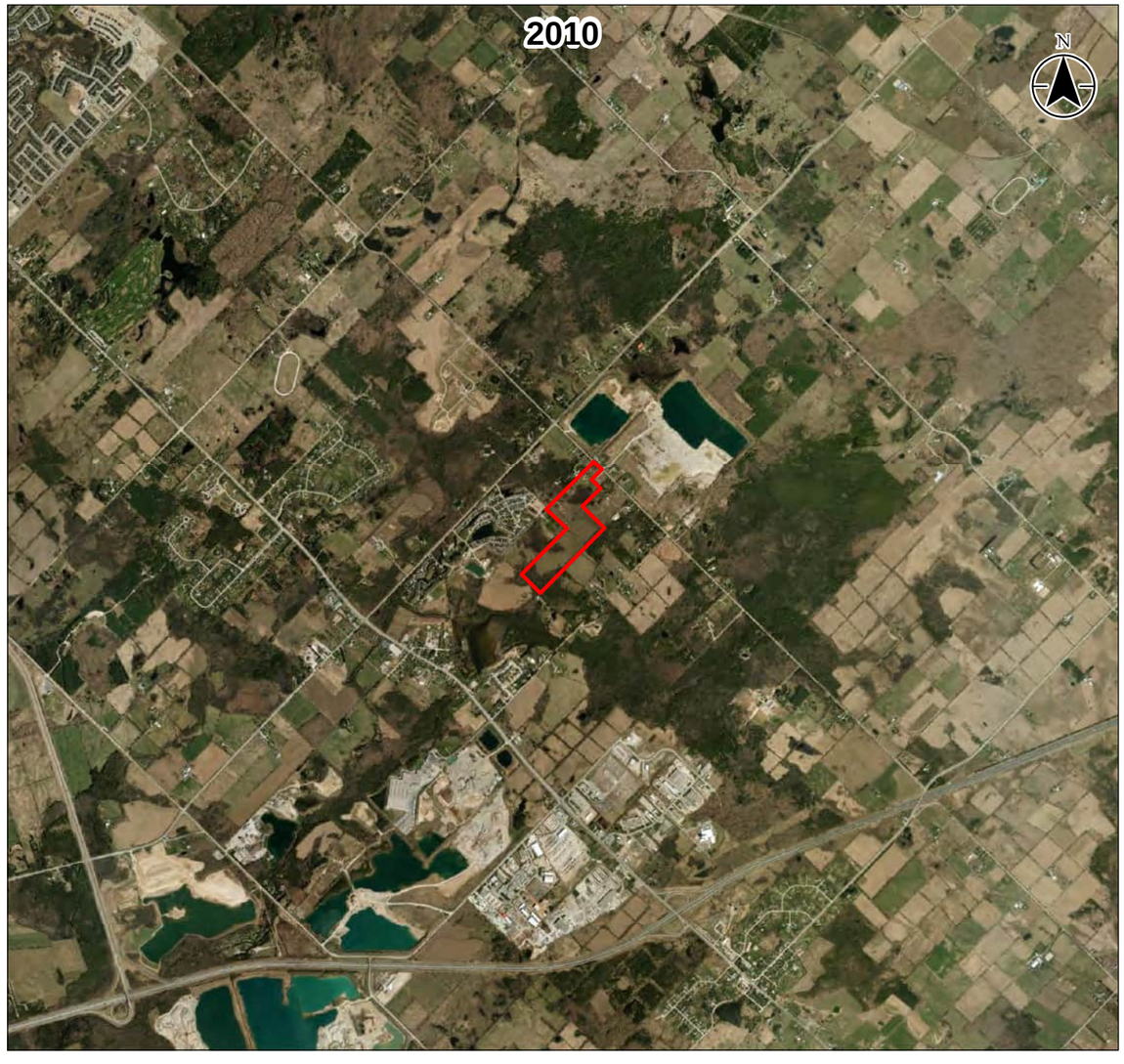

Legend

Property Boundary

Figure Not to Scale

Notes

1. 2000 Aerial - County of Wellington. 2023. Explore Wellington. Accessed electronically: https://sgis.wellington.ca/Maps/index.html?viewer=WellingtonCountyExternal. Last accessed 6 February 2023.
2. 2010 Aerial - County of Wellington. 2023. Explore Wellington. Accessed electronically: https://sgis.wellington.ca/Maps/index.html?viewer=WellingtonCountyExternal. Last accessed 6 February 2023.

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Project Location
Township of Puslinch

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Client/Project
STAGE 1-2 ARCHAEOLOGICAL ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
8

Title
Aerial Photographs

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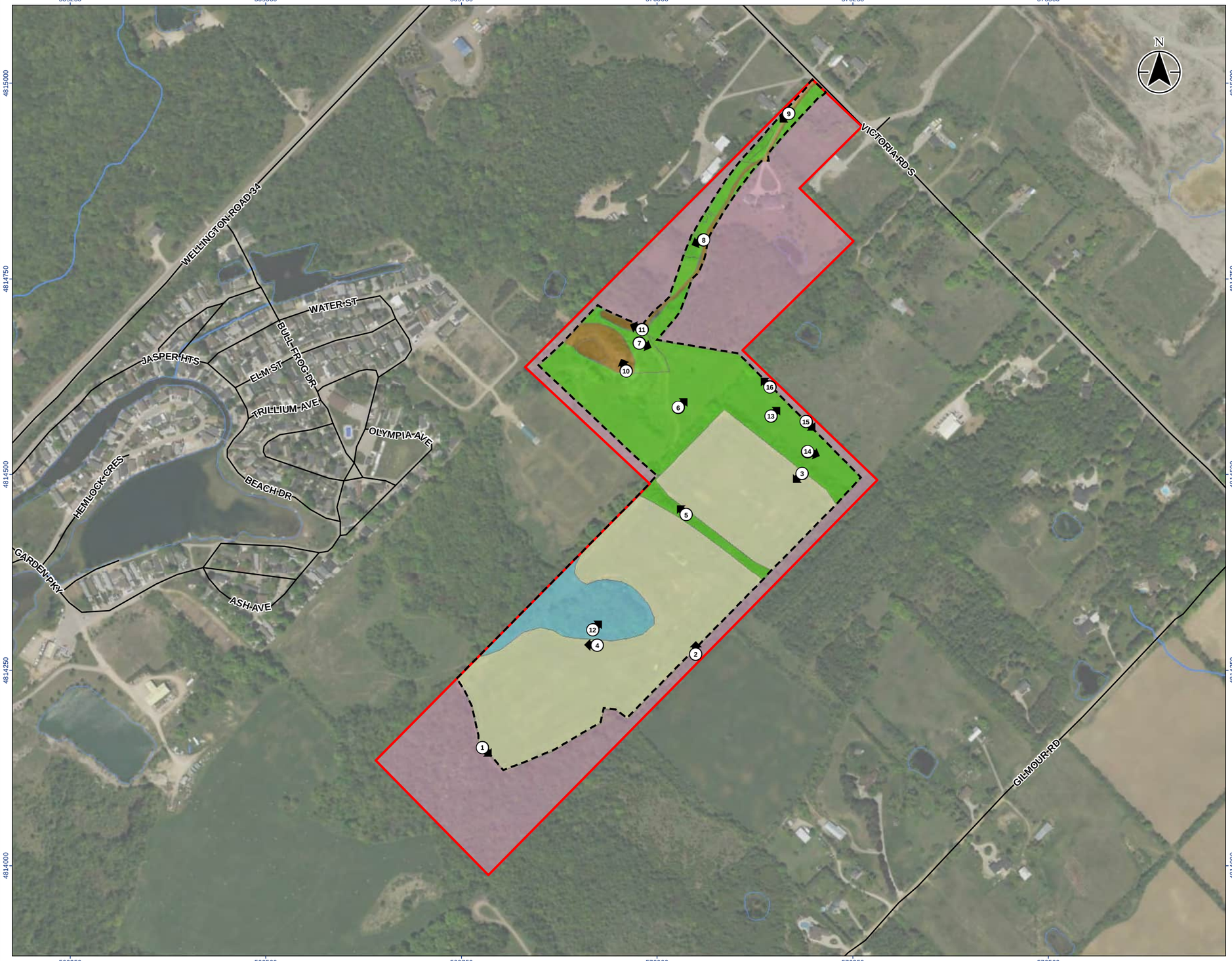

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Legend

- Property Boundary
- Archaeology Photo Log
- Road
- Watercourse
- Waterbody
- Archaeology Survey Area

Archaeological Assessment Assessment Method

- Low and Permanently Wet Area, No Further Archaeological Work Required
- Previously Disturbed, Low to No Archaeological Potential - No Further Archaeological Work Required
- Pedestrian Survey, 5 m Intervals
- Test Pit Survey, 5 m Intervals
- Retains Archaeological Potential – Stage 2 Assessment Required

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Orthoimagery © First Base Solutions, 2021.

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STAGE 1-2 ARCHAEOLOGICAL ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
8

Title
Stage 2 Archaeological Assessment Methods and Results

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11.0 CLOSURE

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential archaeological resources associated with the identified property.

All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report and are based solely on the scope of work described in the report, the limited data available and the results of the work. The conclusions are based on the conditions encountered by Stantec at the time the work was performed. Due to the nature of archaeological assessment, which consists of systematic sampling, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire property.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report. We trust this report meets your current requirements. Please do not hesitate to contact us should you require further information or have additional questions about any facet of this report.

Quality Review _____
(signature)

Parker Dickson – Senior Archaeologist, Senior Associate

Independent Review _____

(signature)

Colin Varley – Senior Archaeologist, Senior Associate

Complete Application Public Consultation Strategy Requirement

Official Plan Amendments, Plans of Subdivision & Condominium Applications

As per O. Reg 543/06 and O. Reg. 544/06, as amended, a strategy for consulting with the public is required to be submitted by the proponent of an Official Plan Amendment, Plan of Subdivision or Condominium application before it can be deemed "complete" as defined by the *Planning Act.* Please discuss your proposal with County Planning staff prior to the submission of any applications.

The *Planning Act* requires that your application be circulated to property owners within 120 m of the subject lands, a notice sign be posted on the property and a public meeting be held regarding the proposal.

Please select all forms of further public consultation that you, as the applicant/agent/owner, intend to undertake, if any, beyond the formal notification requirements of the *Planning Act* outlined above.

- ☐ *Planning Act* requirements provide sufficient notification and consultation;
- ☑ Speak to adjacent landowners directly about proposed development;
- ☐ Post signs within a common area (for multi-residential buildings and developments);
- ☑ Provide additional advertisement of the proposal and public meeting in a local newspaper (please discuss with County planning staff prior to initiating);
- ☑ Host an open house regarding the proposal;
- ☑ Other measures (please elaborate)

Consultation to occur in accordance with the Aggregate Resources Act, e.g. direct mailings, project website

open house, notice sign, etc. Duty to consult with Indigenous communities, e.g. MCFN, SNGR, HCCC.

Dated this 20 day of March, 2026

Yara Elmahdy [redacted]

Please print name Signature (applicant/agent/owner)

Please return this form with the completed Official Plan Amendment, Draft Plan of Subdivision, or Condominium Application to:

County of Wellington
Planning & Development Department
Administration Centre
74 Woolwich Street
Guelph, ON N1H 3T9
Phone: 1-800-663-0750
Fax: 519 -823-1694
www.wellington.ca

Natural Environment Report: Proposed Anthony Pit, Puslinch, Ontario

Final Report

March 6, 2026

Prepared for:
CBM Aggregates
55 Industrial Street,
Toronto, Ontario, M4G 3W9

Prepared by:
Stantec Consulting Ltd.
100-300 Hagey Boulevard
Waterloo, Ontario N2L 0A4

Project/File:
160961457

Stantec

Limitations and Sign-off

The conclusions in the Report titled Natural Environment Report: Proposed Anthony Pit, Puslinch, Ontario are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Prepared by: _____
Signature

Melissa Straus, M. Sc.
Senior Ecologist
Printed Name and Title

Prepared by: _____
Signature

Janice Ball, B.Sc.
Terrestrial Ecologist
Printed Name and Title

Reviewed by: _____
Signature

Debbie Giesbrecht, M. Sc.
Associate, Senior Ecologist
Printed Name and Title

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Acronyms / Abbreviations

ANSI	Area of Natural and Scientific Interest
ARA	*Aggregate Resources Act*
ARU	autonomous recording unit
CC	coefficient of conservatism
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
CVC	Credit Valley Conservation
DFO	Fisheries and Oceans Canada
EAB	Emerald Ash Borer
ECCC	Environment and Climate Change Canada
EIA	Environmental Impact Assessment
ELC	Ecological Land Classification
EP	Environmental Protection
ESA	*Endangered Species Act*
FWCA	*Fish and Wildlife Conservation Act*
GEO	Geospatial Ontario
GPS	Global Positioning System
GRCA	Grand River Conservation Authority
HADD	harmful alteration, disruption or destruction (of fish habitat)
HDF	headwater drainage feature(s)
HiF	high frequency unknown
MBCA	*Migratory Birds Convention Act*
MBR	Migratory Bird Regulations

MECP	Ministry of Environment, Conservation and Parks
MHBC	MacNaughton Hermsen Britton Clarkson Planning Ltd.
MMAH	Ministry of Municipal Affairs and Housing
MNR	Ministry of Natural Resources
MNRF	Ministry of Natural Resources and Forestry
NE	Natural Environment
NHIC	Natural Heritage Information Centre
NHRM	Natural Heritage Reference Manual
OMNR	Ontario Ministry of Natural Resources
O. Reg.	Ontario Regulation
OP	Official Plan
OWES	Ontario Wetland Evaluation System
PPS	Provincial Planning Statement
PSW	Provincially Significant Wetland(s)
SAR	species at risk
SARA	*Species at Risk Act*
SARO	Species at Risk in Ontario
SCA	Species Conservation Act
SOCC	species of conservation concern
SWH	significant wildlife habitat
TRCA	Toronto and Region Conservation Authority
UV	ultraviolet

Units of Measure

%	percent
°C	degree(s) Celsius

µM	micron(s)
”	inch(es)
AM	ante meridian
cm	centimetre(s)
DBH	diameter at breast height
ha	hectare(s)
km	kilometre(s)
L	litre(s)
m	metre(s)
masl	metre(s) above sea level
mm	millimetre(s)
PM	post meridian

1 Introduction

CBM Aggregates, a division of St. Marys Cement Inc. (Canada) (CBM) is applying for a Class 'A' Licence under the *Aggregate Resources Act* (ARA), a Township of Puslinch Zoning By-law Amendment and County of Wellington Official Plan Amendment to permit aggregate extraction on lands located at 4454 Victoria Road South, legally described as Part of Lot 22, Concession 8, Township of Puslinch, County of Wellington (Figure 1, Appendix A).

Stantec Consulting Ltd. (Stantec) was retained by CBM to prepare this Natural Environment Report (NER) in support of these applications and fulfill the requirements of the ARA for a new licensed aggregate operation.

1.1 Purpose

This NER was prepared to meet the standards of the Aggregate Resources of Ontario: Technical Reports and Information Standards (MNR 2023) that will accompany the application for a Class 'A' Pit Below Water. In addition to satisfying ARA requirements, this NER will also meet the requirements of an Environmental Impact Assessment (EIA), required by the County of Wellington and Township of Puslinch to undertake amendments to both the County Official Plan (OP) and Township Comprehensive Zoning Bylaw to facilitate aggregate extraction.

For this NER, the following terminology is used for the Project:

- **Site –** the area that is proposed for licensing under the ARA, also referred to as the "proposed licence area".
- **Extraction Limit –** the total area within the proposed licence boundary where extraction will take place.
- **Proposed Project Footprint –** refers to the lands that will be impacted by the Project, comprised of the Extraction Limit, Acoustic Berms, and Noise Barrier footprints
- **Adjacent Lands –** refers to lands within 120 metres (m) of the proposed licence boundary.
- **Property –** refers to the property currently under private land ownership where site investigations were completed (4454 Victoria Road South). This includes the Site plus a portion of the Adjacent Lands.

These components are shown in Figure 1, Appendix A.

The purpose of this NER is to:

- Identify significant natural heritage features that are present on the Site and/or lands within 120 m; and identify whether natural heritage features are located within a Natural Heritage System as identified by the municipality or a provincial plan.
- Identify potential habitat for Species at Risk (SAR) protected under the *Endangered Species Act, 2007* (ESA) with consideration for the forthcoming *Species Conservation Act* (SCA).
- Identify and assess impacts of the proposed aggregate pit on natural heritage features and/ or the Natural Heritage System and their ecological functions.
- Provide recommendations for preventative, mitigative, or remedial measures related to potential impacts.
- Identify anticipated regulatory approvals under natural heritage legislation.

1.2 Site and Adjacent Lands

1.2.1 Site Description

The Site is located on Victoria Road South, south of Wellington County Road 34, located at municipal address 4454 Victoria Road South in the Township of Puslinch. A large portion of the Site is currently used for agricultural row crops or has succeeded to fallow fields. Hedgerows divide the agricultural fields, and a thicket is present along Victoria Road South. The property owner will remain in residence within the existing dwelling located on the eastern section of the Site.

1.2.2 Adjacent Lands

Natural vegetation communities, including woodlands, wetlands and naturalized plantations occur on Adjacent Lands. Wetlands on Adjacent Lands include unevaluated wetlands and portions of the Mill Creek Puslinch Provincially Significant Wetland (PSW) Complex (Figure 2, Appendix A). Agricultural fields, meadows, residences, and the Mini Lakes Condominium Community also occur on Adjacent Lands.

2 Environmental Policy Context

The Site is in the Township of Puslinch (the Township) in the County of Wellington (the County). The following documents relevant to the Site that describe natural heritage features and regulations were reviewed:

- *Species at Risk Act (*Government of Canada, 2002*)*
- *Migratory Birds Convention Act* (Government of Canada 1994)
- *Fisheries Act (*Government of Canada 1985*)*
- ARA (MNR 2020) and Provincial Standards of Ontario – Category 1 – Class A Pit/Quarry Above/Below Water (MNR 1997)
- Provincial Planning Statement (MMAH 2024)
- ESA (Government of Ontario 2007)
- *Fish and Wildlife Conservation Act* (Government of Ontario 1997)
- County of Wellington Official Plan (County 2024)
- Township of Puslinch Zoning By-Law (2018)

An overview of these legislation and policy documents are discussed in Sections 2.1, 2.2, and 2.3.

2.1 Federal Regulations

2.1.1 Species at Risk Act (SARA)

Species included on Schedule 1 of the Species at Risk Act as endangered or threatened are afforded protection of critical habitat on federal lands under this act. On private or public lands, only aquatic species listed as endangered, threatened or extirpated, and migratory birds are protected under SARA, unless otherwise ordered.

2.1.2 Migratory Birds Convention Act (MBCA)

The *Migratory Birds Convention Act*, 1994 (MBCA) prohibits the killing or capturing of migratory birds, as well as the damage, destruction, removal, or disturbance of their nests. The Migratory Birds Regulation, 2022 (MBR), specifies the periods during which the nests of migratory bird species are protected. It includes specific provisions granting year-round protection for the nests of certain species that reuse their nests, such as the Pileated Woodpecker and Great Blue Heron, for designated durations of 36 and 24 months, respectively.

Most bird species in Canada are protected under the MBCA, as defined by Article I, which names the families and subfamilies of birds protected, and provides clarification of which species are included. In southern Ontario, migratory birds generally nest between April 1 and August 31. Environment and Climate Change Canada (ECCC) can issue permits allowing the destruction of nests for scientific, agricultural, or health and safety purposes.

New development and site alterations are not permitted activities under the MBCA, as vegetation removal may contravene the Act.

2.1.3 Fisheries Act

The *Fisheries Act,* 1985 (last amended in 2024) protects fish and fish habitats (s34) within Canadian waters. Under the current fish and fish habitat protection provisions of the *Fisheries Act*, any works, undertaking or activity of a project must avoid causing the death of fish and the harmful alteration, disruption, or destruction (HADD) of fish habitat. To assist proponents with determining if their project will comply with the fish and fish habitat provisions, Fisheries and Oceans Canada (DFO) has outlined measures to protect fish and fish habitat (DFO 2023) as well as several standards and codes of practices (DFO 2024a). If a project cannot completely implement the measures to protect fish and fish habitat and if the standards and codes of practice are not applicable to the project, DFO recommends that the proponent request a review of the project by DFO. If a project cannot avoid and/or mitigate impacts that will cause death of fish or the HADD of fish habitat, an Authorization under the *Fisheries Act* may be required and may be required to develop a habitat offsetting or compensation plan.

2.2 Provincial Regulations

2.2.1 Aggregate Resources Act (ARA)

The ARA, 1990 aims to sustainably manage aggregate resources in Ontario. The Act regulates operations on both Crown and private lands, mandates the rehabilitation of land after aggregate extraction, and minimizes environmental impacts associated with aggregate operations. A Class A license is required to extract more than 20,000 tonnes of aggregate annually from the site [Section 2(a)]. As outlined in Section 3 of the Act, every application for an aggregate license must be prepared in accordance with the regulations and include documents as may be prescribed.

The Aggregate Resources of Ontario: Technical Reports and Information Standards (Standards; MNR 2020) adopted under Ontario Regulation (O. Reg.) 244/97 of the ARA, sets the standards for how technical reports must be prepared. As set out in Section 2.2, this includes the preparation of a NER to identify any of the following natural heritage features and areas that exist on and within 120 m of the Site:

a) significant wetlands
b) other coastal wetlands in Ecoregions 5E, 6E and 7E
c) fish habitat
d) significant woodlands and significant valleylands

e) habitat of endangered species and threatened species

f) significant wildlife habitat

g) areas of natural and scientific interest (ANSI)

h) Within the area of one or more provincial plan(s), any key natural heritage features not included in (a) through (g)

Provincial plans include Oak Ridges Moraine Conservation Plan, Greenbelt Plan, A Place to Grow: Growth Plan for the Greater Golden Horseshoe (no longer in effect), Niagara Escarpment Plan, and the Lake Simcoe Protection Plan.

2.2.2 Provincial Planning Statement (PPS)

The *Provincial Planning Statement* (PPS; MMAH 2024) was issued under Section 3 of the *Planning Act* and came into effect on October 20, 2024. The PPS replaces the *Provincial Policy Statement, 2020* and *A Place to Grow: Growth Plan for the Greater Golden Horseshoe, 2019*. This report was prepared to be consistent with Policy 4.1 of the PPS with the Natural Heritage Reference Manual (NHRM; MNR 2010).

Natural heritage features relevant to the Site and Adjacent Lands and defined in the PPS are similarly described in the ARA. The Site and Adjacent Lands falls within Ecoregion 6E. Section 4.1.4 of the PPS (2024), states that development and site alteration shall not be permitted in the following features in Ecoregion 6E:

- significant wetlands
- significant coastal wetlands

According to Section 4.1.5 of the PPS, development and site alteration shall not be permitted in the following natural heritage features or areas unless it has been demonstrated that there will be no negative impacts on the features or their ecological functions:

- significant woodlands
- significant valleylands
- significant wildlife habitat (SWH)
- ANSI
- coastal wetlands that are not subject to policy 4.1.4(b)

Further, Sections 4.1.6 and 4.1.7 state that development and site alteration shall not be permitted in the following features, except in accordance with provincial and federal requirements:

- fish habitat
- habitat of endangered or threatened species

Development or site alteration may be permitted on lands adjacent to the natural heritage features listed above if it is demonstrated that there will be no negative impacts on the natural features or the ecological function for which the area was identified. Further the diversity and connectivity of the natural features in an area should be maintained and enhanced, where possible, recognizing linkages between and among natural heritage, surface water and groundwater features (PPS Policy 4.1.2).

2.2.3 Endangered Species Act

The ESA (2007) and associated Regulations that are amended from time to time, identifies wildlife species considered to be at risk in Ontario and designates them as threatened, endangered, extirpated or of special concern. Provincial SAR are identified and assessed by the Committee on the Status of Species at Risk in Ontario (COSSARO), which is a committee of wildlife experts and scientists, as well as those who provide Aboriginal traditional knowledge. COSSARO classifies species according to their degree of risk based on the best available scientific information, community knowledge and Aboriginal traditional knowledge. When COSSARO classifies a SAR, that classification applies throughout Ontario, unless otherwise noted (e.g., black ash).

The ESA protects SAR and their habitats by prohibiting anyone from killing, harming, or possessing protected species (those listed as endangered or threatened), and prohibiting any damage or destruction to the habitat of protected species. All protected species are provided with general habitat protections under the ESA, which protects those areas upon which a species depends to carry out its life processes, such as reproduction, rearing, hibernation, migration or feeding. Recent updates to the ESA have resulted in interim changes and the ESA will be replaced with the *Species Conservation Act* (SCA), which is not yet in effect.

Currently, any activity that could impact a protected species or its habitat must first be authorized through a permit or other authorization from the Ministry of the Environment, Conservation and Parks (MECP). Given the ongoing changes to legislation, the policy that is in place at the time of habitat disturbance (e.g., ESA, SCA) should be reviewed as different permit options may be available.

2.2.4 Fish and Wildlife Conservation Act

The provincial *Fish and Wildlife Conservation Act,* 1997 (FWCA) provides protection of wildlife in Ontario including fish, furbearing mammals, game wildlife and specially protected wildlife through regulations for hunting, trapping, and fishing practices. Game and specially protected mammals, birds, reptiles, amphibians, and invertebrates are listed on Schedules 1-11 of the FWCA. Definitions provided for hunting include capturing or harassing wildlife (Section 5) and would include activities that collect or handle wildlife for inventories or other scientific purposes, or to relocate wildlife out of harm's way (e.g., during construction activities), including individuals and eggs. Sections 7 and 8 also provide protection for nest and eggs of specified bird species including raptors, and dens of bears and furbearing animals, and beaver damns. Under the FWCA, the Minister has the authority to authorize activities that would otherwise be prohibited such as the safe capture of wildlife and removal of nests, dens, and dams, and impose conditions on an authorization.

2.3 Municipal

The County and Township have approval authority for development applications for the Project. The County is the approval authority for OP Amendments for both the County and Township, while the Township is the approval authority for processing zoning applications.

2.3.1 County of Wellington Official Plan

Schedule B7 (Land Use) of the OP identifies the Site and Adjacent Lands as a mix of Rural and Greenlands systems. The Rural System component is comprised of Secondary Agricultural, while the Greenlands System is comprised of Greenlands (primarily woodlands) and Core Greenlands (primarily wetlands).

2.3.2 The Township of Puslinch Comprehensive Zoning By-law

Schedule A of the Township of Puslinch's Comprehensive Zoning By-law (No. 023-18) shows the Site as a mix of Agricultural (A) and Natural Environment (NE) with portions included in an Environmental Protection (EP) Overlay. The EP Overlay is also shown on Schedule B, Map B-1 of the by-law, and represents the natural heritage features included in the Greenlands designation of the County's OP.

3 Project Description

The Site is currently used for rural residential uses and occupied with a detached dwelling, detached garage and a shed. The buildings on the Site are located outside of the proposed Project Footprint.

The area proposed to be licensed is approximately 18.0 hectares (ha) (44.5 acres) with 8.7 ha (21.5 acres) proposed for extraction. The pit is proposed to operate above and below the water table. The proposed maximum annual extraction limit is 1,000,000 tonnes per year.

Above water aggregate extraction is expected to begin in the northeast portion of the Extraction Limit and progress in a general southwesterly direction. The opposite direction is proposed for below water extraction; initiating in the western area of extraction limit and proceed to the northeast. Below water extraction is only proposed for the western part of site. The Site will be extracted to a maximum depth of 304.0 metres above sea level (masl) for below water, and 323.0 masl for above water extraction.

The proposed expansion will not contain any processing, washing, or recycling on the site. There will be no water taking (e.g. dewatering or pumping) on site. Materials will be extracted via excavators and dragline (for below water extraction), stockpiled within the extraction area and then shipped, via highway trucks, for processing to the Aberfoyle Pit (License #5520).

A total of seven acoustic berms and one noise barrier will be located on the Site, some of which will require vegetation removal to facilitate installation.

Access to the Anthony Pit will be via an existing driveway that meets Victoria Road South on the northeast corner of the Site. The first section of the driveway will be shared with the property owner. Afterward, the pit access road will branch from the main residence and extend southwest, passing between two sections of the Mill Creek Puslinch Provincially Significant Wetland (PSW) and entering areas of the property that are currently being used for agricultural row crops and recreation.

4 Methods

4.1 Background Review

Background data were reviewed to identify natural heritage features, including habitat of endangered and threatened species on the Site and Adjacent Lands. The following information sources were reviewed:

- MNR Geospatial Ontario datasets (2025) (Geospatial Ontario Datasets [GEO], 2025)
- Natural Heritage Information Centre (NHIC) online database (MNR 2025a)
- Ontario Amphibian and Reptile Atlas (Ontario Nature 2020)
- Atlas of the Breeding Birds of Ontario (Cadman et al. 2007)
- Atlas of the Mammals of Ontario (Dobbyn 1994)
- Ontario Butterfly Atlas (MacNaughton et al. 2022)
- Grand River Conservation Authority Regulation Mapping (GRCA 2024)
- County of Wellington Official Plan (Wellington County 2024)
- The Ecosystems of Ontario, Part 2: Ecodistricts (Wester et al. 2018)
- Great Lakes Conservation Blueprint for Terrestrial Biodiversity (Henson et al. 2005)
- Fisheries and Oceans Aquatic SAR Maps – Ontario Southwest Map 17 (DFO 2024)
- Data collected during field investigations

4.2 Species at Risk Screening

For this assessment, habitat of endangered and threatened species includes those listed on SARO under the ESA, 2007 (Government of Ontario 2007). Only species listed as threatened or endangered and their habitats are afforded protection under this Act.

Searches were conducted during field investigations (described in Section 4.3) for suitable habitat and signs of SAR. Habitat suitability was assessed in the field based on known species-specific habitat preferences.

The potential for SAR to occur on the Site and Adjacent Lands was determined based on one of the following criteria:

a) presence of suitable habitat on the Site and Adjacent Lands
b) records of the species in the vicinity of the Site and Adjacent Lands from background sources
c) range overlap with the Site and Adjacent Lands

4.3 Field Investigations

Field investigations were conducted at the Site as well as on the section of Adjacent Lands that are part of the Property. Permission to enter the remaining Adjacent Lands was not obtained and therefore were assessed from the property boundary, through air photo interpretation and from data collected from the background review.

Field surveys were carried out in 2022, 2023, and 2024. Surveys included characterizing and mapping vegetation communities, botanical inventories (three-season) and targeted studies such as: black ash survey, wetland delineation, amphibian call count surveys, salamander surveys (egg mass, eDNA, minnow trap), turtle basking surveys, bird surveys (breeding bird, nocturnal bird acoustic, winter raptor), bat surveys (habitat assessment, acoustic), terrestrial insect surveys and headwater drainage feature assessment.

A summary of field studies is provided in Table 1 and detailed methods are described in the following sections. Incidental wildlife observations were documented during each site visits.

Table 1 Field Surveys Completed for the Project

Survey Type	Survey Date	Surveyor
Vegetation Surveys		
Ecological Land Classification (ELC) Survey and Botanical Inventory	May 19, 2022 September 9, 2022 September 29, 2022 June 2, 2023 July 17, 2024	J. Ball B. Miller B. Miller B. Miller J. Ball
Black Ash Survey	June 10, 2024 July 17, 2024	M. Straus J. Ball
Wetland Delineation and Soil Assessment	October 24, 2024 November 8, 2024	J. Ball J. Ball
Herpetofauna Surveys		
Amphibian Call Count Surveys	April 14, 2022 May 10, 2022 June 15, 2022	J. Ball, K. Ellis J. Ball, L. Marshall J. Brooks, K. Ellis
Salamander Egg Mass Survey	April 14, 2022	J. Ball, K. Ellis
Salamander eDNA Survey	May 19, 2022	A. Taylor, D. Eusebi
Salamander Minnow Trap Surveys	March 25-27, 2024 April 1-2, 2024	J. Ball, M. Straus J. Ball, M. Larson

Survey Type	Survey Date	Surveyor
Turtle Basking Surveys	April 22, 2022 April 29, 2022 May 5, 2022 May 19, 2022 May 30, 2022 June 10, 2022	J. Ball M. Straus M. Straus J. Ball L. Marshall L. Marshall
Bird Surveys		
Breeding Bird Surveys	May 30, 2022 June 10, 2022 June 21, 2022	L. Marshall L. Marshall J. Brooks, K. Ellis
Nocturnal Bird Acoustic Surveys	March 18 – April 15, 2022	L. Marshall
Winter Raptor Surveys	March 4, 2022 March 18, 2022	M. Straus L. Marshall
Bat Surveys		
Bat Habitat Assessment	March 4, 2022	M. Straus
Bat Acoustic Surveys	June 3 – June 25, 2022	J. Randall
Insect Surveys		
Terrestrial Insect Surveys	June 2, 2022 July 28, 2022 September 1, 2022	A. Taylor J. Brooks J. Brooks
Aquatic Surveys		
Headwater Drainage Feature Assessment	March 18, 2022 (Visit 1) April 14, 2022 (Visit 1, continued)	L. Marshall J. Ball, K. Ellis

4.3.1 Ecological Land Classification

Ecological Land Classification (ELC) was used to identify and map natural and anthropogenic vegetation communities on the Site and Adjacent Lands. The results were used to inform the presence of rare vegetation communities, including other candidate significant wildlife types and habitat of endangered and threatened species. Identification and mapping of vegetation communities was completed following the ELC System for Southern Ontario (Lee et al. 1998). The ELC codes used follow the updated 2008 ELC naming convention. ELC mapping was completed to vegetation type, where possible.

Before undertaking field surveys, vegetation communities were mapped using aerial imagery, with boundaries delineated in ArcGIS. The field inventories were completed over three seasons (spring, summer, fall) and included verifying and refining the boundaries mapped during the desktop exercise. In the ELC system, community boundaries are delineated according to guidance that designates the outer 10 m as a transitional buffer strip (Government of Ontario, 2017). This method is different from the

Ontario Wetland Evaluation System (OWES) described in Section 4.3.4 and may result in minor boundary inconsistencies when features are overlaid using both systems.

The surveys were completed on the Property, which included the Site and a portion of Adjacent Lands. The remaining Adjacent Lands were assessed from the property boundary and through air photo interpretation. Vegetation field studies were completed on May 19, September 9, and September 29, 2022; June 2, 2023; and July 17, 2024.

4.3.2 Botanical Inventory

A three-season botanical inventory was completed to survey for plant species with different phenology (e.g., spring ephemerals, midsummer wildflowers, fall wildflowers). Botanical inventories on the Property were conducted concurrently with ELC surveys between 2022 and 2024.

All vascular plants observed in each vegetation community were recorded using the common name and scientific nomenclature from the provincial Ontario Species List provided by the NHIC (MNR 2025b). Conservation status of plant species was used to identify species of conservation concern (SOCC) and habitats for endangered and threatened species, based on the following criteria:

- Provincial Status: provincial rankings assigned by the NHIC (MNR 2024b), COSSARO and Species at Risk in Ontario List (SARO) under the ESA.
- Federal Status: Federal rankings were based on the Committee on the Status of Endangered Wildlife in Canada Committee (COSEWIC) and SARA.

Additionally, the Significant Plant List for Wellington County (City of Guelph 2012) was used to identify if plant that are ecologically important, rare, or at risk, to the local Guelph region occur on the Site or on Adjacent lands.

A floristic quality assessment was also completed to determine the level of disturbance and overall quality of the vegetation communities. Identification of potentially sensitive native plant species is based on their assigned coefficient of conservatism (CC) value, as determined by Oldham et al. (1995). This CC value, ranging from 0 (low) to 10 (high), is based on a species' tolerance of disturbance and fidelity to a specific natural habitat. Species with a CC value of 8, 9 or 10 generally exhibit a high degree of fidelity to a narrow range of habitat parameters.

4.3.3 Black Ash Survey

Black ash were recorded during botanical inventories completed between 2022 and 2024. Additional targeted surveys were completed on the Property on June 10 and July 17, 2024 based on new conditional exemptions and assessment guidelines developed by MECP.

Black ash was listed as endangered on the SARO List (O. Reg. 230/08) under the ESA in January 2022. Its protection under the ESA was suspended for two years but reinstated on January 25, 2024. Conditional exemptions were developed and prescribed under a new regulation (O. Reg. 6/24) with

O. Reg. 832/21 amended (through O. Reg. 7/24) to define black ash habitat. Black ash is protected under the ESA if it is a living tree, healthy, ≥8 centimetres (cm) in diameter at breast height (DBH) and located in an area identified in Schedule 1 of O. Reg. 6/24. The Project is within the area of the province where black ash is protected.

A health assessment for black ash was completed on the Property in accordance with O. Reg. 6/24, per the "Black Ash Assessment Guidelines: Assessment of Black Ash (*Fraxinus nigra*) for the purposes of the Endangered Species Act, 2007" (MECP 2024). The health assessment followed these requirements:

- **Size**: if the tree is <8 cm DBH an assessment is not completed.
- **Timing of Assessments**: to be completed during the leaf-on season between June 1 and October 1.
- **Assessing Canopy Condition**: examine signs of thinning, defoliation and dieback and assign a rating using the five-point canopy condition rating system.
- **Assessing Emerald Ash Borer (EAB) Infestation**: assess the presence and severity of EAB infestation based on direct observations of adult or larval life stages, EAB exit holes, and larval galleries. Where past or current infestation is identified, the severity is classified as low, medium or high based on one or more of the listed criteria.
- **Assessing other Possible Health Stressors**: identify and assess other factors that may be contributing to the condition of the tree, such as pathogens or pests, competition, poor habitat quality, low relative crown class, drought conditions, effects of wind exposure, injuries and site degradation (e.g., soil compaction) caused by human activities. The severity of the impact of those factors is classified as low, medium and high based on the criteria listed.
- **Health Determination**: provide a determination as to whether the tree is significantly declining or exhibiting the effects of a significant decline in health using the canopy condition ratings (1 through 5). In general rankings of 1 to 3 are considered healthy, particularly if mortality is not expected within a five-year period. Unhealthy trees include ratings of 3 to 5 if mortality is likely within a five-year period).

Under O. Reg. 832/21, black ash habitat is defined as the area within a radial distance of 30 m around each black ash tree. Damage and destruction are prohibited in black ash habitat to protect and maintain essential habitat conditions (the critical root zone) around each healthy tree.

4.3.4 Wetland Delineation

Provincial mapping (GEO 2025) indicates that the boundaries of the wetlands on the Site were last reviewed in 2009. The boundaries were subsequently re-assessed in the field in 2024.

Where Project components (e.g., access road, Extraction Limit, Acoustic Berms) were located adjacent to wetlands, a detailed wetland field delineation was completed. Delineation methods were based on the protocols outlined in the OWES Southern Manual (MNRF 2022). In general, where greater than 50% of the vegetation cover consists of wetland species as described by OWES, the community is considered wetland. The assessment is performed from upper (e.g., canopy and sub-canopy) to lower (e.g.,

herbaceous ground cover) vegetation layers, as larger and longer-lived species are considered better indicators of long-term conditions (MNRF 2022). In situations where plant species do not indicate a clear boundary, additional evidence, such as the nature of the underlying substrate may also be considered (MNRF 2022).

Detailed wetland boundaries were delineated using vegetation characteristics on October 24, 2024, and supplemented by soil augering on November 8, 2024. Wetland delineation was completed outside of spring and summer period when the highest number of vegetation species may be present and identifiable, however the timing of surveys did not affect results for several reasons:

- The majority of wetland habitat on site, and the entire PSW consisted of treed swamp habitats with tree cover that could be assessed during the late site visits.
- Several of the wetlands were confined to clearly defined basins or depressions in the ground. Therefore, the boundary was applied at the top of the depression unless vegetation cover indicated otherwise.
- Soil augering was conducted to support wetland delineation in areas where vegetation and topographic characteristics were inconclusive; locations are shown on Figure 3 (Appendix A).

Detailed wetland boundaries were recorded in the field using a high-accuracy (<60cm) Trimble Catalyst GPS (Global Positioning System) Unit connected to the ArcGIS Field Maps application.

This wetland delineation process differs from ELC boundary delineation (as described in Section 4.3.1) where a transitional boundary is not acknowledged. Wetland boundaries located on Adjacent Lands were delineated using air photo interpretation, observations made from the Property boundary and using the ELC protocol; these boundaries were not surveyed with a high-accuracy GPS.

4.3.5 Amphibian Call Count Surveys

Amphibian call count surveys were completed in 2022, following the Marsh Monitoring Program protocol (Bird Studies Canada 2009). Eight (8) stations were surveyed, as shown on Figure 3, Appendix A.

Surveys were completed from 30 minutes after sunset to midnight on evenings with minimum temperatures of 5 degrees Celsius (°C) in April, 10°C in May, and 17°C in June, and a maximum wind speed of 3 on the Beaufort Scale. Each survey station was a 100 m radius semicircle where surveyors listened for calling frogs and toads for three minutes. The approximate location and direction of calling toads were recorded, and call levels were classified into three categories: 1, 2, or 3. Level 1 indicates that individuals could be counted, and calls were not simultaneous. Level 2 denotes that calls are distinguishable but with some simultaneous calling. Level 3 indicates a full chorus where calls are continuous and overlapping. Toads and frogs calling from outside of the survey stations were also recorded. Survey dates, times, weather conditions, and surveyors are provided in Table 2.

Table 2 Amphibian Call Count Survey Dates, Times, and Weather Conditions

Survey	Date	Time (24 hr)	Temp (˚C)	Wind (Beaufort Scale)	Cloud (%)	Precipitation (Current/Last 24 hours)	Surveyors
1	April 14, 2022	20:33 – 21:14	8	2	0	None / none	J. Ball, K. Ellis
2	May 10, 2022	21:03 – 21:54	13	3	5	None / none	J. Ball, L. Marshall
3	June 15, 2022	21:33 – 22:00	25	2	0	None / none	J. Brooks, K. Ellis

4.3.6 Salamander Surveys

4.3.6.1 Salamander Egg Mass Survey

Wetlands on the Property were surveyed on April 14, 2022 for terrestrial mole salamander (*Ambystoma* sp.) egg masses. Based on background records and the presence of suitable habitat, potential mole salamander species present on the Property include Blue-spotted Salamander (*Ambystoma laterale*), Spotted Salamander (*Ambystoma maculatum*), and the endangered Jefferson Salamander (*Ambystoma jeffersonianum*). Mole salamanders lay their eggs in small clumps attached to submerged sticks or plant stems in early spring (March and April).

Ecologists walked around the perimeter of wetlands where pooling water occurred to search for egg masses in suitable habitat on the Site and Adjacent Lands within the following ELC communities (described further in Section 6.1): deciduous swamp communities (SWDM3-3a, SWDM3-3b, SWDM3-3c, SWDM3-3d, SWMO1-1), marsh communities (MAMM1-12) and shallow aquatic communities (SAS, SA). Polarized glasses were used to improve visibility of underwater features. Surveyors limited entry to the wetlands to the extent possible to reduce potential impacts to the egg masses and adult salamanders. Binoculars were used to locate potential egg mass attachment sites that were further from the edge of wetlands. Egg mass size, shape, and conditions were recorded to help with species identification.

4.3.6.2 eDNA Survey

An environmental DNA (eDNA) survey to detect the potential presence of Jefferson Salamander was completed on May 19, 2022, at nine (9) sample locations in four (4) wetlands and ponds on the Property (Figure 3, Appendix A). To optimize capture of eDNA, the survey was scheduled to coincide with larval activity in the pools, prior to larvae metamorphizing and leaving wetland in late summer/early fall. The study design accounted for the possibility that Jefferson Salamander populations, if present, may occur at low densities, resulting in low and patchy eDNA distribution. The design follows guidance from Advice on the Use of Targeted Environmental DNA (eDNA) Analysis for the Management of Aquatic Invasive Species and Species at Risk (DFO 2021).

Three composite samples (A, B, C) were collected from each sample location to further optimize the capture of eDNA. For each composite sample, three sub-samples were collected using a polypropylene sampling container affixed to a telescopic pole. Sub-samples were pooled in a bucket (approximately 4 litres (L) total) before being pumped through a Smith-Root Self-Preserving filter (PES 1.2 microns (µM) mesh size) using a portable peristaltic pump powered by a cordless drill (i.e., one bucket per composite sampling location). Filtration was completed following the filter manufacturer's instructions. Water temperature and pH were measured at each sample site.

For all composite samples, filtration volume was limited to approximately 1 L to avoid concentrating compounds in the water that could inhibit eDNA analysis; Stantec has encountered inhibition during previous eDNA surveys when filtering larger water volumes, and this can result in false negatives. The amount of water pumped through filters was recorded for each composite sample. At some sites, due to suspended particulates in the water, it was not possible to filter 1 L of water through the pump (i.e., the filter became clogged). One negative control sample of filtered distilled water was also collected in the field to test for quality control during collection, handling, and transport to the testing laboratory. Once filtration was complete, the seal of the filter was partially opened, and the pump was run for one minute to air dry the self-preserving filter membrane. After the filter was dried, the filter was sealed in a sterile bag and shipped to the lab for processing within 24 hours of sampling. A multi-species test (metabarcoding) for freshwater vertebrates was completed to detect Jefferson Salamander and/or a Jefferson Salamander dependent unisexual hybrid. Stantec submitted filters to NatureMetrics for eDNA processing as they are a qualified lab specializing in eDNA wildlife metabarcoding analyses in Canada.

Quality Assurance and Quality Control

Standardized sample collection, filtration, handling, and shipment procedures were implemented by experienced field staff to protect the integrity of eDNA collected and avoid degradation. Samples were collected in sterile containers, were filtered on the same day as their collection, and stored in a dark cooler prior to filtration to avoid potential eDNA breakdown due to elevated air temperatures and/or ultraviolet (UV) exposure in intense sunlight. To prevent cross contamination, clean nitrile gloves were used between wetlands and new sampling supplies (i.e., filters and filter tubes, sampling containers, buckets) were used for each sampling site. The sample pole and any other re-used equipment in contact with water (e.g., boots) were sterilized with a 1% bleach solution between wetlands.

4.3.6.3 Salamander Trapping Surveys

Salamander trap surveys were completed in wetlands where eDNA results showed the presence of salamanders. Trapping was completed following methods outlined in the Sampling Protocol for Determining the Presence of Jefferson Salamanders (*Ambystoma jeffersonianum*) in Ontario (Jefferson Salamander Recovery Team 2013). Un-baited minnow traps were placed along the edges of the wetland pools where water was sufficiently deep to submerge the trap to the opening, but with at least 2 cm of space in the trap to allow animals to breathe. Minnow traps with square shaped galvanized 6”x6” (inches) mesh were used to prevent salamanders from getting stuck in the mesh. Sampling sites were chosen near potential egg mass attachment areas, where present. Traps were tethered with a rope and tied to a tree or branch.

Minnow traps were set in the evenings of March 25 and 26, and April 1, 2024 on evenings when salamander movement was expected to be high (i.e. during warm and wet weather). The traps were set just prior to dusk and checked/emptied no more than one hour after sunrise the following morning, and always within 12 hours of deployment. The minnow traps were removed from wetlands on nights when sampling was not taking place. The number of individuals trapped or trapping nights were limited to a maximum of 20 salamanders from each feature. To reduce the likelihood of trampling or disturbing salamanders, staff avoided entering wetlands and exercised caution while walking around and between potential breeding habitats.

Salamander Handling

Salamanders were handled according to Ontario Species at Risk Handling Manual: For Endangered Species Act Authorization Holders (MNRF 2013). Salamanders were handled with nitrile gloves that had been moistened with water from the source wetland/pond. Time spent handling each individual salamander was kept as short as possible. Salamanders were placed in a secure container on a paper towel soaked with water from the source wetland/pond until they were sampled.

Tissue Sampling

Salamanders in the traps were identified to species whenever possible. Tissue samples (i.e., tail clippings) were collected from salamanders that were suspected Jefferson Salamanders or their dependent unisexual hybrids. Tissue sampling involved the removal of a small portion of the tip of the salamander's tail (no more than 5 millimetres (mm)), which was placed in 70% ethanol. Tail samples were clipped using surgical scissors, which were sterilized with alcohol between each specimen.

Each tissue sample collected was given a unique identifying code and submitted to Dr. Jim Bogart's laboratory at the University of Guelph for genetic analysis.

4.3.7 Turtle Basking Surveys

Turtle basking surveys were completed at two ponds on the Site: SA and SAS (Figure 3, Appendix A). Basking surveys generally followed the Survey Protocol for Blanding's Turtle *(Emydoidea blandingii)* in Ontario (MNRF 2015). Weather conditions were clear, and temperatures were above 10°C to improve probability of detection at each pond. Surveys were completed on six (6) dates between late April and early June, as turtles are more likely to bask when air temperatures are warmer than water temperature. Each survey consisted of visually scanning the ponds (both with the naked eye and with binoculars) for up to 45 minutes to check for turtle activity and active basking sites. Survey dates, times, weather conditions, and surveyors are provided in Table 3.

Table 3 Turtle Basking Survey Dates, Times and Weather Conditions

Survey	Date	Time (24 hr)	Temp (˚C)	Wind (Beaufort Scale)	Cloud (%)	Precipitation (Current/Last 24 hours)	Surveyors
1	April 22, 2022	14:11 – 15:30	10-12	1	5	None/Rain	J. Ball
2	April 29, 2022	10:45 – 11:45	7-10	3	10	None/Rain	M. Straus
3	May 5, 2022	13:39 – 14:30	13-14	2	25	None/Rain	M. Straus
4	May 19, 2022	13:05 – 14:08	16	3	40-80	None/Rain	J. Ball
5	May 30, 2022	10:00 – 10:50	20-23	1	50	None/none	L. Marshall
6	June 10, 2022	10:00 – 10:45	11-13	1	0	None/Rain	L. Marshall

4.3.8 Breeding Bird Surveys

In 2022, breeding bird surveys were completed in all habitats following established protocols such as the Ontario Breeding Bird Atlas (Cadman et al. 2021) and the North American Breeding Bird Survey (ECCC 2018). Surveys were completed by traversing the Property on foot between sunrise and 10:00 a.m. All bird species seen or heard were recorded. A conservative approach to determining breeding status was taken; all birds seen or heard in appropriate habitat during the breeding season were assumed to be breeding. Survey dates, times, weather conditions, and surveyors are provided in Table 4.

Table 4 Breeding Bird Survey Dates, Times and Weather Conditions

Survey	Date	Time (24 hr)	Temp (˚C)	Wind (Beaufort Scale)	Cloud (%)	Precipitation (Current/Last 24 hours)	Surveyors
1	May 30, 2022	05:56 – 10:00	17-23	1	50	None / none	L. Marshall
2	June 10, 2022	06:00 – 10:00	11-16	1	0	None / Rain	L. Marshall
3	June 21, 2022	07:02 – 09:56	25	2	0	None / none	J. Brooks, K. Ellis

4.3.9 Nocturnal Bird Surveys

In 2022, six (6) ARUs were deployed in treed habitat, on edges of treed habitat, and within a hedgerow. The ARUs were programmed to record nocturnal birds (specifically Great Horned Owl and Eastern Screech-Owl) and began recording one hour after sunset for six hours each night. Units operated between this timeframe each night between March 18 and April 15, 2022. Locations of ARUS are shown on Figure 3, Appendix A.

Acoustic data were analysed using Audacity software, a multi-track audio editing and processing program. Recordings were loaded into the software and viewed in spectrogram form to assist with the visual detection of vocalizations of target species. The frequency range to detect owls was set from 516 and 1051 Hz and time was set to one second intervals. Window size was set to 1024 and type was set to Hann. Recordings that were made during evenings when heavy rain fell, or when wind speeds that exceeded 3 on the Beaufort scale were excluded from analysis.

Audio recordings were analyzed by visually scanning and "spot-checking" areas of interest (i.e., visual inconsistencies) within an audio file's spectrogram display. An audio file was loaded into Audacity, the spectrogram settings were applied, and areas of interest were visually identified. Great Horned Owl and Eastern Screech-Owl vocalizations appear prominently on a spectrogram, particularly if the bird is close to the ARU while vocalizing. The vocalizations of each species appear as easily identifiable visual markers and therefore, rapid visual scans and confirmation using Audacity's playback feature was the method used most frequently in this analysis.

A random subset of ten days was chosen for analysis. If an owl vocalization was detected, the next six nights of recordings were skipped, and analysis resumed with the recording taken seven nights after the initial vocalization. If no owl vocalizations were observed within the subset of ten days, owls were considered absent from the area in which the ARU had been deployed.

4.3.10 Raptor Surveys

Two winter raptor surveys were completed on the Property in 2022. The Property was traversed on foot and raptor behaviour (e.g., perching, hunting, interacting with other birds) was recorded. The surveys were completed during late winter when leaves were not yet present on trees to improve detectability of stick nests in forest communities. During breeding bird surveys, any raptors seen or heard were recorded.

Survey dates, times, weather conditions and surveyors are provided in Table 5.

Table 5 Raptor Survey Dates, Times and Weather Conditions

Survey	Date	Time	Temp (˚C)	Wind (Beaufort Scale)	Cloud (%)	Precipitation (Current/Last 24 hours)	Surveyors
1	March 4, 2022	10:00 – 13:00	-3 to -1	4	0	None/None	M. Straus
2	March 18, 2022	09:00 – 12:15	8 to 16	1	100-50	None/None	L. Marshall

4.3.11 Bat Maternity Roost Suitability Survey

Results of the ELC survey was used to identify areas with potential bat maternity roost habitat (for both SAR and SWH) on the Site and Adjacent Lands. Forest, woodland and swamp communities on the Site and Adjacent Lands were considered potential SWH for bat maternity roost colonies (ELC codes: FOD, FOM, FOC, WOD, WOM, WOC, SWD, SWM, SWC). Detailed bat roost suitability surveys were not completed for areas that are not anticipated to be impacted by the Project. Therefore, a snag density calculation was not completed as prescribed in the Ecoregion Criteria (MNRF 2015) for SWH. Instead, SWH for bat maternity roost colonies was assumed present in these ELC communities on the Site and Adjacent Lands.

Candidate bat SAR habitat includes the ELC communities noted for SWH above (e.g., FO, WO, SW) but also may include hedgerows, thickets (THD), and plantations (TAG), if suitable roosting trees are present.

A maternity roost assessment was completed on March 4, 2022 for trees with a DBH >10 cm to identify trees that may be suitable for bat maternity roosts within the proposed vegetation clearing zone, which consisted mainly of hedgerows and some thickets.

The following were recorded for each assessed tree:

- geographic coordinates (UTM)
- tree species
- DBH
- tree height
- presence of cavity, loose bark, crack or knot hole
- cavity height
- tree height and DBH relative to trees in the surrounding landscape
- canopy open/closed
- presence of other candidate roost trees in vicinity
- decay class category (early, category 1-3 or late, category 4 - 6)

Bat roost tree suitability was determined using guidance from MNR's Survey Protocol for Species at Risk Bats within Treed Habitats: Little Brown Myotis, Northern Myotis & Tri-coloured Bat, April 2017 (MNRF 2017). Snag trees suitable for Little Brown Myotis and Northern Myotis were those in an early state of decay with loose bark, or at least one cavity, crack, knot or leaf cluster. Roost trees suitable for Tri-coloured Bat included oak trees over 10 cm DBH, sugar maple trees over 25 cm DBH, and sugar maple trees over 10 cm DBH that also include a dead/dying leaf cluster. According to MNR guidance, an ELC ecosite can qualify as suitable bat SAR maternity habitat regardless of the number of maternity roost trees per hectare. Since the completion of the surveys in 2022, three additional bat species were added to the ESA – Eastern Red Bat, Hoary Bat and Silver-haired Bat (referred to collectively as migratory SAR bats).

It should be noted that MECP provided Stantec with two (2) new draft interim guidance documents for bat treed habitats in the time since this survey was performed:

- Species at Risk Bats Survey Note 2022 (MECP 2022a)
- Maternity Roost Surveys (Forests and Woodlands) (MECP 2022b)

The development of these draft guidance documents was primarily based on Bat and Bat Habitat: Guidelines for Wind Power Projects (MNR 2011). Upon reviewing the new guidance, it was determined that the collected data fulfilled the requirements.

Survey dates, times, weather conditions, and surveyors are provided in Table 6. The results of the suitability surveys were used to determine the locations of bat acoustic monitoring stations.

Table 6 Bat Maternity Roost Suitability Survey Dates, Times and Weather Conditions

Survey	Date	Time	Temp (˚C)	Wind (Beaufort Scale)	Cloud (%)	Precipitation (Current/Last 24 hours)	Surveyors
1	March 4, 2022	12:30 – 15:30	-3 to -2	5	0	None/None	M. Straus

4.3.12 Bat Acoustic Surveys

Five (5) autonomous recording units (ARUs) were deployed in treed habitat on the Property from June 3 - 25, 2022. ARUs were moved from their initial locations to new locations on June 14 where they remained until June 25, 2022. Locations of ARUs are shown on Figure 3, Appendix A.

The acoustic data were analysed using Kaleidoscope Pro software by Wildlife Acoustics. The data processing though Kaleidoscope Pro involves running the software's automatic identification, which screens out noise files and provides a suggested species for each bat call file. Where possible, calls were identified to species, or a group of similar species. For calls that were identified as bats that were not SAR (Big Brown Bat), the automatic species identifications (IDs) were used. Calls that were identified as SAR (Northern Myotis, Tri-colored Bat, Eastern Small Footed Bat, Eastern Red Bat, Hoary Bat, and Silver-haired Bat) were reviewed by a qualified biologist to confirm the identification as follows:

- If the identification was given a match ratio (percentage of pulses matching the auto classification result) over 60%, and there were >5 pulses, the manual ID was used.
- For calls with ≤5 pulses, the call was given an identification of 'high frequency unknown' (HiF), as these short calls do not have enough information to provide a reliable identification.
- A subset of the remaining calls identified as bat SARs were manually reviewed.

In some cases, species cannot reliably be identified based on the quality of the call. Where a call was reviewed and determined to be in the *Myotis* genus, but a species ID was not possible, it was categorized as *Myotis* species. In other instances, if a call was manually reviewed and of a high frequency (>35khz), and thus potentially representative of a SAR bat, it is categorized as HiF. The HiF category includes *Myotis* species, as well as Eastern Red Bat.

4.3.13 Terrestrial Insect Surveys

Three (3) surveys for damselflies, dragonflies and butterflies were completed in 2022, one in each of June, July and September. Surveys were completed under gentle or moderate breeze conditions, on warm days (>15°C), and when the sun was overhead (approximately 10:00 am to 4:00 pm). Species were identified at a distance using binoculars or captured using an aerial net and identified in the hand where required.

Surveys were completed by walking through the Property and recording species encountered. Emphasis was placed on areas where insects were likely to concentrate such as woodland edges, meadows, nectar plants, wetland or open water or habitat containing butterfly larval host plants. Targeted nighttime moth surveys were not conducted.

Survey dates, times, weather conditions, and surveyors are provided in Table 7.

Table 7 Terrestrial Insect Survey Dates, Times and Weather Conditions

Survey	Date	Time (24 hr)	Temp (ºC)	Wind (Beaufort Scale)	Cloud (%)	Precipitation (Current/Last 24 hours)	Surveyors
1	June 2, 2022	12:00 – 14:00	18	3	75	None/None	A. Taylor
2	July 28, 2022	13:25 – 15:25	26	4	50	None/Rain	J. Brooks
3	September 1, 2022	12:50 – 14:50	20	3	0	None/None	J. Brooks

4.3.14 Incidental Wildlife and Plant Observations

Incidental wildlife and plant observations were recorded by staff during all field investigations.

4.3.15 Headwater Drainage Feature Assessment

Stantec applied the Evaluation, Classification and Management of Headwater Drainage Features (HDF) Guidelines (TRCA and CVC 2014) to the Site. The HDF Guidelines (TRCA and CVC 2014) are to be applied to any drainage feature that is:

- part of the drainage network (i.e. drainage channels that are identified from aerial photography, and/or drainage lines result from ArcHydro analysis), or
- a groundwater seepage area or spring, or

- a connected headwater wetland (a surface outlet connects to downstream), and
- not a mapped or known perennially flowing stream.

Desktop sources were searched in accordance with the Evaluation, Classification and Management of Headwater Drainage Features Guidelines (TRCA and CVC 2014). No mapped watercourses are present on the Site (GEO 2025, GRCA 2024). No headwater drainage features are visible in aerial photographs (Google 2024) on the Site or portion of the Adjacent Lands on the Property. A field survey was completed during the first window (late March to Mid April) identified in the Guidelines (TRCA and CVC 2014) to confirm the findings of the desktop search. Details of the survey are summarized in Table 8. No HDF were observed during the first visit and therefore no subsequent visits were completed to search for HDF as per the guidelines (TRCA and CVC 2014).

Table 8 Headwater Drainage Feature Assessment Dates, Times, and Weather Conditions

Survey	Date	Time	Temp (ºC)	Wind (Beaufort Scale)	Cloud (%)	Precipitation (Current/Last 24 hours)	Surveyors
1	March 18, 2022	09:00 – 12:15	8 to 16	1	50 to 100	None/None	L. Marshall
1 (continued)	April 14, 2022	15:30 - 20:30	8	2	0	None/None	J. Ball K. Ellis

4.4 Analysis of Significance and Impact Assessment

An analysis of significance was conducted to assess whether significant environmental features or SAR are present or have moderate or high potential to be present on the Site and Adjacent lands. This was completed using the results derived from the background review and field investigations and analyzed using the relevant guidance for each feature or habitat type being assessed, as outlined in Section 7.

The potential impacts of the proposed extraction operations on significant features were then identified through analysis of field survey data in conjunction with findings from hydrogeological studies. These results were then used to develop preventive, mitigative and remedial measures aimed at avoiding net effects to the surrounding natural features.

5 Background Review Results

5.1 Local Context

The Site and Adjacent Lands are in Ecoregion 6E (Lake Simcoe-Rideau Ecoregion), and more specifically the Ecodistrict of 6E-1 (Stratford) (Wester et al. 2018). This Ecodistrict consists of smooth clay areas and gently rolling till moraines, known as the Stratford Till Plain and the Oxford Till Plain. The land use in this Ecodistrict is predominately agriculture with cropland constituting a large portion of the land cover (44%). Other land uses include gravel pits, quarries, and settlement areas. Sixteen percent (16%) of the Ecodistrict remains as natural cover, of which 50% is comprised of till moraine and till plain forest complexes, and 34% is comprised of wetland, primarily swamp.

5.2 Topography and Drainage

The Site and Adjacent Lands are within the Horseshoe Moraine physiographic region. The regional topography is dominated by the Paris Moraine, a major depositional feature forming a height of land approximately 3 km northwest of the Site and Adjacent Lands. The Paris moraine, which trends in a southwesterly direction (i.e., along Maltby Road), is generally characterized as hummocky topography with ground surface elevation ranging from 345 to 365 masl.

Local topography is gently rolling. The Site and Adjacent Lands straddle the upland area between two branches of Mill Creek. Total topographic relief across the Property is approximately 7 m, ranging from approximately 329 masl at Victoria to approximately 322 masl at the south limit of the Property.

In the northern portion of the Site, overland drainage flows towards closed depressions (e.g., internally draining) and wetland areas. Infiltrated surface water in this area flows in a southwesterly direction, as groundwater baseflow, towards Aberfoyle Creek. In the southern portion of the Site, overland drainage flows in a southwesterly direction towards Aberfoyle Creek and associated riparian wetlands.

5.3 Designated Natural Features

For this assessment, designated natural features refer to those determined as significant by federal, provincial, or municipal agency mapping. Designated natural features on the Site and Adjacent Lands are shown on Figure 2, Appendix A and include:

- Wetlands that are part of the Mill Creek Puslinch Provincially Significant Wetland Complex on the Site and Adjacent Lands
- Unevaluated wetlands on the Site and Adjacent Lands
- Areas designated Greenlands in the OP and Environmental Protection in the Zoning Bylaw on the Site and Adjacent Lands

- Areas designated as Core Greenlands in the OP and Natural Environment in the Zoning Bylaw on the Site and Adjacent Lands

Refinements to the boundaries of wetlands that were identified in background mapping and on Figure 2 (Appendix A) are discussed in Section 6.5.

5.4 Species at Risk

During the review of wildlife atlas records and background data sources, records of 18 SAR (2 amphibians, 1 reptile, 6 birds, 7 mammals, and 2 plants) were identified that overlap with the Site and Adjacent Lands (Table 9). Range maps provided in the various wildlife atlases are relatively coarse in nature and do not provide precise locations or information on concentrations/densities of records.

SAR identified during the background review were assessed for their potential to occur on the Site and Adjacent Lands based on the following factors:

- records of the species in the region from background sources listed above in the previous 30 years
- range overlap with the Site and Adjacent Lands
- the presence of suitable habitat on the Site and Adjacent Lands

Habitat assessments were conducted in the field to identify suitable habitat for these species. SAR with suitable habitat and at least one recent record and/or an overlapping range on the Site and Adjacent Lands were considered to have a reasonable probability of occurring. Detailed results of the SAR screening for threatened and endangered species are in Appendix B.1 and summarized in Section 7.5.

Table 9 Species at Risk with Potential to Occur on the Site and Adjacent Lands

Species		Status			
		S-Rank	SARO	COSEWIC	SARA
Amphibians					
Jefferson Salamander	*Ambystoma jeffersonianum*	S2	END	END	END
Unisexual Ambystoma (Jefferson Salamander dependent population)	*Ambystoma hybrid pop. 1*	S2	END	END	END
Birds					
Bank Swallow	*Riparia riparia*	S4B	THR	THR	THR
Bobolink	*Dolichonyx oryzivorus*	S4B	THR	SC	THR
Chimney Swift	*Chaetura pelagica*	S4B, S4N	THR	THR	THR
Eastern Meadowlark	*Sturnella magna*	S4B	THR	THR	THR
Least Bittern	*Ixobrychus exilis*	S4B	THR	THR	THR
Red-headed Woodpecker	*Melanerpes erythrocephalus*	S3	END	END	END
Mammals					
Little Brown Myotis	*Myotis lucifugus*	S4	END	END	END
Northern Myotis	*Myotis septentrionalis*	S3?	END	END	END
Eastern Small-footed Myotis	*Myotis leibii*	S2S3	END		
Tri-coloured Bat	*Perimyotis subflavus*	S3?	END	END	UC
Eastern Red Bat	*Lasiurus borealis*	S4	END	END	UC
Hoary Bat	*Lasiurus cinereus*	S4	END	END	UC
Silver-haired Bat	*Lasionycteris noctivagans*	S4	END	END	UC
Plants					
Butternut	*Juglans cinerea*	S2	END	END	END
Smooth Yellow False Foxglove	*Aureolaria flava*	S2?	THR	THR	THR
Reptiles					
Blanding's Turtle	*Emydoidea blandingii*	S3	THR	END	END

END – Endangered

THR – Threatened

UC – Under Consideration for addition to Schedule 1 of SARA

6 Field Survey Results

6.1 Ecological Land Classification

The Site and Adjacent Lands are situated in a semi-rural setting that is typical of southern Ontario, with a mix of residential land uses, farmland and remnants of natural heritage features. The Site and Adjacent Lands include natural features such as forest and swamp communities within the Mill Creek Puslinch PSW Complex, semi-natural features such as thickets, hedgerows, and fallow meadows, and human-made features including agricultural fields and rural residences. None of the ELC vegetation communities identified on the Site and Adjacent Lands are considered provincially rare.

Vegetation communities documented during field surveys are shown on Figure 4, Appendix A, and are described in Table 10.

Table 10 ELC Vegetation Types on the Site and Adjacent Lands

ELC Type	Community Description
Constructed	
CVI Transportation and Utilities	The CVI community represents Victoria Road South.
CVR_4 Rural Property	The CVR_4 communities represent large, rural properties with residential buildings, maintained lawn and planted trees.
CVR_4 / TAGM1 Rural Property / Coniferous Plantation	The CVR_4 / TAGM1 community represents a large, rural property with a coniferous plantation. The property is located on the northeast side of the Site.
CVR_5 Trailer Park	The CVR_5 community represents the Mini Lakes Condominium Community on the Site and Adjacent Lands.
Agriculture	
OAGM1 Annual Row Crops	The OAGM1 communities in the center of the Site are comprised of row crops (e.g., corn).
OAG	The OAG community is on Adjacent Lands where access was not permitted.
Meadow	
ME Meadow	The ME communities represent meadow communities on Adjacent Lands where access was not permitted.

ELC Type	Community Description
MEMM3 Dry – Fresh Mixed Meadow	This dry to fresh open meadow area is dominated by common old field meadow species such as Canada goldenrod, grey-stemmed goldenrod, smooth brome, old field aster and white heath aster. Other common species are wild carrot, orchard grass, grass-leaved goldenrod, common timothy grass, New England aster, Kentucky bluegrass and Canada bluegrass.
MEMM4 Fresh – Moist Mixed Meadow	This small meadow is situated between two sections of SWDM3-3a (WE-1d) and SWDM3-3d (WE-1c) swamp. The ground layer is dominated by Canada goldenrod with occasional North American red raspberry. Immature seedings and saplings of common buckthorn and green ash occur occasionally.
Hedgerow	
THDM3a Dry - Fresh Deciduous Hedgerow Thicket	This section of hedgerow is dominated by dense common buckthorn and young Manitoba maple.
THDM3b Dry - Fresh Deciduous Hedgerow Thicket	This small hedgerow is next to Victoria Road South and is dominated by common lilac and common buckthorn.
THDM3-1 Buckthorn Deciduous Hedgerow Thicket	This section of hedgerow is dominated by dense common buckthorn.
FODM11 Naturalized Deciduous Hedgerow	These hedgerows along the north and south edge of the Site and Adjacent Lands are occupied by mature sugar maple with occasional bitternut hickory and black cherry. Common buckthorn is abundant in the understory level, along with saplings of common apple, basswood, Manitoba maple, white ash, sugar maple and staghorn sumac.
Thicket	
THCM2-1 Fresh - Moist White Cedar Coniferous Thicket	This area is dominated by dense eastern white cedar in the 5 to 15 m tall range. Common buckthorn shrubs and to a lesser extent white ash saplings are common at the edge of the thicket.
THD Deciduous Thicket	This THD community is a deciduous thicket community in the Adjacent Lands where access was not permitted.
THDM2 Dry - Fresh Deciduous Shrub Thicket	This thicket is next to Victoria Road South. It is sparsely to densely dominated by common buckthorn and common lilac in the understory level. Young white pine is also common in the understory. A few large open-grown sugar maple trees are present.

ELC Type	Community Description
THDM2-6 Buckthorn Deciduous Shrub Thicket	This small thicket is dominated by dense common buckthorn with associates of thicket creeper, common lilac and white elm saplings. A few larger white elm, black cherry and trembling aspen also occur.
THDM3-1 Buckthorn Deciduous Hedgerow Thicket Type	Thicket hedgerow on the southeastern edge of the Site in between the agricultural OAGM1 fields. Sub-canopy species contained common buckthorn.
THDM4 Dry - Fresh Deciduous Regeneration Thicket Ecosite	This THDM4 community is a deciduous thicket community in the Adjacent Lands where access was not permitted.
THDM4a Dry - Fresh Deciduous Regeneration Thicket	This area is dominated by regenerating sugar maple saplings with occasional shrubs of common buckthorn and saplings of white ash, black cherry, and balsam poplar. A few larger sugar maple and eastern cottonwood also occur.
THDM4b Dry - Fresh Deciduous Regeneration Thicket	This small area is dominated by regenerating sugar maple seedlings and common buckthorn shrubs.
Woodland	
FOCM6 Naturalized Coniferous Plantation	This coniferous plantation community is located on the Adjacent Lands where access was not permitted.
FODM5	Upland sugar maple deciduous forest.
FODM5-10 Dry – Fresh Sugar Maple – White Birch – Poplar Deciduous Forest	This section of upland forest surrounds a swamp community. It is dominated by sugar maple, paper birch and trembling aspen in the canopy. The understory is dominated by alternate-leaved dogwood with occasional sugar maple, white ash and trembling aspen. The ground layer contains occasional zigzag goldenrod, thicket creeper, Canada wild-ginger and enchanter's nightshade.
FODM8-1 Fresh – Moist Poplar Decious Forest Type	This forest is a mixture of upland and lowland aspen. Trembling and large-toothed aspens are dominant. Paper birch occurs occasionally. Basswood and white ash are common in the sub-canopy and understory layers. The ground layer contains species such as thicket creeper, zigzag goldenrod, poison ivy, false Solomon's seal, graceful sedge and bladder sedge.
TAGM1 Coniferous Plantation	This coniferous plantation is comprised of mid-aged white pine.

ELC Type	Community Description
WOCM1-2 Dry-Fresh White Cedar Coniferous Woodland Type	This community is located on Adjacent Lands where access was not permitted. The community is classified as an upland coniferous woodland because it is outside of the MNR PSW layer, and the white cedar tree cover was noted as relatively sparse on aerial imagery.
WOD Deciduous Woodland	These WOD Codes are deciduous woodland communities in the Adjacent Lands where access was not permitted.
WODM5-3 Fresh – Moist Manitoba Maple Deciduous Woodland	This small woodland is dominated by a semi-open canopy of Manitoba maple and occasional exotic willows. A few larger eastern cottonwood occur here as well. The ground layer is dominated by Canada goldenrod.
Wetland	
SA Shallow Water	This small area of shallow water represents a dug pond that has been stocked with bass. Emergent and submerged vegetation is limited in this feature. This pocket of wetland is dominated by a dense ground layer of variegated scouring-rush. Other ground layer associates include northern water-horehound, yellow sedge, panicled aster and grass-leaved goldenrod. Tall phragmites is also abundant in this community. Greenish sedge, golden sedge and narrow-leaved cattail occur occasionally.
SAS Submerged Shallow Aquatic	This community represents a pond on the residential property on the Site, immediately east of the SWDM3-3b swamp community. The pond contains an abundance of submerged aquatic vegetation and is surrounded by narrow-leaved cattail. Maintained lawn is directly adjacent to the north, east and south edges of the pond.
MAMM1-12 Common Reed Graminoid Mineral Meadow Marsh	This pocket of wetland is dominated by a dense ground layer of variegated scouring-rush. Other ground layer associates include northern water-horehound, yellow sedge, panicled aster and grass-leaved goldenrod. Tall phragmites is also abundant in this community. Greenish sedge, golden sedge and narrow-leaved cattail occur occasionally.
SWCM1-1 White Cedar Mineral Coniferous Swamp	This area is a mixture of upland and lowland eastern white cedar forest/swamp. The community is dominated by white cedar with few other associates. The ground layer is sparse throughout with few species such as woodland/wetland sedges and spinulose wood fern.
SWD Deciduous Swamp	Two different deciduous swamp communities on Adjacent Land where access was not permitted.

ELC Type	Community Description
SWDM3-3a Swamp Maple Mineral Deciduous Swamp	This swamp area is dominated by mature Freeman's (swamp) maple in the canopy, sub-canopy and understory. Standing water was present in the swamp in the spring. Later in the season, the ground layer was dominated by sensitive fern and marsh fern. Small-spike false nettle and northern water-horehound. Wetland sedges such as Tuckerman's sedge and hop sedge are also common throughout the ground layer.
SWDM3-3b Swamp Maple Mineral Deciduous Swamp	This swamp area is dominated by mature Freeman's (swamp) maple in the canopy, sub-canopy and understory. The exotic glossy buckthorn occurs occasionally in the understory. Standing water was present in the swamp in the spring. The ground layer was dominated by small-spike false nettle. Sensitive fern and marsh fern occur abundantly. Northern water-horehound and Tuckerman's sedge occur occasionally. The endangered black ash tree occurs sparsely in this community. Several dead black ash were also observed.
SWDM3-3c Swamp Maple Mineral Deciduous Swamp	This small area of swamp is dominated by mature Freeman's (swamp) maple in the canopy. Peach-leaved willow occurs sparsely in the canopy. The understory contains balsam poplar and blue-beech. The ground layer contains sensitive fern, marsh fern, wild sarsaparilla and dwarf raspberry. The endangered black ash tree occurs sparsely in the understory.
SWDM3-3d Swamp Maple Mineral Deciduous Swamp	This is a swamp community, and it is dominated by Freeman's (swamp) maple in the canopy cover with blue beech and balsam poplar in the understory.
SWDM4-5 Poplar Mineral Deciduous Swamp Type	This swamp community is located on the southwestern edge of the Site south of the agricultural OAGM1 field. This community is dominated by a canopy of trembling aspen with associates of paper birch, and eastern white cedar. The understory is dominated by trembling aspen saplings, chokecherry, alternate-leaved dogwood and a few black ash. The ground layer is dominated by poison ivy, thicket creeper, and graceful sedge.
SWDO2-3 Swamp Maple Organic Deciduous Swamp Type	This swamp community is on the southwestern edge of the Site, south of the agricultural OAGM1 field. This community is dominated by Freeman's swamp maple in the canopy and understory. Eastern white cedar occurs occasionally. Standing water was present in the spring of 2023. The ground layer is dominated by sensitive fern, small-spiked false nettle, marsh fern, and various wetland sedges.
SWMO1 White Cedar Organic Mixed Swamp Ecosite	This community is located on Adjacent Lands where access was not permitted. The community overlaps with the MNR PSW layer, and the community is classified as an organic cedar coniferous swamp based on the dominance of white cedar in the canopy, and the presence of a similar organic cedar swamp community identified on the Adjacent Lands (SWMO1-1).

ELC Type	Community Description
SWMO1-1 White Cedar – Hardwood Organic Mixed Swamp	This dense mixed swamp is dominated by a mixture of eastern white cedar, red maple and mature yellow birch in the canopy and sub-canopy. Tamarack and eastern hemlock occur occasionally in the canopy layers. The understory is dominated by eastern white cedar and endangered black ash (saplings). Highly invasive common and glossy buckthorns occur occasionally. The ground layer contains a diverse assortment of herbaceous species including wild sarsaparilla, bulblet bladder fern, sensitive fern, common oak fern, rough-stemmed goldenrod, common lady fern, drooping woodreed, northern starflower, yellow clintonia, wild lily-of-the-valley, two-seeded sedge, heart-leaved foamflower and bladder fern.

6.2 Botanical Inventory

The following is a floristic summary for the Site and Adjacent Lands based on botanical data collected in 2022, 2023 and 2024. A detailed vascular plant list with the scientific plant names and species' status, is provided in Appendix C.1.

- There were 190 species of vascular plants recorded, which includes taxa identified to species, subspecies (ssp.) and variation (var.) levels.
- 141 of the 190 recorded species are native to Ontario, while 49 are exotic species not native to Ontario.
- 132 of the native species recorded have a provincial rank of S5, which indicates that they are common with a secure population in Ontario.
- There are nine native species with a provincial rank of S4, which indicates they are uncommon, but not rare in the province and populations are apparently secure.
- Four regionally significant plant species (SOCC) in Wellington County were observed on the Site and Adjacent Lands:
    - Clinton's wood fern (SWMO1-1 community)
    - fringed milkwort (SWMO1-1 community)
    - chestnut sedge (SWMO1-1 community)
    - hop sedge (SWDM3-3a, SWDM3-3b and SWMO1-1 communities)
- There was one provincially endangered tree species (black ash) that was observed occasionally in the SWDM3-3b and c communities and was abundant in SWMO1-1. This species was also recorded in SWDM4-5 (see Section 6.3). All black ash are located on Adjacent lands.
- One highly sensitive plant species (coefficient of conservatism 8) was observed in the SWMO1-1 community (two-seeded sedge) on Adjacent Lands.

6.3 Black Ash Survey

Ninety (90) black ash saplings were documented in wetlands on Adjacent Lands during the botanical inventory. A summary of the black ash observations and their associated ELC wetland communities is provided below:

- SWDM3-3b (9 saplings)
- SWDM3-3c (4 saplings)
- SWDMO1-1 (64 saplings)
- SWDM4-5 (13 saplings)

All observed black ash saplings were less than 8 cm DBH; therefore, these trees do not meet the protection criteria outlined in the MECP guidance (MECP 2024) under the ESA. Saplings will receive protection from direct damage and destruction by implementing ecological buffers on wetland communities.

6.4 Woodlands

Wooded areas identified on the Site and Adjacent Lands were primarily swamps, but also included woodlands (coniferous and deciduous), coniferous plantations, and both deciduous and coniferous forests. Eight (8) woodland units (WO-1 – WO-8) were identified based on the results of the background review and field studies and are shown on Figure 5 (Appendix A).

6.5 Wetlands

Ten wetland units were identified on the Site and Adjacent Lands, as shown on Figure 6 (Appendix A). This includes four wetland segments associated with the Mill Creek Puslinch PSW Complex (WE-1a, b, c, d), three associated with unevaluated wetlands identified on background mapping (WE-2 – WE-4) and three additional wetlands identified in the field by Stantec (WE-5 – WE-7).

Wetlands occurred in depressions at the edge of agricultural fields, former aggregate lands and access roads; therefore, the delineation was based on topography in addition to the presence of wetland vegetation and soil characteristics.

The SWDM3-3a (WE-2), SWDM3-3b (WE-1b), SWDM3-3d (WE-1c), and MAMM1-12 (WE-7) communities were located at the base of relatively short and steep slopes. The delineation of these boundaries was determined based on vegetation characteristics and topography.

The wetlands in the northwest corner (SWDM3-3c [WE-1a]) and the southeast corner of the Property (SWMO1-1, SWDM4-5, SWDO2-3; WE-1d) could not be clearly delineated using vegetation characteristics and topography. Therefore, soil samples were collected in each of the communities along the gradual slopes to assess soil characteristics and soil moisture regime. These results were then used to determine wetland boundaries. Soils were comprised of sandy loam, cobble was struck at depths of 40

to 64 cm, and soil moisture regime ranged from 2 (fresh) to 5 (moderately moist). Soil sample locations are shown on Figure 3, Appendix A. The following is a summary of the soil sample characteristics and related wetland boundary determinations:

- Soil Sample 1 (WE-1a): Sandy Loam; hit cobble at 64cm; 44cm to mottles, Moisture Regime=4 (moderately moist); included in wetland boundary
- Soil Sample 2 (WE-1a): Sandy Loam; hit cobble at 40cm; no distinct mottles; Moisture Regime=2 (fresh); human made berms in area; sugar maples present; not included in wetland boundary
- Soil Sample 3 (WE-1d): Sandy Loam; hit cobble at 60cm; slight mottles at 42cm - mottles might be from hitting rocky layer; colour change at 27cm; Moisture Regime=4 (moderately moist); included in wetland boundary (northern edge)
- Soil Sample 4 (WE-1d): Sandy Loam; hit cobble at 40cm; mottles at 29cm - mottles might be based on hitting rocky layer; Moisture Regime=5 (moderately moist); included in wetland boundary
- Soil Sample 5 (WE-1d): Sandy Loam; hit cobble at 42cm; mottles at 35cm - mottles might be based on hitting rocky layer; Moisture Regime=4 (moderately moist); included in wetland boundary

The wetland boundaries delineated by Stantec (Figure 6, Appendix A) differ slightly from those delineated on MNR mapping (MNR 2024b). The methods implemented to delineate the updated wetland boundaries for the Site and Adjacent Lands are described in Section 4.3.4 and included two separate processes. OWES protocols (including soil sampling) were used to delineate wetland boundaries closest to the Site, using a high-accuracy GPS to inform setbacks. This included the two lobes along the southeastern boundary of WE-1a; the northern, western, and southwestern boundaries of WE-1b; the entire boundary of WE-2 and WE-7; the southeastern boundary of WE-1c; and the northeastern boundary of WE-1d, as shown on Figure 4, Appendix A. The remaining wetland boundaries on Adjacent Lands were delineated using ELC, background data, and air photo interpretation.

Two wetland communities (WE-5 and WE-6; Figure 6, Appendix A) are dug ponds that do not meet the OWES definition of wetlands. However, they are included here because of their wetland characteristics and the need to consider hydrologic function and wildlife habitat.

6.6 Amphibian Call Surveys

In 2022, eight amphibian call survey stations were surveyed within the Property as shown on Figure 3, Appendix A. Species and call activity levels are provided in Table 11.

Table 11 Amphibian Call Count Survey Results

Station	Date	Species				
		American Toad	Gray Treefrog	Green Frog	Spring Peeper	Wood Frog
AMP01	April 14 2022	-	-	-	3-50*	1-1
	May 10 2022	1-1	2-8, 1-1*	-	-	-
	June 15 2022	-	2-3*	-	-	-
AMP02	April 14 2022	-	-	-	-	-
	May 10 2022	-	-	-	-	1-1
	June 15 2022	-	-	-	-	-
AMP03	April 14 2022	-	-	-	-	2-8
	May 10 2022	-	-	-	-	-
	June 15 2022	-	-	-	-	-
AMP04	April 14 2022	-	-	-	3-30	1-1
	May 10 2022	1-1	1-1	-	1-5	-
	June 15 2022	-	2-5	-	-	-
AMP05	April 14 2022	-	-	-	-	-
	May 10 2022	2-4	-	-	-	-
	June 15 2022	-	1-4	1-1	-	-
AMP06	April 14 2022	-	-	-	3-20*, 3-30	2-10
	May 10 2022	-	-	-	2-15	-
	June 15 2022	-	-	-	-	-
AMP07	April 14 2022	-	-	-	-	-
	May 10 2022	-	-	-	-	-
	June 15 2022	-	1-2	-	-	-
AMP08	April 14 2022	-	-	-	2-15	-
	May 10 2022	-	1-1, 1-1	-	2-15	-
	June 15 2022	-	2-3*, 2-4	-		-

* Notes: Calling from more than 100 m from the survey station

Call activity levels: 1-1 refers to a call level of 1 with 1 individual calling

Five species of calling amphibians were recorded: American Toad (*Anaxyrus americanus*), Gray Treefrog (*Dryophytes versicolor*), Green Frog (*Lithobates clamitans*), Spring Peeper (*Pseudacris crucifer*) and Wood Frog (*Lithobates sylvaticus*). Calling amphibians were recorded at each station. Spring Peeper was the most abundant, with choruses of approximately 15 individuals within 100 m from station 8, 30 individuals within 100 m of stations 4 and 6, and approximately 50 individuals more than 100 m from station 1 in April.

Stations 1 and 4 had the highest diversity, each recording 4 of the 5 species. At stations 6 and 8, 2 of the 5 species were recorded while only one species was recorded at stations 2, 3 and 7 on a single survey date.

6.7 Salamander Egg Mass Surveys

Salamander egg masses were observed in the SWDM3-3a, SWDM3-3b swamp communities, and the MAMM1-12 marsh community. The observed egg masses most closely resembled those of Blue-spotted Salamander: egg masses laid singly or in small clusters (2-12 eggs), encased in a loose jelly envelope, and typically attached to submerged vegetation or rocks [Toronto Zoo; no date]).

In the SWDM3-3a swamp community, nine salamander eggs masses with 3 to 13 eggs, and three areas with individual eggs were observed. Two of the egg masses were white in colour, which indicates that they were likely not viable. The ponding area in the SWDM3-3a community is approximately 200 m x 100 m with a depth around 20 cm, reaching up to 30 cm. It contains tea coloured water, a leaf-covered bottom and fairy shrimp with woody debris for egg mass attachment sites.

Approximately 42 salamander eggs masses with 2-15 eggs were observed in the SWDM3-3b swamp community. Five egg masses were white in colour, indicating that they were likely not viable. The pool in the SWDM3-3b community is approximately 300 m x 300 m in size with a depth up to 40 cm. It contains tea coloured water, a leaf covered bottom, fairy shrimp and an abundance of woody debris for egg mass attachment sites.

Two egg masses were observed in the MAMM1-12 marsh community. They were white in colour indicating that they were likely not viable. The pool in the MAMM1-12 community is approximately 20 m x 30 m in size. Horsetail provides attachment sites on the east side in shallow water, which reaches a depth of 20 cm. Phragmites is present on the west side of the community where water is up to 40 cm deep.

Results of salamander egg mass surveys are summarized in Table 12.

Table 12 Salamander Egg Mass Survey Results

Wetland Pool ID	Salamander Egg Mass Observations
SWDM3-3a	1 egg mass with 4 eggs 1 egg mass with 3 white eggs 2 egg masses with 8 and 6 eggs; one is white in colour 2 egg masses with 13 and 4 eggs; green algae present 3 eggs on leaves; approx. 20 cm deep 12 eggs on twig in 25 cm of water; green algae present 3 single eggs on twig in 25 cm of water; green algae present 2 egg masses on twigs; 8 eggs in each; approx. 40 cm deep; green algae present 1 egg mass on twigs; 8 eggs; 30 cm of water; green algae present
SWDM3-3b	3 small egg masses attached to leaves; 1 with 2 eggs, 1 with 5 eggs, 1 with 3 eggs; approx. 20cm deep 1 egg mass with approx. 10 eggs; white in colour; approx. 30 cm deep 4 egg masses on small, submerged twigs; 4 to 10 eggs in each; approx. 20cm deep 7 egg mass on a sensitive fern stem; approx. 15cm deep 6 egg masses; 4-5 eggs in each 8 egg masses; 2 with approx. 15 eggs; 2-8 eggs in others; approx. 15cm deep 8 egg masses with 3-5 eggs 3 egg masses with approx. 4 eggs; white in colour; close to edge of pool 4 eggs in each on twig; approx. 25cm deep 6 white eggs
MAMM1-12	2 egg masses with approx. 8 eggs in each; white in colour

No egg masses were observed in the SA and SAS communities. In addition, these communities are anthropogenic in nature with limited vegetation. Therefore, salamander habitat was determined to be absent from these ponds and no additional surveys (i.e., eDNA, trapping) were completed at these locations.

6.8 eDNA Survey

Twenty-two taxa were detected from the nine eDNA samples that were collected from the sample stations shown on Figure 3, Appendix A. Taxa included two unique fish, eight amphibians, eight birds and four mammals. Average taxonomic richness was 6.8 and ranged from 3 to 9. The most frequently detected taxa were Wood Frog (*Lithobates sylvaticus*), Blue-spotted Salamander (*Ambystoma laterale*) and Wood Duck (*Aix sponsa*).

Blue-spotted Salamander (*Ambystoma laterale*) was detected in seven out of the nine samples (not detected in samples 1 and 6). A unisexual salamander (*Ambystoma unisexual*) was detected in samples 3 and 9. To further investigate these findings, salamander trapping and tail clipping surveys were completed in breeding ponds 3 and 9 (see Section 6.9) to assess whether Blue-Spotted Salamander

A. laterale [LL]), Blue-spotted Salamander dominant (*Ambystoma 2-laterale jeffersonianum* [LLJ] or Jefferson Salamander dominant [LJJ]) populations were present).

Fish were identified at two stations, including an exotic introduced species belonging to the genus *Carassius* (either a goldfish; *Carassius auratus* or Prussian carp; *Carassius gibelio*) in sample 8 and Northern redbelly dace (*Chrosomus eos*) in sample 6.

6.9 Salamander Trapping Survey

Four salamanders were caught during the minnow trap survey at station B1 (eDNA station 9). Tail clip samples were collected from the four salamanders and submitted to the Bogart Laboratory at the University of Guelph for DNA analysis. The samples were identified as blue-spotted salamander dominant polyploids (LLJ and LL). The laboratory results are provided in Appendix D.

No salamanders were captured at stations A1- A10 (eDNA station 3) and no genetic results were obtained.

6.10 Turtle Basking Survey

Midland Painted Turtle was observed in the small, dug pond (ELC community SAS) on June 10, 2022 (one individual), and in the pond directly south of the residence (ELC community SA) on April 22 (one individual), April 29 (one individual), May 5, May 30 (three individuals), and June 10 (one individual), 2022. No turtle SAR were observed on the Site in 2022.

Predated turtle nests were observed in a mixture of sand and gravel on an embankment of a dry, phragmites-dominated wetland on June 14. Evidence of excavation on the embankment was also observed on June 14. The location of the predated nests and excavation are shown on Figure 7, Appendix A.

6.11 Breeding Bird Survey

During 2022 breeding bird surveys, 49 bird species were observed, 44 of which are considered likely to be breeding within the Property and one (Eastern Kingbird) that was confirmed to be breeding on the Site (i.e., Extraction Limit) in the central THDM4b community as adults were observed on a nest on two separate dates. Four species that were observed during surveys are not expected to be breeding on the Property: Canada Goose, Turkey Vulture, Ring-billed Gull, and Great Blue Heron, all of which were observed flying over the Site and Adjacent Lands and/or foraging. All bird species observed are ranked S5 (secure; common and widespread), S4 (apparently secure; uncommon but not rare), or SNA (status not applicable) during the breeding season.

During the 2022 breeding bird surveys, a single SAR, the Eastern Meadowlark, was recorded on Adjacent Lands. This species is provincially and federally designated as threatened and receives habitat protection under the ESA. Eastern Meadowlark was observed singing in a field on Adjacent Lands south of the Site. There is no suitable habitat available on the Site (row crop agriculture, no suitable grassland habitat) so Eastern Meadowlark is not expected to be present.

Two (2) SOCC, Barn Swallow and Eastern Wood-Pewee, were observed on Adjacent Lands. Barn Swallow is listed as special concern under the ESA and threatened under SARA. This species was observed foraging in agricultural communities on the Site and Adjacent Lands. Barn Swallows nest on walls or ledges of barns and on other human-made structures such as bridges, culverts or other buildings (COSEWIC 2021). No structures were found within the proposed Project Footprint, and no Barn Swallow nests were observed on the shed or bunkie. The residence was not checked for bird nests since it will not be affected by the Project.

Eastern Wood-Pewee is listed as special concern under the ESA and SARA. This species was observed singing in the SWMO1-1 and SWDM3-3d swamp communities, and in the FODM5-10, THCM2-1 and MEMM3 communities on each of the three breeding bird surveys in 2022. It is expected that the species is breeding within treed habitats on both the Site and Adjacent Lands. One of these observations was on the edge of the proposed Extraction Limit (MEMM3). Eastern Wood-Pewees do not nest in meadow habitats, so this observation is considered outside of breeding habitat. Observations are shown on Figure 7, Appendix A.

Pileated Woodpecker was observed during the breeding bird survey in the onsite hedgerows and incidentally in 2024 within woodlot edges within the Site. Although the proposed Project Footprint overlaps with the hedgerows, these areas are unlikely to provide suitable nesting habitat for Pileated Woodpecker. Furthermore, these areas were surveyed during bat habitat assessments (see Section 6.14) and there was no evidence of nesting. In 2024, evidence of past Pileated Woodpecker nesting was incidentally observed in SWDM3-3b on Adjacent Lands.

A list of birds observed during the 2022 breeding bird surveys is provided in Appendix C.2.

6.12 Nocturnal Bird Surveys

Of the six (6) ARUs that were deployed between March 18 and April 15, 2022, to record nocturnal birds, only one (1) Eastern Screech-Owl was recorded on a single ARU (NBS4) on April 7, 2022, in the SWDM3-3c swamp community. The owl was only recorded once and is considered a transient, non-breeding visitor to the Site. Owls are considered absent from the Site and Adjacent Lands within the Property. Locations of ARUs are shown on Figure 3, Appendix A.

6.13 Raptor Surveys

No raptors were observed on the Site during winter raptor surveys in 2022, which suggests that the Site and Adjacent Lands do not provide overwintering habitat. In addition, no stick nests were observed during the winter survey. Red-tailed Hawk and Turkey Vulture were observed on the Site and Adjacent Lands during breeding bird surveys conducted from late May to mid-June. However, the absence of stick nests during targeted surveys suggests that these species are likely nesting occurs outside of the Property.

6.14 Bat Maternity Roost Survey

In 2022, suitable bat maternity roost habitat for both SAR and SWH was documented in several areas within the Site and on Adjacent Lands, where access was permitted. One central swamp community and several hedgerow communities collectively contained twenty-three (23) trees with characteristics of potential bat maternity roosts.

MNR guidance states that an ELC ecosite is considered suitable maternity roost habitat for SAR bats regardless of the number of maternity roost trees per hectare. SWH, however (further discussed in Section 7.4.1), excludes hedgerows and plantations and requires >10 wildlife trees > 25 cm DBH per hectare to qualify as significant.

Details of the potential bat maternity roost trees are provided in Table 13 and shown on Figure 3, Appendix A.

Table 13 Bat Maternity Roost Tree Results

Tree Number	Tree Species	Cavities Present (y/n)	DBH (cm)	Tree Height (m)	Cavity Height (m)	Bat Maternity Roost Characteristics	ELC Community
1	American Elm	Y	25	10	8	One of the tallest trees in the community Abundance of peeling bark	Dry - Fresh Deciduous Hedgerow Thicket Ecosite (THDM3)
2	Sugar Maple	Y	85	20	7	Large DBH One of the tallest trees in the community Abundance of peeling bark	Dry – Fresh Deciduous Shrub Thicket Ecosite (THDM2)
3	Sugar Maple	Y	120	20	7	Large DBH One of the tallest trees in community	Dry – Fresh Deciduous Shrub Thicket Ecosite (THDM2)

Tree Number	Tree Species	Cavities Present (y/n)	DBH (cm)	Tree Height (m)	Cavity Height (m)	Bat Maternity Roost Characteristics	ELC Community
4	White Ash	N	18	15	N/A	Abundance of peeling bark Tree is dead but still has primary limbs attached Decaying One of the tallest trees in community	Rural Residential Property (CVR_4)
5	Black Cherry	Y	30	10	2	Open canopy	Dry – Fresh Deciduous Regeneration Thicket Ecosite (THDM4)
6	American Elm	N	18	9	N/A	Peeling bark Early stages of decay	Naturalized Deciduous Hedgerow Ecosite (FODM11)
7	American Elm	N	18	10	N/A	Peeling bark Early stages of decay	Naturalized Deciduous Hedgerow Ecosite (FODM11)
8	Sugar Maple	Y	65	19	15	Cavity is high in tree Abundance of peeling bark Large DBH One of the tallest trees in the community Decaying	Naturalized Deciduous Hedgerow Ecosite (FODM11)
9	American Basswood	Y	62	20	12	Abundance of peeling bark Cavity is high in tree Large DBH One of the tallest trees in the community Decaying	Naturalized Deciduous Hedgerow Ecosite (FODM11)
10	Sugar Maple	Y	21	15	8	Abundance of peeling bark Decaying	Naturalized Deciduous Hedgerow Ecosite (FODM11)
11	Manitoba Maple	Y	26	15	4	Decaying	Naturalized Deciduous Hedgerow Ecosite (FODM11)

Tree Number	Tree Species	Cavities Present (y/n)	DBH (cm)	Tree Height (m)	Cavity Height (m)	Bat Maternity Roost Characteristics	ELC Community
12	American Elm	Y	16	N/A	2	Peeling bark Decaying	Naturalized Deciduous Hedgerow Ecosite (FODM11)
13	Manitoba Maple	Y	60	17	10	Cavity is high in tree Decaying	Naturalized Deciduous Hedgerow Ecosite (FODM11)
14	Wild Black Cherry	Y	53	20	2	Abundance of peeling bark	Naturalized Deciduous Hedgerow Ecosite (FODM11)
15	Sugar Maple	Y	122	20	15	Cavity is high in tree Decaying Abundance of peeling bark One of the tallest trees in the community Large DBH	Naturalized Deciduous Hedgerow Ecosite (FODM11)
16	Bitternut Hickory	Y	62	20	2	Cavity is high in tree One of the tallest trees in the community Large DBH	Naturalized Deciduous Hedgerow Ecosite (FODM11)
17	Sugar Maple	Y	90	15	2	Abundance of peeling bark Decaying Large DBH	Naturalized Deciduous Hedgerow Ecosite (FODM11)
18	Sugar Maple	Y	105	20	19	Cavity is high in tree Abundance of peeling bark Decaying Large DBH One of the tallest trees in the community	Naturalized Deciduous Hedgerow Ecosite (FODM11)
19	Sugar Maple	Y	88	20	15	Cavity is high in tree Decaying Large DBH One of the tallest trees in the community	Naturalized Deciduous Hedgerow Ecosite (FODM11)

Tree Number	Tree Species	Cavities Present (y/n)	DBH (cm)	Tree Height (m)	Cavity Height (m)	Bat Maternity Roost Characteristics	ELC Community
20	Sugar Maple	Y	60	N/A	8	Abundance of peeling bark Large DBH One of the tallest trees in the community	Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)
21	Sugar Maple	Y	80	20	2	Abundance of peeling bark Large DBH	White Cedar Mineral Mixed Swamp Ecosite (SWMM1)
22	Sugar Maple	Y	70	20	12	Cavity is high in tree Abundance of peeling bark Decaying Large DBH	White Cedar Mineral Mixed Swamp Ecosite (SWMM1)
23	Sugar Maple	Y	62	18	10	Cavity is high in tree Abundance of peeling bark Open Canopy Decaying Large DBH	Naturalized Deciduous Hedgerow Ecosite (FODM11)

With the addition of migratory bats (e.g., Hoary Bat, Eastern Red Bat, Silver-haired bat) to the SARO list in January 2025, it is our understanding that bat SAR habitat may also include shrub habitats.

6.15 Bat Acoustic Surveys

In 2022, six (6) bat species were recorded at nine (9) ARU stations on the Property: Hoary Bat (*Lasiurus cinereus*), Big Brown Bat (*Eptesicus fuscus*), Silver-haired Bat (*Lasionycteris noctivagan*s), Eastern Red Bat (*Lasiurus borealis*), Little Brown Myotis (*Myotis lucifugus*) and Tri-coloured Bat (*Perimyotis subflavus*) (Table 14). No data was obtained from a tenth station (Bat 6) due to equipment malfunction, but sufficient data was collected at stations 4 and 2, located to the north and south of Station 6, respectively.

Big Brown Bat is listed as S5 (Secure) in Ontario. Little Brown Myotis, Tri-coloured Bat, Hoary Bat, Eastern Red Bat, and Silver-haired Bat are all listed as endangered on the SARO list. Big Brown Bat, Hoary Bat and Silver-haired Bat were recorded at each of the nine (9) ARU stations.

Eastern Red Bat was recorded at eight (8) of the nine (9) stations while Little Brown Myotis was recorded at all nine (9) survey locations (Figure 3, Appendix A). Tri-coloured Bat was recorded at two (2) of the nine (9) survey locations.

In addition to the calls listed above, 182 could only be identified as “Myotis species,” 486 as “high-frequency unknown (HiF) and 3,222 could not be reliably identified by the software (no ID).

Table 14 Acoustic Bat Survey Results

ARU ID	Date Range	Identification Category									Total
		Big Brown Bat	Eastern Red Bat	Hoary Bat	Silver-haired Bat	Little Brown Myotis	Tri-coloured Bat	Myotis Species	HiF	No ID	
Bat1	June 3 – June 14, 2022	161	2	215	161	34		1	43	154	771
Bat2	June 14 – June 25, 2022	489	4	345	162	24		2	16	324	1366
Bat3	June 3 – June 14, 2022	483	11	213	253	144	5	19	33	520	1681
Bat4	June 14 – June 25, 2022	1078	16	239	88	241	3	60	64	726	2515
Bat5	June 3 – June 14, 2022	14		27	26	7		1	17	37	129
Bat6	June 14 – June 25, 2022	Unit malfunctioned – no data retrieved									
Bat7	June 3 – June 14, 2022	416	21	79	149	802		39	186	412	2104
Bat8	June 14 – June 25, 2022	55	4	96	55	17		5	21	341	594
Bat9	June 3 – June 14, 2022	148	6	185	215	73			15	216	858
Bat10	June 14 – June 25, 2022	388	9	144	103	449		55	91	492	1731
Totals		3232	73	1543	1212	1791	8	182	486	3222	11749

6.16 Terrestrial Insect Surveys

During the 2022 surveys, 18 butterfly species, 17 Odonata species (dragonflies and damselflies) and 1 bumblebee species were observed on the Property across three survey dates. Most species observed were ranked S5 (very common and secure in Ontario) or S4 (common and apparently secure in Ontario). One (1) SOCC, (Monarch [*Danaus plexippus*]*)*, is ranked S4B, S2N (imperiled in Ontario) and is listed as special concern provincially and endangered federally. Although this species is not afforded habitat under the ESA, it is still considered further in Section 7.4.3 as SWH.

During the 2022 surveys, eighteen (18) butterfly species, seventeen (17) Odonata species (dragonflies and damselflies), and one (1) bumblebee species were recorded on the Property across three survey dates.

Common Milkweed, the Monarch's larval host plant was found in low abundance in meadow communities on the Site.

A list of insect species observed are included in the wildlife list in Appendix C.2.

6.17 Incidental Wildlife Observations

During field investigations, the following wildlife species (including evidence of presence) were recorded incidentally:

- Bullfrog (*Lithobates catesbeiana*)
- Green Frog (*Lithobates clamitans*)
- Eastern Gartersnake (*Thamnophis sirtalis*)
- American Woodcock (*Scolopax minor*)
- Black-and-white Warbler (*Mniotilta varia*)
- Brown Thrasher (*Toxostoma rufum*)
- Dark-eyed Junco (*Junco hyemalis*)
- Hairy Woodpecker (*Dryobates villosus*)
- Horned Lark (*Eremophila alpestris*)
- Pine Siskin (*Spinus pinus*)
- Tundra Swan (*Cygnus columbianus*)
- Coyote (*Canis latrans*)
- Eastern Cottontail (*Sylvilagus floridanus*)
- Grey Squirrel (*Sciurus carolinensis*)
- Porcupine (*Erethizon dorsatum*)
- Raccoon (*Procyon lotor*)
- Red Fox (*Vulpes vulpes*)
- White-tailed Deer (*Odocoileus virginianus*)
- Largemouth Bass (*Micropterus salmoides*)

Evidence of deer browse, and abundant deer tracks were observed on the Property. All species observed incidentally are ranked S5 (very common and secure in Ontario). Incidental wildlife observations are included in the wildlife list in Appendix C.2.

6.18 Aquatic Features

6.18.1 Headwater Drainage Feature

No HDF are present on the site based on a search of desktop information and a field survey of the Property (completed over two separate dates) completed in accordance with the HDF Guidelines (TRCA and CVC 2014).

6.18.2 Fish Habitat

There are no watercourses on the Site or Adjacent Lands, but the Site contains dugout ponds. Wetlands with pools of water are also present on Adjacent Lands. eDNA surveys for salamanders conducted in the SWD3-2d wetland detected two fish species: Goldfish and Northern Redbelly Dace. It is possible that the dugout ponds are stocked with fish, supported by the observation of a Largemouth Bass in the SAS pond, or that the eDNA records are a result of flooding or spring freshet.

Since there are no watercourses connecting to the dugout ponds and no fish were observed within the wetland, these features are not considered fish habitat under the *Fisheries Act*. Therefore, fish habitat is not present within the Site or Adjacent Lands.

6.19 Summary of Natural Heritage Features

This section compiles natural heritage features identified within proposed Project Footprint (Extraction Limit and berms), Site and Adjacent Lands of during the background data review and field investigations. Protected natural features include features described by the relevant provincial and municipal policy documents described in Section 2. Presence or absence of these features are summarized in Table 15.

Table 15 Summary of Natural Heritage Features

Natural Heritage Feature	Proposed Project Footprint	Site	Adjacent Lands
Significant Areas of Natural and Scientific Interest	No	No	No
Significant Valleylands	No	No	No
Significant Woodlands	Yes	Yes	Yes
Significant Wetlands	No	No (based on Stantec's wetland boundary delineation)	Yes (including unevaluated wetlands)
Other Coastal Wetlands in Ecoregions 5E, 6E and 7E	No	No	No
Fish Habitat	No	No	No

Natural Heritage Feature	Proposed Project Footprint	Site	Adjacent Lands
Habitat of Endangered and Threatened Species	Yes (bats)	Yes (bats)	Yes (bats, Eastern Meadowlark)
Significant Wildlife Habitat	No (Discussed in Section 7.4)	Yes (Discussed in Section 7.4)	Yes (Discussed in Section 7.4)

7 Analysis of Significance - Natural Heritage Features Assessment

The following documents were used in the analysis of significance:

- Natural Heritage Reference Manual (NHRM; MNR 2010)
- Significant Wildlife Habitat Technical Guide (SWHTG; MNR 2000)
- Significant Wildlife Habitat Mitigation Support Tool (SWHMiST; MNRF 2014)
- Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF 2015)
- Wellington County OP

7.1 Significant Woodlands

Wellington County OP Section 5.5.4 outlines the County's criteria for woodland significance. In the Rural System, woodlands over 4 ha and plantations over 10 ha are considered significant and included in the Greenlands System. Additional criteria may be applied to determine woodland significance, such as proximity to watercourses, wetlands, or other woodland, linkage functions, age of the stand or individual trees, presence of endangered or threatened species, or overall species composition (Wellington County 2024).

Significant woodlands on the Site and Adjacent Lands are identified as Greenlands by the OP and have been assessed by Wellington County. Woodlands identified in field studies that are outside the Greenlands System require an analysis of significance based on the criteria specified in the OP. Significant woodlands evaluated by the County, and other un-evaluated woodlands on the Site and Adjacent Lands are described in Table 16 and shown on Figure 5, Appendix A. For each woodland, a determination (or confirmation) of significance is provided, along with the specific criteria that is met. The significance of plantations must be assessed evaluated independently based on criteria outlined in the OP (e.g., WO-6 and WO-8), including consideration for size, regardless of whether they are contiguous with other significant woodlands.

The significance of plantations should be evaluated independently based on the criteria specified in the OP (such as WO-6 and WO-8), including considerations of size, regardless of whether they are contiguous with other significant woodlands.

The following woodlands on the Site were evaluated as significant: WO-1, WO-2, WO-3, and WO-4 (Table 16; Figure 5, Appendix A). The proposed Acoustic Berm locations, overlap with approximately 0.02 ha of significant woodland including WO-1 and WO-3.

Table 16 Significant Woodland Evaluation

Unit ID	Location	ELC	Size (ha)	Criteria Met	Evaluation
Significant Woodlands – Evaluated by The County of Wellington					
WO-1	Proposed Project Footprint Site Adjacent Lands	• WE-1a (SWDM3-3c, SWMO1) • THCM2-1 • FODM5-10	**13.16**	• Size (> 4 ha) • Contains Mill Creek PSW • Proximity to other wetlands, woodlands, linkages • Potential habitat for endangered or threatened species (bats) • Supports SWH: confirmed amphibian breeding habitat (woodland), and confirmed SOCC (Eastern Wood-Pewee)	**Significant** – as evaluated by the County; meets more than one of the Ops criteria
WO-2	Site Adjacent Lands	• WE-2 (SWDM3-3a • WE-1c (SWDM3-3d)	**4.78**	• Size (> 4 ha) • Contains Mill Creek PSW • Proximity to other wetlands, woodlands, linkages • Potential habitat for endangered or threatened species (bats) • Supports SWH: confirmed amphibian breeding habitat (woodland), and confirmed SOCC (Eastern Wood-Pewee and hop sedge)	**Significant** – as evaluated by the County; meets more than one of the OP criteria

Unit ID	Location	ELC	Size (ha)	Criteria Met	Evaluation
WO-3	Proposed Project Footprint Site Adjacent Lands	• WE-1d (SWCM1-1, SWDO2-3, SWMO1-1, SWD, SWT) • WE-4 (SWD) • FODM5 • WOCM1-2 • FOD and FOM (Adjacent Lands, western limit)	**29.54**	• Size (> 4 ha) • Contains Mill Creek PSW • Proximity to other wetlands, woodlands, linkages • Potential habitat for endangered or threatened species (bat SAR, black ash) • Supports SWH: confirmed SOCC (Eastern Wood-Pewee, Clinton's wood fern, fringed milkwort, chestnut sedge, and hop sedge)	**Significant** – as evaluated by the County; meets more than one of the OP criteria
Other Woodlands – Evaluated Using OP Criteria					
WO-4	Site Adjacent Lands	• WE-1b (SWDM3-3b) • WE-3 (SWD) • WOD	3.26	• Contains Mill Creek PSW and unevaluated wetlands • Proximity to other wetlands, woodlands, linkages • Potential habitat for endangered or threatened species (bats, black ash). • Supports SWH: confirmed amphibian breeding habitat (woodland) and confirmed SOCC (hop sedge)	**Significant** – does not meet the minimum size threshold; however other criteria outlined in the OP are met

Unit ID	Location	ELC	Size (ha)	Criteria Met	Evaluation
WO-5	Proposed Project Footprint Site Adjacent Lands	• WODM5-3	0.15	• Proximity to Mill Creek PSW and significant woodland WO-1 • Potential habitat for endangered or threatened species (bats)	**Not Significant –** does not meet the minimum size threshold. While some criteria are met, this feature is not considered part of the larger contiguous woodland in terms of ecological function. This area consists of a young regenerating treed community featuring an open canopy. It is situated adjacent to a plantation, which is assessed independently pursuant to the OP. See Section 7.5 for further discussion of bat SAR.
WO-6	Adjacent Lands	• TAGM1	4.80	• Potential habitat for endangered or threatened species (bats)	**Not Significant –** does not meet the minimum size or other criteria outlined in the OP. See Section 7.5 for further discussion of bat SAR.
WO-7	Adjacent Lands	• FOCM6	2.22 (approx.)	• Potential habitat for endangered or threatened species (bats)	**Not Significant –** does not meet the minimum size or other criteria outlined in the OP. See Section 7.5 for further discussion of bat SAR.
WO-8	Adjacent Lands	• TAGM1	0.79	• Proximity to other woodlands • Potential habitat for endangered or threatened species (bats)	**Not Significant** – does not meet the minimum 10 ha size for plantations. See Section 7.5 for further discussion of bat SAR.

7.2 Significant Wetlands

A PSW (Mill Creek Puslinch Wetland Complex) and unevaluated wetlands were identified on the Site and Adjacent Lands during the background review (Figure 2, Appendix A). Field studies were conducted to verify the presence of these wetlands, as well as to identify any additional wetlands that had not been previously recorded. Wetlands were delineated and characterized following OWES or ELC protocols, depending on whether the wetlands were accessibility and/or their proximity to the proposed Project Footprint.

During field studies, the presence of the PSW and other unevaluated wetlands were confirmed. There were four wetland units mapped as PSW: WE-1a, WE-1b, WE-1c, WE-1d and three unevaluated wetlands (WE-2, WE-3, WE-4), all of which were located on Adjacent Lands. The delineation of wetlands in the field using OWES resulted in changes to the boundaries of these communities. During the background review, two additional unevaluated wetland communities (WE-3 and WE-4) were identified on Adjacent Lands. Field verification of these wetlands could not be conducted due to lack of land access. In addition to the wetlands that were verified from the background review, three more wetlands were documented: WE-5, WE-6, and WE-7. WE-6 and WE-7 are dug ponds that do not meet the standard definition of wetlands according to ELC or OWES. However, they are included because they exhibit wetland characteristics, so wildlife habitat and hydrologic impacts need to be considered. A detailed description of these wetland communities is provided in Table 10 and a summary of each of the wetland communities is presented in Table 17. Figure 6 in Appendix A shows a comparison of wetlands on Adjacent Lands to the background mapping.

The PSW and unevaluated wetlands identified from the background review (WE-1, WE-2, WE-3 and WE-4) are within the Core Greenlands designation under the County's OP and zoned as Natural Environment by the Township's Zoning Bylaw. Two of the wetlands identified from ELC (WE-6 and WE-7) are within the Greenlands designation and mapped as Environmental Protection Overlay by the Township.

In general, wetlands smaller than 2 ha (5 acres) are not evaluated under OWES. However, smaller wetlands can be evaluated if there is rationale that they serve important ecological functions. On January 1, 2023, the MNR proceeded with changes to the OWES (ERO 019-6160) in support of the *More Homes Built Faster Act, 2022*. One key change was the removal of wetland "complexing", or the practice of grouping together wetlands that are in close together or hydrologically connected. These and other revisions have made it more challenging for wetlands to qualify as provincially significant.

The unevaluated wetlands listed in Table 17 do not meet the 2 ha minimum size requirement for evaluation. With the removal of complexing, even if there is rationale for ecological importance (e.g., habitat of endangered to threatened species), it is unlikely that they would meet the criteria for provincial significance. Furthermore, these recent changes could prompt a re-evaluation of the Mill Creek Puslinch PSW Complex under the updated OWES. As a result, each wetland unit that is not contiguous with others in the complex would be evaluated individually, which may result in the status being downgraded to non-significant.

Table 17 Summary of Wetland Communities on the Site and Adjacent Lands

Unit ID	Size (ha)[1]	Source	Location	ELC	Species/Features	Overview / Recommendation
Mill Creek Puslinch Provincially Significant Wetland						
WE-1a	13.12	GEO Field Verified where access permitted	Adjacent Lands	SWDM3-3c	**SWH** • Candidate amphibian movement corridor • Confirmed amphibian breeding habitat (woodland) • Eastern Wood-Pewee (SOCC) **SAR** Bat SAR	• Within Core Greenlands: PSW, Significant Woodland (WO-1) • Zoned NE • Updates required based on wetland delineation
			Adjacent Lands	SWM01	**SAR** Bat SAR	• Within Core Greenlands: PSW, Significant Woodland (WO-1) • Zoned NE
WE-1b	2.69	GEO Field Verified where access permitted	Adjacent Lands	SWDM3-3b	**SWH** • Hop sedge (SOCC) • Salamander egg masses • Blue-spotted salamander (eDNA, samples 4,5,8,9) • Confirmed amphibian breeding habitat (woodland) **SAR** black ash, bat SAR	• Within Core Greenlands: PSW • Zoned NE • Updates required based on wetland delineation

Unit ID	Size (ha)[1]	Source	Location	ELC	Species/Features	Overview / Recommendation
WE-1c	3.87	GEO Field Verified where access permitted	Adjacent Lands	SWDM3-3d	**SAR** • Bat SAR	• Within Core Greenlands: PSW, Significant Woodland (WO-2) • Zoned NE • Updates required based on wetland delineation
WE-1d	11.72	GEO Field Verified where access permitted	Adjacent Lands	SWMO1-1	**SWH** • Clinton's wood fern, fringed milkwort, chestnut sedge, and hop sedge (SOCC) **SAR** Bat SAR	• Within Core Greenlands: PSW, Significant Woodland (WO-3) • Zoned NE • Updates required based on wetland delineation
			Adjacent Lands	SWDO2-3	**SAR** Bat SAR	• Zoned NE
			Adjacent Lands	FOCM2-2 / SWCM1-1	**SAR** Bat SAR	• Zoned NE
			Adjacent Lands	SWD	Unknown	• Zoned NE
			Adjacent Lands	SWT	Unknown	• Zoned NE

Unit ID	Size (ha)[1]	Source	Location	ELC	Species/Features	Overview / Recommendation
WE-2	0.83	GEO Field Verified	Adjacent Lands	SWDM3-3a	**SWH** • Hop sedge (SOCC) • Salamander egg masses • Blue-spotted salamander (eDNA, samples 2, 3) • Confirmed amphibian breeding habitat (woodland) **SAR** Bat SAR	• Within Core Greenlands: Significant Woodland (WO-2) • Zoned NE • Too small under OWES
WE-3	0.80	GEO	Adjacent Lands	SWD	**SAR** Bat SAR	• Within Core Greenlands • Zoned NE
WE-4	0.05	GEO	Adjacent Lands	SWD	**SAR** Bat SAR	• Within Core Greenlands: Significant Woodlands (WO-3) • Zoned NE
Other Wetlands						
WE-5	0.09	Field Verified	Site	SAS (dug pond)	**SWH** Midland Painted Turtle (SOCC)	• Zoned Agricultural • Too small under OWES to be delineated as a wetland
WE-6	0.06	Field Verified	Site	SA (dug pond)	**SWH** Midland Painted Turtle (SOCC)	• Within Greenlands • Zoned EP Overlay • Too small under OWES to be delineated as a wetland

Unit ID	Size (ha)[1]	Source	Location	ELC	Species/Features	Overview / Recommendation
WE-7	0.08	Field Verified	Site	MAMM1-12	**SWH** • Salamander egg masses • Blue-spotted salamander (eDNA, sample 7) • Candidate turtle nest (predated nests) • Confirmed amphibian breeding habitat (woodland)	• Within Greenlands • Zoned EP Overlay • Too small under OWES to be delineated as a wetland

[1]Size calculation reflects the total size of the contiguous wetland unit, including the area that extends beyond the Site and Adjacent Lands. Sizes for each individual community within a wetland unit is provided in the effects assessment where there is encroachment.

7.3 Greenlands

As defined by the County of Wellington Official Plan, Core Greenlands includes:

- provincially significant wetlands
- all other wetlands
- habitat of endangered or threatened species and fish habitat
- hazardous lands.

Core Greenlands on the Site per Figure 2 (Appendix A) include wetlands; however, Stantec refined the wetland boundaries as detailed in Section 4.3.4. Habitat for threatened or endangered species are discussed in Section 7.5.

Greenlands, per the County OP, include:

- Fish and wildlife habitat
- Areas of Natural and Scientific Interest (ANSI's)
- Streams and Valleylands
- Significant Woodlands
- Environmentally Sensitive Areas

Greenlands per Figure 2 (Appendix A) on the site includes:

- agricultural lands
- woodland: WODM5-3
- thicket: THDM4a
- marsh: MAMM1-12
- dug pond: SA
- meadow: MEMM3

Based on the definition, the reason for designating these communities on the Site as Greenlands is unclear. Woodland WO-5 (WODM5-3), discussed in Section 7.1 was assessed as not significant primarily based on size; however, it provides candidate SWH. Similarly, MAMM1-12 provides salamander breeding habitat and a portion of MEMM3 candidate turtle nesting areas, although both are anthropogenically created.

7.4 Significant Wildlife Habitat

A SWH assessment was completed in accordance with the SWH Criteria Schedule for Ecoregion 6E (MNRF 2015b). A full evaluation of each of the SWH types is provided in Appendix B.1, with a summary provided in the sections below. The assessment identified several candidate and confirmed SWH types on the Site and Adjacent Lands. Based on background information and field investigations, there is potential for seasonal concentration of animals, specialized habitat for wildlife, and habitat for SOCC. No rare vegetation communities were noted onsite or on Adjacent Lands. Locations of confirmed and candidate SWH is shown on Figure 7, Appendix A.

7.4.1 Seasonal Concentration Areas of Animals

One type of seasonal concentration area was confirmed on the Site and Adjacent Lands:

Candidate SWH:

- Bat Maternity Colonies – High numbers of bat species were recorded on ARUs during acoustic surveys and suitable bat maternity roost trees were observed during field studies. Since no detailed assessments were done beyond the Extraction Limit, the required habitat density could not be confirmed but is assumed present. Confirmed habitat for bat maternity colonies is present in the following woodland communities on the Site and Adjacent Lands: FOC, FOD, FOM, WOC, WOD, SWD.

7.4.2 Specialized Habitat for Wildlife

The following confirmed and candidate SWH types of specialized habitat for wildlife are present on the Site and on Adjacent Lands:

Confirmed SWH:

- Amphibian Breeding Habitat (Woodland) –WE-1b, WE-2, WE-7 was confirmed SWH for amphibian breeding due to the presence of Blue-spotted Salamander as well as high numbers of Spring Peepers and the presence of Wood Frog in WE-2. This habitat is located on the Site and Adjacent Lands.

Candidate SWH:

- Turtle Nesting Areas – Depredated turtle nests were present north of MAMM1-12 in an area of exposed gravel/sand. The number and type of turtle nests is not known to confirm SWH. However, Midland Painted Turtle presence and evidence of turtle nesting is confirmed on the Site.

7.4.3 Habitat for Species of Conservation Concern

A full assessment for habitat for SOCC on the Site and Adjacent Lands is in Appendix B.2. Based on species identified in the background review, SOCC are characterized as being either confirmed present or with low, moderate, or high potential to occur based on habitat assessments conducted during field studies.

The following SOCC were confirmed on the Site and Adjacent Lands:

- Midland Painted Turtle was observed in the two constructed ponds on the Site
- Barn Swallow was recorded during breeding bird surveys. No nests or nest building was observed; however, suitable nesting features (i.e., sheds, eaves) were present on the Site
- Eastern Wood-Pewee was recorded in the Adjacent Lands during breeding bird surveys and suitable breeding habitat is present in the proposed Project Footprint, Site and Adjacent Lands. There was also one meadow observation of Eastern Wood-Pewee (MEMM3), but this is outside of suitable breeding habitat.
- Monarch was observed on the Property during the insect survey. Common milkweed, Monarch's larval host plant, was also present and habitat was identified within the proposed Project Footprint, Site and Adjacent Lands.

Field studies did not target these species; however, given the presence of suitable habitat, the following SOCC are considered to have a moderate potential to occur on the Site and Adjacent Lands:

- Eastern Milksnake – potential habitat throughout the open habitat on the Site and Adjacent Lands for this habitat generalist.
- Eastern Ribbonsnake – potential habitat adjacent to wetlands on the Site and Adjacent Lands
- Betrothed Underwing Moth – associated with its larval host plants, honey locust or black walnut
- Chestnut Schizura Moth – associated with its larval host plant, Viburnum species which occurs on the Site and Adjacent Lands
- Giant Leopard Moth – potential to occur as its larvae feed on a diversity of plant species
- Penitent Underwing Moth – associated with its larval host plant; ash, butternut, hickory, pecan and walnut trees which occur on the Site and Adjacent Lands
- Walnut Caterpillar Moth – associated with its larval host plant, black walnut, which occurs on Adjacent Lands

7.4.4 Animal Movement Corridors

There were no animal movement corridors present. Amphibian movement corridors are absent due to the lack of wetland amphibian breeding habitat and there were no deer yards identified on the Site and Adjacent Lands.

7.5 Species at Risk (Endangered and Threatened Species)

A full assessment of candidate habitat for SAR on the Site and Adjacent Lands is in Appendix B.3. Species identified in the background review were classified as confirmed present or as having low, moderate, or high likelihood of occurrence based on habitat assessments completed during field studies.

For bats, updates to habitat definitions under the ESA came into effect on June 5, 2025. It is our understanding based on recent correspondence with MECP that the following definitions apply to bat SAR maternity roosts:

For all bat SAR:

- The natural roost feature (e.g., tree, snag, rock) or entire anthropogenic structure (entire bridge, barn, or rock pile) occupied for breeding (gestation, birth) and rearing pups
- The contiguous ELC ecosite up to a radius of 1000m from the confirmed maternity roost which is essential for breeding and rearing pups

For migratory bat SAR:

- Migratory stopover areas (migratory bats)
- The forested area habitually occupied for staging during migration
- Habitat-use by migratory bat SAR should be considered, which includes live or dead trees >10 cm in DBH, and trees with exfoliating bark, cracks, knots, holes, and cavities
- Shrubs >1 m in height, as these may provide roosting habitat for bat SAR
- Active window for Eastern Red Bat, Hoary Bat, and Silver-haired Bat is April 1 – November 30

Based on this, confirmation of a maternity feature is needed to confirm SAR habitat. Bat SAR were recorded on the Site and Adjacent Lands, but presence of maternity colonies was not confirmed.

The following SAR were confirmed on the Site and Adjacent Lands, and potential SAR Habitat is shown on Figure 8 (Appendix A):

- Eastern Red Bat was detected during bat acoustic surveys at 8 out of 9 stations. Potential habitat is present in the woodland, swamp, hedgerow and thicket communities on the Site (including the proposed Project Footprint) and Adjacent Lands.
- Hoary Bat was detected during bat acoustic surveys at all 9 stations. Potential habitat is present in the woodland, swamp, hedgerow and thicket communities on the Site (including the proposed Project Footprint) and Adjacent Lands.
- Little Brown Myotis was detected during bat acoustic surveys at all 9 stations. Potential habitat is present in woodland, swamp, hedgerow and thicket communities on the Site (including the proposed Project Footprint) and Adjacent Lands.

- Tri-coloured Bat was detected during bat acoustic surveys at 2 of 9 stations. Potential habitat is present in the woodland, swamp, hedgerow and thicket communities on the Site (including the proposed Project Footprint) and Adjacent Lands.
- Silver-haired Bat was detected during bat acoustic surveys at all 9 stations. Potential habitat is present in the woodland, swamp, hedgerow and thicket communities on the Site (including the proposed Project Footprint) and Adjacent Lands.
- During the botanical inventory, Black ash was observed in the FODM5-10, SWDM3-3 and SWMO1-1 communities on Adjacent Lands. However, these saplings are not protected (or mapped) as none exceeded the 8 cm DBH required for protection.
- Eastern Meadowlark was observed singing in a field on Adjacent Lands. Eastern Meadowlark was not observed on the Site (including the proposed Project Footprint) and there is no suitable habitat present for this species (i.e., only row crops). Therefore, this species is present on Adjacent Lands but absent from the Site.

8 Assessment of Impacts

The potential impacts to natural features that may occur from the proposed aggregate operation are identified and discussed in this section. Where direct impacts to SAR are anticipated, an approach to authorization under the provincial *Endangered Species Act* is outlined.

This section should be read in conjunction with the Site Plan (MHBC 2025) and the Level I and II Water Report (Stantec 2026) as part of the aggregate extraction application. The Site Plan provides specific details on existing conditions, Extraction Limits and phasing, and a progressive rehabilitation plan.

Vegetation communities within the Extraction Limit and acoustic berm creation (i.e. proposed Project Footprint) will be impacted, as shown in Table 18.

Table 18 Vegetation Communities within the Proposed Project Footprint

Community Type	Description	Quantities (ha)
Constructed (0.02 ha)		
CVR_4	Rural Property	0.02
Agricultural (6.87 ha)		
OAGM1	Annual Row Crops	6.87
Meadow (1.96 ha)		
MEMM3	Dry – Fresh Mixed Meadow	1.96
MEMM4	Fresh – Moist Mixed Meadow	0.004
Hedgerow (1.25 ha)		
FODM11	Naturalized Deciduous Hedgerow Ecosite	0.90
THDM3a	Dry - Fresh Deciduous Hedgerow Thicket Ecosite	0.14
THDM3b	Dry - Fresh Deciduous Hedgerow Thicket Ecosite	0.01
THDM3-1	Buckthorn Deciduous Hedgerow Thicket Type	0.20
Thicket (0.30 ha)		
THCM2-1	Fresh - Moist White Cedar Coniferous Thicket	0.03
THDM2-6	Buckthorn Deciduous Shrub Thicket	0.06
THDM4a	Dry - Fresh Deciduous Regeneration Thicket	0.07

Community Type	Description	Quantities (ha)
THDM4b	Dry - Fresh Deciduous Regeneration Thicket	0.14
Woodlands (0.08 ha)		
FODM5	Dry-Fresh Sugar Maple Deciduous Forest Ecosite	0.01
FODM5-10	Dry – Fresh Sugar Maple – White Birch – Poplar Deciduous Forest	0.01
WODM5-3	Fresh – Moist Manitoba Maple Deciduous Woodland	0.06

8.1 Significant Woodlands and Wetlands

As discussed in Section 7.1, seven woodlands are present on the Site and Adjacent Lands (Figure 7, Appendix A). Four of these woodlands were evaluated as significant (WO-1, WO-2, WO-3, WO-4) and were carried forward to the assessment of impacts.

As described in Section 7.2, there were six wetland units (WE1a-d, WE-2, WE-5) identified on Adjacent Lands. There are two wetlands (WE-6 and WE-7) present on the Site. WE-5 does not qualify as significant and is therefore not discussed in this section.

Impacts to woodlands and wetlands are discussed below; details on mitigation are covered in Section 9 and rehabilitation in Section 10.

8.1.1 Setbacks

A vegetation protection zone from the Extraction Limit is proposed 10 m from Significant Woodlands (with minor exceptions, e.g., FODM5) and 30 m from the wetlands, as shown on Figures 5 and 6 (Appendix A). This setback is considered sufficient to protect the form and function of the wetlands and woodlands from potential impacts, including encroachment, edge effects, and screening from noise and light disturbances. Although the County of Wellington does not prescribe a minimum woodland and wetland setback, the 10 and 30 m setbacks is consistent with other surrounding municipalities (e.g., City of Guelph).

The access road will follow the current gravel driveway and a secondary laneway between two areas of the Mill Creek PSW (WE-1a/WO-1 and WE-1b/WO-4), as shown on Figure 6 and Figure 7 (Appendix A). The access road is within 2 m of WE-1a and WE-1b and within 2 m of WO-1 and WO-4.

8.1.2 Acoustic Berms

Acoustic berms are proposed within both the 10 m and 30 m setback areas (Figure 5 and 6, Appendix A). In some areas, the grading required to accommodate the specified heights of the acoustic berms will require grading within significant woodlands, including removal of approximately 0.02 ha of significant woodland (FODM5, FODM5-1). The limited area proposed for removal along existing vegetation edges will not impact the form or function of the significant woodland. Furthermore, upon completion of the aggregate operation, setback areas will be replanted as part of the Rehabilitation Plan (MHBC 2026), which is further detailed in Section 10.

Where possible, berms will be located outside of the critical root zone to avoid impacts on tree survival to the woodland edge. This will require an assessment by a qualified arborist and should follow standard arborist guidelines (e.g., PNWISA 2021).

8.1.3 Wetland Water Balance and Thermal Impacts

The key potential impact of the proposed extraction on the surrounding natural environment relates to water impacts (surface water and groundwater) to fish habitat, wetlands (including PSW, amphibian habitat) and ponds. Fish habitat is absent from the Site and Adjacent Lands but is discussed in Section 8.3 relative to offsite impacts. Overland drainage and water table levels will change during and after extraction, which may impact wetlands on Adjacent Lands. Impacts and the water balance budget were assessed using data from the Level I and II Water Report (Stantec 2026) and are summarized below.

In areas where dredging of aggregate will be undertaken, the local water table will be affected in two ways:

1. Over the short term (i.e., anticipated 2-to-5-year extraction period), the volume of the aggregate removed will be replaced by groundwater. This displacement, equivalent to approximately 1,050 m^3/day during normal operations, will temporarily draw down the water table within the aggregate ponds area by up to 0.3 m. This water table drawdown will decrease with radial distance from the aggregate ponds, interpreted to be approximately 0.13 m at the boundary of neighboring wetlands. These small water table adjustments are minor relative to the 1 m variations observed seasonally. This drawdown will not occur post rehabilitation of the pit.
2. The water table gradient will flatten within the area of the proposed pit ponds. The projected effects of this hydraulic gradient change, as shown on Figure 15 of Stantec's Water Report (2026), as summarized as follows:
    - water table rise (up to 0.3 m) in the southwestern portion of the licensed area
    - water table decline (up to 0.6 m) in the northeastern portion of the of the licensed area
    - no significant water table change (0.3 m or less) in local wetland areas.

Other key findings of the Water Report (Stantec 2026), related to water resources, include:

- Water ponding in the local PSWs is directly related to seasonally high-water table levels. Due to the limited catchment areas of the PSWs, ponding is not observed during the late-summer and fall months (i.e., low water table season), even during substantial precipitation events. It is therefore concluded that partial removal of the surface catchment areas adjacent to PSWs should not interfere with the current hydroperiods observed seasonally.
- The average annual volume of infiltration under pre-development conditions is estimated at approximately 22,345 m^3/year or unit rate of approximately 255 mm/year. Under post-development conditions, increased evaporation (i.e., due to the open pit ponds) is expected to decrease the average annual infiltration to approximately 10,747 m^3/year or unit rate of approximately 123 mm/year. The presence of the pit ponds is therefore expected to reduce the onsite infiltration rate by 11,598 m^3/year (equivalent to 65 m^3/day or 0.4 L/s). This reduction is small, equivalent to less than 1% of the interpreted base flow rate in Aberfoyle Creek (down stream of the Site). This adjustment should not affect normal groundwater or surface water flow conditions locally.
- Permanent adjustment of the local water table gradient at PSW locations, in response to creation of the pit ponds, are projected to be less than 0.3 m. These small water table adjustments are minor relative to the 1 m variations observed seasonally. The zone of influence of these changes are interpreted to be approximately 400 m from the edge of the pit ponds.
- Local groundwater temperatures range from 8°C to 12°C. The average annual water temperature within the aggregate pit ponds is interpreted to increase approximately 6°C, reflecting a range of 14°C to 18°C. This pond water will flow in a southwesterly direction, cooling along its flowpath and eventually outflowing into Aberfoyle Creek. At Aberfoyle Creek (along a 200 m section on the east side) the temperature of this groundwater could be 2°C above the local ambient (e.g., reflecting a range of 10°C to 14°C. It is noted that once the groundwater base flow in this 200 m section mixes with the creek flow, no temperature difference is likely to be realized from normal creek flow conditions.

Following on the conclusions provided above and water effects delineated on Figure 15 of the Water Report (Stantec 2026), the interpreted effects on the natural environment are outlined below.

- Seasonal groundwater changes under the adjacent wetlands (e.g., WE-2) are not expected to impact wetland flora and fauna as these changes are relatively minor and occur within a normal range of groundwater fluctuations realized year to year.
- Onsite groundwater only supports the adjacent wetland hydroperiod for a limited portion of the year, as surplus water conditions occur for the remainder of the year (i.e., fall-spring). As a result, minor changes in groundwater conditions are inconsequential to the wetland as they will continue to have a viable hydroperiod. The hydroperiod of the wetlands is also supported by surface water flow and near surface interflow within the retained catchment of each feature.
- A shortened hydroperiod is not anticipated as this could have negative impacts on amphibian breeding if water depths are insufficient to support amphibian egg maturation.

- An increased water level post-operation may occur due to a flattening of the water tables.
- Projected temperature changes in groundwater baseflow towards Aberfoyle Creek should have no effect on the local aquatic habitat.

Overall, the collective inputs to the features allow the wetlands to maintain hydric conditions. Small changes to any of these inputs are not expected to negatively impact the form or function of the wetlands on Adjacent Lands.

8.2 Greenlands

A portion of the agricultural lands designated as Greenlands are located within the Extraction Limit (1.16 ha) and within the proposed footprint for acoustic berms (0.64 ha). Of the 1.16 ha that is proposed for removal, most is active agriculture (OAGM1) with a small portion of MEMM1. These communities do not qualify as Greenlands and therefore impacts to the form and function of greenlands are not anticipated.

The proposed acoustic berms impact small portions of WODM5-3, THDM4a, and MEMM3. Impacts to candidate bat SAR habitat and turtle nesting habitat are addressed in Sections 8.3.5 and 8.3.2, respectively. With the implementation of mitigation and restoration proposed for the functions provided by these small, marginal features within the designated Greenlands, no loss of Greenland function is anticipated.

8.3 Wildlife and Wildlife Habitat

8.3.1 Amphibians

Direct impacts to amphibian habitat are not anticipated.

Although SWH for amphibian movement is not present on the Site, due to the proximity of the Site to SWH for amphibian breeding (woodland), potential impacts to amphibians associated with road mortality along the access road were assessed. Amphibian movement includes the spring migration period when amphibians travel overland to breeding ponds, the timing of which is dependent upon ice melt, nighttime temperatures, and often rain (e.g., COSEWIC 2010), but generally occurs in evenings from late March to mid-April. Restricting operation to daylight hours during this time would mitigate road mortalities during the highly sensitive period.

The sensitive breeding/larval development period within amphibian ponds last from egg-laying in the spring until early August when the juveniles leave to search for overwintering sites. Timing of this movement is less time-specific and concentrated, which makes it difficult to implement targeted mitigation for road mortality. However, the implementation of timing windows and speed limits, as described in Section 9, as well as habitat creation (Section 10.2.1), overall impacts to amphibians are not anticipated.

8.3.2 Turtles

To facilitate the construction of one of the acoustic berms, grading will result in a direct impact to one candidate SWH feature (Turtle Nesting Area), as identified on Figure 7 (Appendix A). Although this SWH type was not confirmed, depredated turtle nests were observed north of a small wetland (MAMM1-12) in an area of exposed gravel/sand. The confirmed presence of Midland Painted Turtles indicates that the Site supports turtle nesting.

With implementation of proposal mitigation measures and habitat creation (Section 10.2.2), no negative impacts to turtles are anticipated from the proposed pit.

8.3.3 Eastern Wood-Pewee

There will be a loss of approximately 0.01 ha of FODM5-3 that is mapped as Eastern Wood-pewee habitat. The Eastern Wood-pewee observed within this woodland feature was not present within the portion of the woodlot proposed for removal; however, as SWH includes the entire ELC community. Therefore, this community qualifies as habitat for SOCC. The proposed removal of the edge of this feature outside of where the bird was observed to result in direct impacts to Eastern Wood-pewee. Impacts can be managed by vegetation removal timing windows.

8.3.4 Monarch

There will be a loss of 0.57 ha of candidate habitat for Monarch. Monarch was observed during field investigations and suitable habitat for egg-laying and larval development (common milkweed and swamp milkweed) is present on the Site. Monarch is typically found where milkweed and wildflowers (including goldenrods and asters) are present (COSEWIC 2010). Caterpillars are dependent on milkweed, whereas adults exhibit broader habitat preferences and will feed on a variety of wildflowers. With compensation and mitigation measures for Monarch provided in Section 9 and 10.2.3, overall impacts are not anticipated to Monarch.

8.3.5 Bat Species at Risk

There will be a loss of 1.56 ha of potential Bat SAR Habitat and eighteen candidate bat roost trees. Eastern Red Bat, Hoary Bat, Little Brown Myotis, Silver-haired Bat and Tri-colored Bat were confirmed on the Site and Adjacent Lands based on the bat acoustic survey results, but it was not possible to confirm the presence of maternity roost sites. Three woodlands (WODM5-3, FODM5, FODM5-10), and five hedgerow/thicket communities (FODM11, THDM3a, THDM3-1, THDM4b and THCM2-1), which contain suitable bat habitat will be impacted by the Project. With compensation and mitigation measures for bat SAR provided in Section 9 and 10.3, no impacts are anticipated to bat SAR, pending confirmation from MECP.

Indirect impacts such as onsite light use, will be limited as work is proposed during daylight hours during the bat active period.

8.4 Fish Habitat

There is no Fish Habitat within the Site or Adjacent Lands. Aberfoyle Creek is located approximate 300 m southwest of the Site and Adjacent Lands.

Aberfoyle Creek is a Brook Trout creek with a coldwater thermal regime. The temperature range for optimal growth and survival of adult Brook Trout used in the Brook Trout Habitat Suitability Index (HSI) is 11-16°C (Raleigh 1982).

Brook Trout normally require high oxygen concentrations with optimum conditions at dissolved oxygen concentrations near saturation and temperatures above 15°C (Raleigh 1982). The dissolved oxygen concentration should not fall below 5 mg/L (Raleigh 1982), which is the same as the Provincial Water Quality Objective (PWQO; MOEE 1994) for coldwater biota at 20°C.

As discussed in Section 8.1.3, local groundwater temperature ranges from 8°C to 12°C. The average annual water temperature within the aggregate pit ponds is interpreted to increase approximately 6°C, reflecting a range of 14°C to 18°C. This pond water will flow in a southwesterly direction, cooling along its flowpath and eventually outflowing into Aberfoyle Creek. At Aberfoyle Creek (along a 200 m section on the east side) the temperature of this groundwater could be 2°C above the local ambient (e.g., reflecting a range of 10°C to 14°C). It is noted that once the groundwater base flow in this 200 m section mixes with the creek flow, no temperature difference is likely to be realized from normal creek flow conditions.

This is well within the Provincial Water Quality Objectives (PWQO) that states that the water temperature '*at the edge of a mixing zone shall not exceed the natural ambient water temperature at a representative control location by more than 10 Celsius degrees*' (MOEE 1994). Additionally, this will not impact the habitat suitability of Aberfoyle Creek for Brook Trout as it will remain within the optimal temperature regime.

9 Mitigation

Standard Best Management Practices to reduce the likelihood of impacts to the adjacent natural features include:

- Migratory birds and their nests, when active (i.e., contain a viable egg, or young) are protected under the MBCA (Government of Canada 1994). Avoid vegetation removal during the active period, generally April 1 – August 31, to reduce the risk of harm to protected nests. Nest surveys by a qualified biologist may be conducted if the area to be search is relatively simple (e.g., hedgerows) and the primary mitigation measures (i.e., timing windows) cannot be applied. Active nests will be protected with an appropriate buffer until young have fledged.
- Vegetation clearing where milkweed plants are present is recommended to proceed when Monarch larvae are absent (i.e. not April 1 to September 30), if possible.
- Restrict operations to daylight hours - 07:00 to 19:00 on weekdays and 08:00 to 16:00 on weekends – which should avoid key amphibian movement periods in the spring evenings (late March to mid-April).
- Implement speed limits on the access road of 20 km/hour
- Consultation with MECP on permitting requirements or consideration under the forthcoming SCA for the removal of approximately 1.56 ha of bat SAR habitat and eighteen candidate roost trees, as shown on Figure 7, Appendix A. Avoid vegetation removal outside the active period (i.e., do not remove forest, hedgerows, and thickets from April 1 – November 30).
- Implement enhancement, restoration, and mitigation measures outlined on the Rehabilitation Plan (MHBC 2026), detailed in Section 10.

9.1 Vegetation

The following mitigation measures are recommended to reduce the likelihood of impacts to vegetation and vegetation communities (e.g., wetlands, woodlands, thickets, meadows), with rehabilitation discussed in Section 10.1:

- The boundaries of the project limits, vegetation clearing and retention zones within the project limits, and natural areas adjacent to the project limits, shall be clearly delineated in plans/drawings and in the field.
- In the case of unexpected vegetation removal or accidental damage to trees, vegetation shall be replaced and/or restored.
- Access road upgrades, if required, will consider overhanging trees and avoid compression of critical root zones of adjacent features (i.e., woodlands and wetlands). The footprint of the road will be reduced to the greatest extent possible to avoid further encroachment to the adjacent natural features.

- Vegetation removals shall adhere to applicable timing windows, December 1 to March 30 to accommodate most species.
- Strict mitigation for dust suppression will be implemented as detailed in the *Best Management Plan for Fugitive Dust: Anthony Pit Project* (Stantec 2026).

9.2 Invasive Species Management

- Clean vehicles and equipment in an area that is free of mud, with a gravel surface, a hard surface, or a regularly mowed grassy area at least 30 m away from nearby watercourses and areas of natural vegetation in accordance with Clean Equipment Protocol for Industry (Halloran et al. 2013)
- European Buckthorn will be removed and stored in a manner that does not spread seeds. Buckthorn can be brushpiled and left as wildlife habitat in the area where it was removed, chipped and buried, or disposed of off-site at an appropriate facility.
- Seeds being used for hydro seeding or revegetation should be certified free of weeds or invasive species. Mulch should be weed free.

9.3 Erosion and Sediment Control

- Develop and implement an Erosion and Sediment Control Plan prior to construction to protect sensitive natural heritage features.
- ESC measures shall be installed prior to vegetation removal and remain in place until vegetation has become established and soils re-stabilized.
- Selection of ESC measures shall be appropriate for the site and extent of disturbance, and potential impacts to wildlife, such as entanglement and movement barriers.
- Stockpiled materials shall be stored in areas where stormwater run-off will not drain directly into wetland and the woodlot areas being maintained at the Site.
- Berms constructed at the Site shall be vegetated as soon as possible after placement, to help stabilize the berm side slopes.
- ESC measures shall be inspected to confirm as part of construction monitoring activities (Section 9.5).

9.4 Spill Prevention

- Develop and implement a Spill Prevention and Response Contingency Plan that includes measures for preventing, addressing, and reporting potential spills, in accordance with all applicable regulations, permits, and guidelines.
- On-site hazardous materials, vehicle maintenance and refueling activities shall be properly stored and located at least 30 m away from wetlands, and other sensitive natural features.
- Spill kits shall always be kept on-site and accessible at all times.

- Control onsite activities, including equipment maintenance and re-fueling, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble, etc., into the natural environment.

9.5 Environmental Monitoring

- Environmental monitoring during operation should be documented and include, but not be limited to:
  - Regular inspections of sensitive features so that setbacks are adhered to and that damage/alteration to the demarcations or protective measures of these features is addressed.
  - Regular monitoring of erosion and sediment control, equipment refuelling activities, so that spills and sediment releases are prevented or addressed quickly and effectively.
  - Monitoring for dust as detailed in *Best Management Plan for Fugitive Dust: Anthony Pit Project* (Stantec 2026).
- Specialized environmental monitoring programs shall be developed and implemented as it relates to:
  - Rehabilitation and enhancement (Section 10.1)
  - Permit and approval requirements, which will be confirmed as part of the permitting processes (Section 10.3).

10 Rehabilitation and Enhancement

A Rehabilitation Plan for the Anthony Pit has been developed by MHBC. This plan has been developed to restore, enhance and offset potential impacts of the development as described in the following sections.

10.1 Woodlands and Wetlands

Vegetation will be planted along the boundary of the natural features, which will increase the woodland area of WO-2, WO-3, and setbacks to WE-1c-d and WE-2. The approximately 0.02 ha of significant woodland proposed for removal will be replaced by a proposed 1.8 ha of future woodlands, which will increase the amount of woodland compared to existing conditions.

Native species plantings will result in an improvement in both size and quality of woodlands. Nodal planting details are provided in Appendix D and will include a standard survival guarantee of two years for vegetation planting.

A small 0.9 ha wetland will be created as part of the rehabilitation works. This wetland area will be approximately ±0.15 - 1.0 m deep, comprised of placed organic material, topsoil, substrates and cover materials with emergent herbaceous vegetation and structures within the littoral zone. A schematic is provided in the Wetland Area Detail inset portion of the plan, found in the Rehabilitation Plan (MHBC 2026).

10.2 Significant Wildlife Habitat

10.2.1 Amphibians Breeding Habitat (Woodland)

In addition to the creation of the wetland area described in Section 10.1, the post-extraction ponds will also be modified by providing organic material, topsoil, substrates and cover maternity to promote shoreline aquatic vegetation. The placement of large woody debris and rubble/boulder material along the pond edge is also proposed in the Shoreline Area Detail (Rehabilitation Plan (MHBC 2026)).

These created features may provide suitable salamander and amphibian breeding habitat, which will increase habitat availability on Site. The post-extraction ponds will also provide frog and toad breeding habitat, based on the addition of specific shoreline features as outlined in the Rehabilitation Plan (Rehabilitation Plan (MHBC 2026)). The larger ponds are not expected to provide appropriate conditions (e.g., size, potential for predators due to fish stocking) to support salamander breeding but the protection of existing breeding ponds and the creation of 0.9 ha of new habitat will result in a net gain of this habitat type.

10.2.2 Turtles and Turtle Habitat

To supplement the proposed removal of existing turtle nesting habitat onsite to facilitate berm construction, the creation of a turtle nesting mound is recommended in the vicinity of removal (i.e., in proximity to MAMM1-12) in accordance with guidance provided by the Canadian Wildlife Federation (CWF) and Paterson et al. 2015, including:

- Locate above the high-water mark
- Locate in open areas to receive sun most of the day
- Place geotextile cloth under the nesting area to prevent vegetation growth
- Soil should be a mixture of fine gravel, sand, and existing soil
- Site each mound facing south or south-west
- Slope of no more than 30%

To avoid impacts to turtles nesting onsite, construction of the proposed nesting mound is recommended to occur prior to removal of the existing nesting site so there is a continuous availability of nesting areas. Specific timing windows and exclusionary measures will (or concurrently) be required so that removal of the existing feature will not directly impact turtle eggs that could be in the feature to be removed. The following are recommended to reduce the likelihood of impacts to turtles during operation:

- if there are repeat observations of turtles in the active pit (including nesting), barrier fencing may be used to direct wildlife away from the active work area(s) and toward natural wetland areas outside the Extraction Limit
- all fencing materials should be wildlife-friendly to prevent accidental entanglement
- If a turtle nest site or evidence of a turtle nest (i.e., areas of fresh digging in loose gravel or sandy material) is found within the work areas, all work in that area shall cease. The nests shall be left undisturbed, flagged and a setback applied to protect against construction activities. If avoidance is not possible, egg salvage may be completed by a Qualified Biologist.

10.2.3 Habitat for Species of Conservation Concern

Three SOCC were present in the Site and are shown on Figure 7 (Appendix A) – Eastern Wood-Pewee, Monarch and Midland Painted Turtle. Compensation for Midland Painted Turtle nesting habitat is discussed in Section 10.2.2 and the rehabilitation planting plan will offset the loss of the edge of Eastern Wood-pewee habitat that is proposed for removal.

Monarch is typically found where milkweed and wildflowers (including goldenrods and asters) are present (COSEWIC 2010). Caterpillars are dependent on milkweed, whereas adults exhibit broader habitat preferences and will feed on a variety of wildflowers. Common milkweed and nectar producing plants (e.g., serviceberry, dogwood, asters, goldenrods, blackeyed Susan, Joe Pye weed) will be incorporated into the rehabilitation seed mix described in the Rehabilitation Plan.

10.3 Species at Risk

Since bats were identified during acoustic surveys, and suitable habitat is present in the proposed Project Footprint, consultation with MECP is recommended to develop appropriate mitigation and compensation for bat SAR under the ESA or forthcoming SCA. The following are recommended compensation and mitigation measures (subject to appropriate regulatory consideration or approvals) for bat SAR:

- Installation of artificial roosting structures (i.e. bat boxes) and woodland restoration.
  - The two-chamber Rocket Boxes that can accommodate an average of 250 bats (specifications available at the following website http://www.batcon.org/files/RocketBoxPlans.pdf) and is recommended for inclusion in the Rehabilitation Plan.
  - BrandenBark™ features may also be used to supplement the Rocket Boxes
- Include oak and maple in the replanting plan to support tree-roosting bats
- To reduce the effects of light pollution on bats, it is recommended that permanent light fixtures installed near bat habitat be avoided, where feasible. If not feasible, reduce illumination and light spill through design (e.g. height of light, light shields, lighting intensity, direction and spectral composition).

11 Summary and Closing

The results of the extensive field program undertaken for this NER/EIS identified the following significant natural features located within the Proposed Project Footprint (Extraction Limit and acoustic berm/barrier footprints), on the Site and Adjacent Lands as detailed in Table 19.

Table 19 Summary of Natural Heritage Features for the Project

Natural Heritage Feature	Proposed Project Footprint	Site	Adjacent Lands
Significant Areas of Natural and Scientific Interest	No	No	No
Significant Valleylands	No	No	No
Significant Woodlands	Yes	Yes	Yes
Significant Wetlands	No	No (based on Stantec's wetland boundary delineation)	Yes (including unevaluated wetlands)
Other Coastal Wetlands in Ecoregions 5E, 6E and 7E	No	No	No
Fish Habitat	No	No	No
Habitat of Endangered and Threatened Species	Yes (bats)	Yes (bats)	Yes (bats, Eastern Meadowlark)
Confirmed Significant Wildlife Habitat	Habitat of SOCC (Monarch, Eastern Wood-pewee)	• Amphibian Breeding Habitat (woodland) • Habitat of SOCC (Midland Painted Turtle, Barn Swallow, Eastern Wood-pewee, Monarch)	• Amphibian Breeding Habitat (woodland) • Habitat of SOCC (Midland Painted Turtle, Barn Swallow, Eastern Wood-pewee, Monarch)
Candidate Significant Wildlife Habitat	• Bat Maternity Roost Habitat • Habitat of SOCC (Eastern Milksnake, Eastern Ribbonsnake, Betrothed Underwing Moth, Giant Leopard Moth)	Habitat of SOCC (Eastern Milksnake, Eastern Ribbonsnake, Betrothed Underwing Moth, Chestnut Schizura Moth, Giant Leopard Moth, Penitent Underwing Moth, Walnut Caterpillar Moth)	Habitat of SOCC (Eastern Milksnake, Eastern Ribbonsnake, Betrothed Underwing Moth, Chestnut Schizura Moth, Giant Leopard Moth, Penitent Underwing Moth, Walnut Caterpillar Moth)

Permitting under the Endangered Species Act may be required to address potential impacts to bat SAR habitat, although consideration should be given to the policy in place at the time of removal (e.g., the forthcoming *Species Conservation Act*).

The proposed licensed area is approximately 18.0 hectares (ha) (44.5 acres) with 8.7 ha (21.5 acres) proposed for extraction. The pit is proposed to operate above and below the water table, which will create two large ponds post-extraction. Access will occur via an existing driveway that meets Victoria Road South on the northeast corner of the Site, a portion of which will be shared with the property owner. The remaining portion of the access road will pass between two sections of the Mill Creek Puslinch PSW and extraction is focused on areas being used for agricultural row crops and recreation.

Impacts discussed in this report focus on significant features detailed in Table 19, looking at both potential direct (e.g., removal) and indirect (i.e., water balance) impacts.

A series of recommendations are included in Sections 9 (mitigation) and 10 (rehabilitation and enhancement) to offset potential impacts of the pit to natural features and wildlife habitat identified within the impact area, Site, and on Adjacent Lands. This includes:

- Timing restrictions for vegetation removal to occur outside the active seasons for migratory birds (April 1 – August 31), bat SAR (April 1 –November 30), and Monarch (milkweed plants, April 1 – September 30; where feasible)
- Specific measures are included for vegetation protection, invasive species management, erosion and sediment controls, spill prevention measures and environmental monitoring.
- Operational considerations, including restricting work to daylight hours (07:00 to 19:00 on weekdays and 08:00 to 16:00 on weekends) to avoid key amphibian movement periods in the spring evenings (approximately late March to mid-April), lighting considerations for indirect impacts to bats, the implementation of speed limits on the access road (20 km/hour), and mitigation for dust suppression as detailed in the *Best Management Plan for Fugitive Dust: Anthony Pit Project* (Stantec,2026).
- Post-operation, the Site will be rehabilitated/enhanced to provide a new constructed wetland, two large ponds structured to support fish, amphibian, and turtles (including a new nesting area), seeding and tree planting to support future habitat for Monarch, bats, amphibians, SOCC insects, as well as provisioning of bat boxes to offset woodland/hedgerow/thicket removal.
- With the implementation of the mitigation and rehabilitation measures outlined in this report

This NER/EIS was prepared to meet the assessment requirements of the ARA, the PPS, and the County of Wellington OP.

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Appendices

Appendix A Figures

Stantec

Legend

- Site
- Adjacent Lands (120 m)
- Road
- Watercourse
- Waterbody

0 200 400 metres

1:7,500 (At original document size of 11x17)

Notes

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Project Location
Township of Puslinch

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Prepared by PRM on 2025-09-22
Technical Review by MS on 2025-09-16

Client/Project
CBM AGGREGATES
ANTHONY PIT
NATURAL ENVIRONMENT REPORT

Figure No.
1

Title
Site and Adjacent Lands

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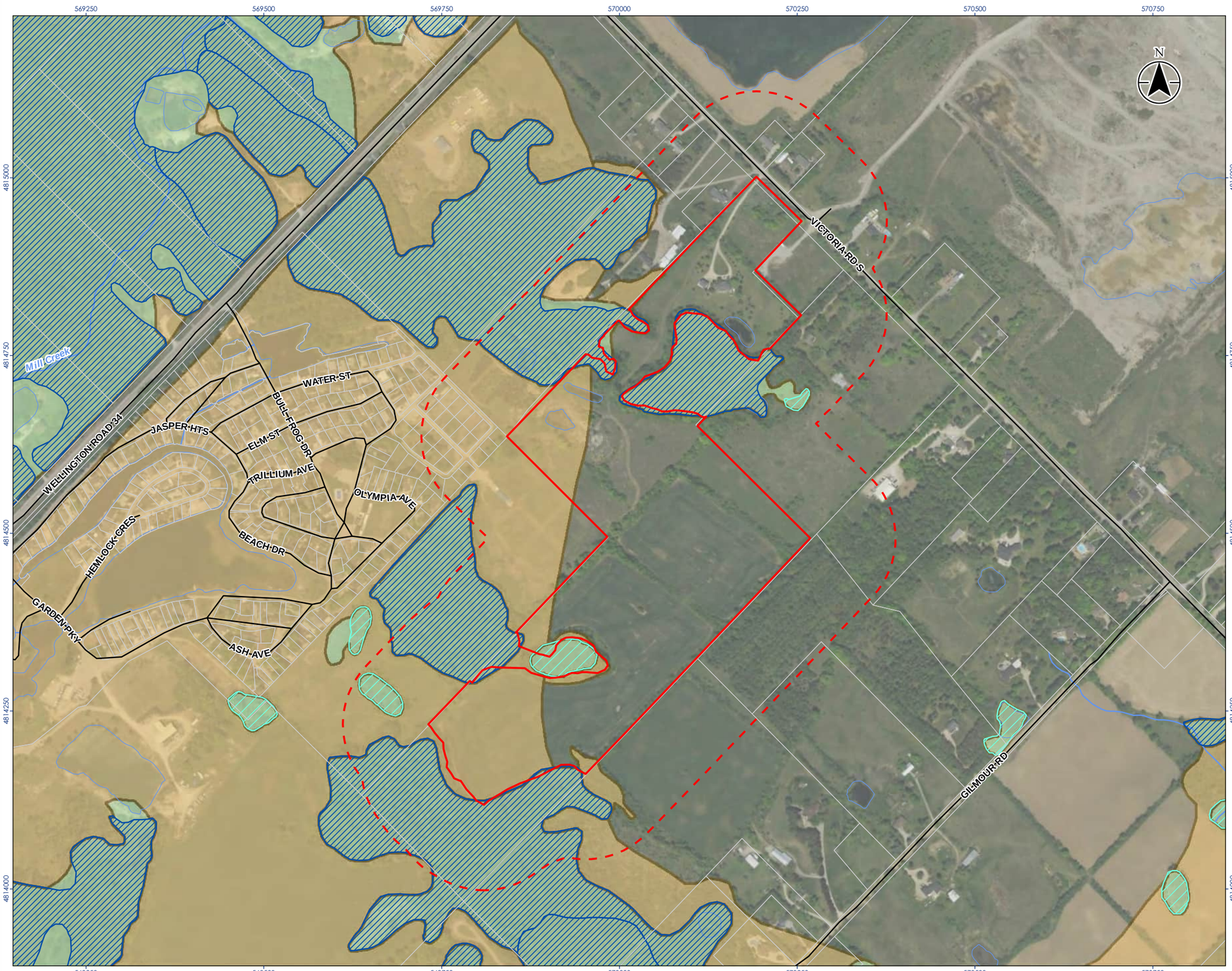

Stantec

Legend

- Site
- Adjacent Lands (120 m)
- Road
- Watercourse
- Waterbody
- Mill Creek Provincialy Significant Wetland (GEO)
- Unevaluated Wetland (GEO)
- Parcel Boundary

The Greenland System

- Core Greenlands
- Greenlands

0 100 200 metres

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Project Location
Township of Puslinch

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NATURAL ENVIRONMENT REPORT

Figure No.
2

Title
Natural Features

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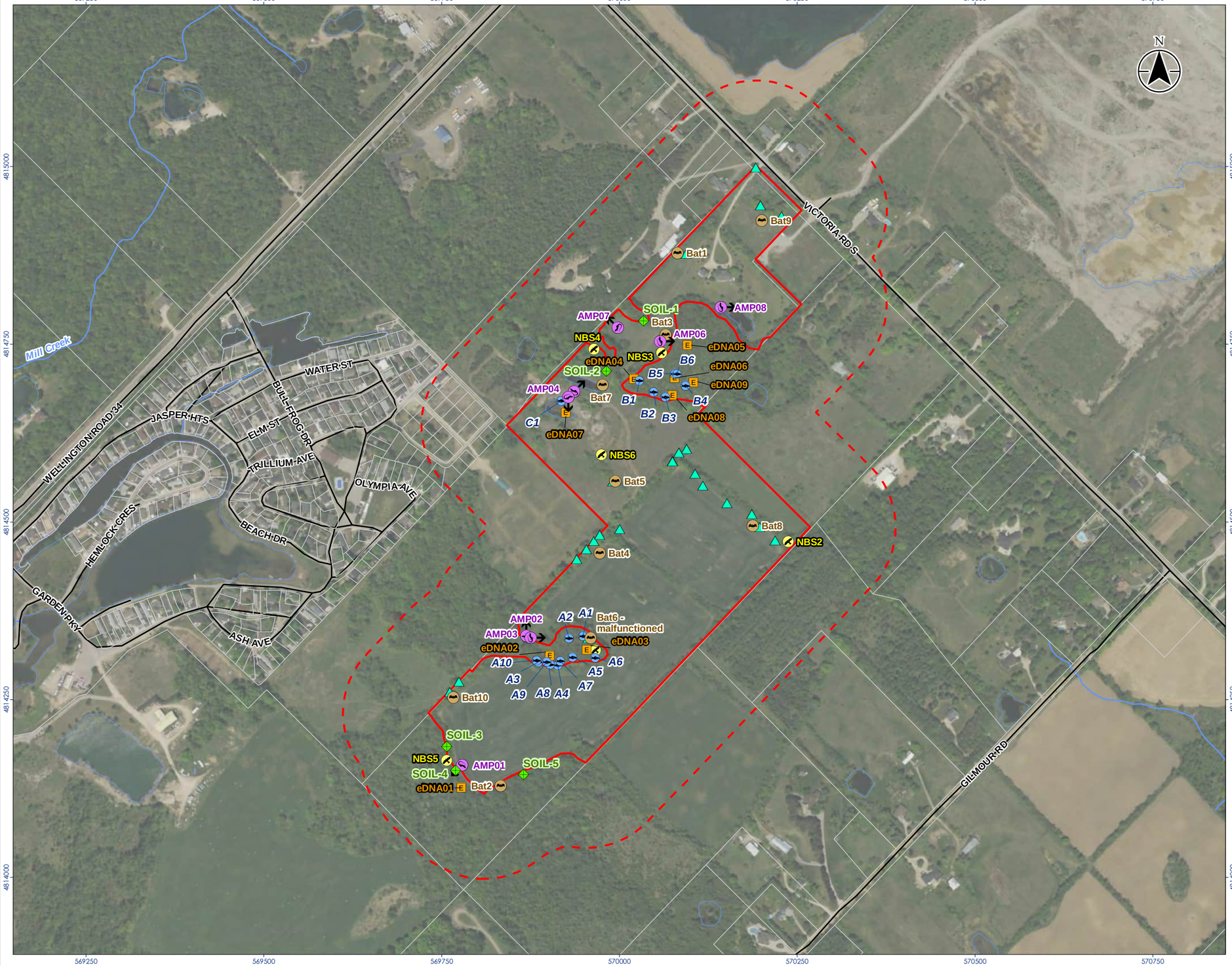

Stantec

Legend

- Site
- Adjacent Lands (120 m)

Survey Location

- Amphibian Survey Location
- Potential Bat Roost Tree
- Bat Acoustic Survey Location
- Salamander Minnow Trap Location
- Nocturnal Bird Survey Station
- eDNA Sample Locations
- Soil Sample Location

Base Features

- Road
- Watercourse
- Waterbody
- Parcel Boundary

0 100 200 metres
1:5,500 (At original document size of 11x17)

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Project Location
Township of Puslinch

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Prepared by PRM on 2025-09-22
Technical Review by MS on 2025-09-16

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ANTHONY PIT
NATURAL ENVIRONMENT REPORT

Figure No.
3

Title
Survey Location

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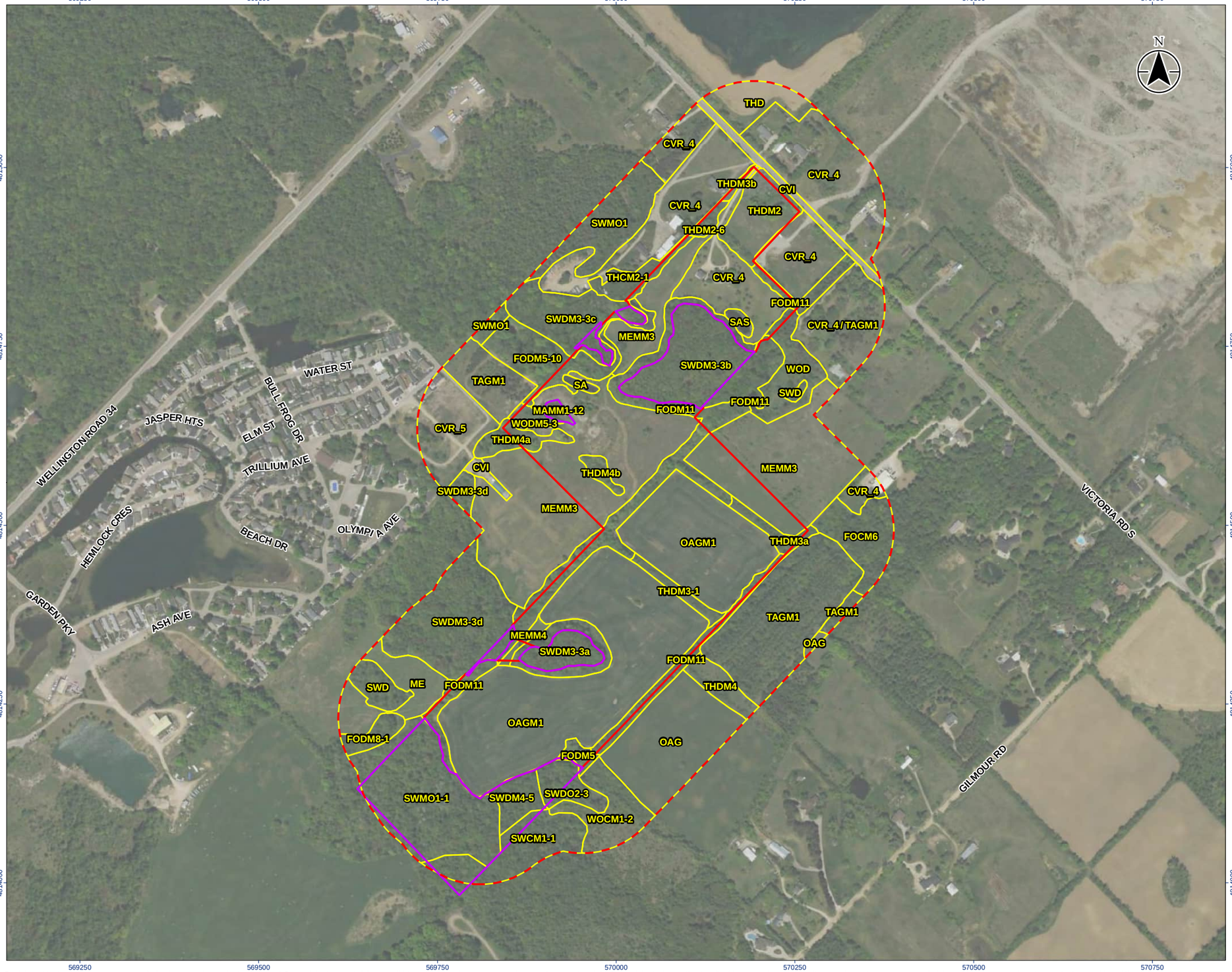

Stantec

Legend

- Site
- Adjacent Lands (120 m)
- Wetland (Stantec 2024)
- ELC Boundary

CVI - Transportation and Utilities
CVR_4 - Rural Property
CVR_5 - Trailer Park
FOCM6 - Naturalized Coniferous Plantation
FODM11 - Naturalized Deciduous Hedge-row Ecosite
FODM5-10 - Dry – Fresh Sugar Maple – White Birch – Poplar Deciduous Forest Type
FODM5 - Dry-Fresh Sugar Maple Deciduous Forest Ecosite
FODM8-1 - Fresh – Moist Poplar Deciduous Forest Type
MAMM1-12 - Common Reed Graminoid Mineral Meadow Marsh Type
ME - Meadow
MEMM3 - Dry - Fresh Mixed Meadow Ecosite
MEMM4 - Fresh - Moist Mixed Meadow Ecosite
OAG - Open Agriculture
OAGM1 - Annual Row Crops
SA - Shallow Water
SAS - Shallow Marsh
SWCM1-1 - White Cedar Mineral Coniferous Swamp Type
SWD - Deciduous Swamp
SWDM3-3 - Swamp Maple Mineral Deciduous Swamp Type
SWDM4-5 - Poplar Mineral Deciduous Swamp Type
SWDO2-3 - Swamp Maple Organic Deciduous Swamp Type
SWMO1-1 - White Cedar - Hardwood Organic Mixed Swamp
SWMO1 - White Cedar Organic Mixed Swamp Ecosite
TAGM1 - Coniferous Plantation
THCM2-1 - Fresh - Moist White Cedar Coniferous Thickte Type
THD - Deciduous Thicket
THDM2-6 - Buckthorn Deciduous Shrub Thicket Type
THDM2 - Dry - Fresh Deciduous Shrub Thicket Ecosite
THDM3-1 - Buckthorn Deciduous Hedgerow Thicket Type
THDM3 - Dry - Fresh Deciduous Hedgerow Thicket Ecosite
THDM4 - Dry - Fresh Deciduous Regeneration Thicket Ecosite
WOCM1-2 - Dry-Fresh White Cedar Coniferous Woodland
WOD - Deciduous Woodland
WODM5-3 - Fresh - Moist Manitoba Maple Deciduous Woodland Type

0 100 200 metres
1:5,500 (At original document size of 11x17)

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Project Location
Township of Puslinch

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by MS on 2026-02-12

Client/Project
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ANTHONY PIT
NATURAL ENVIRONMENT REPORT

Figure No.
4

Title
Ecological Land Classification

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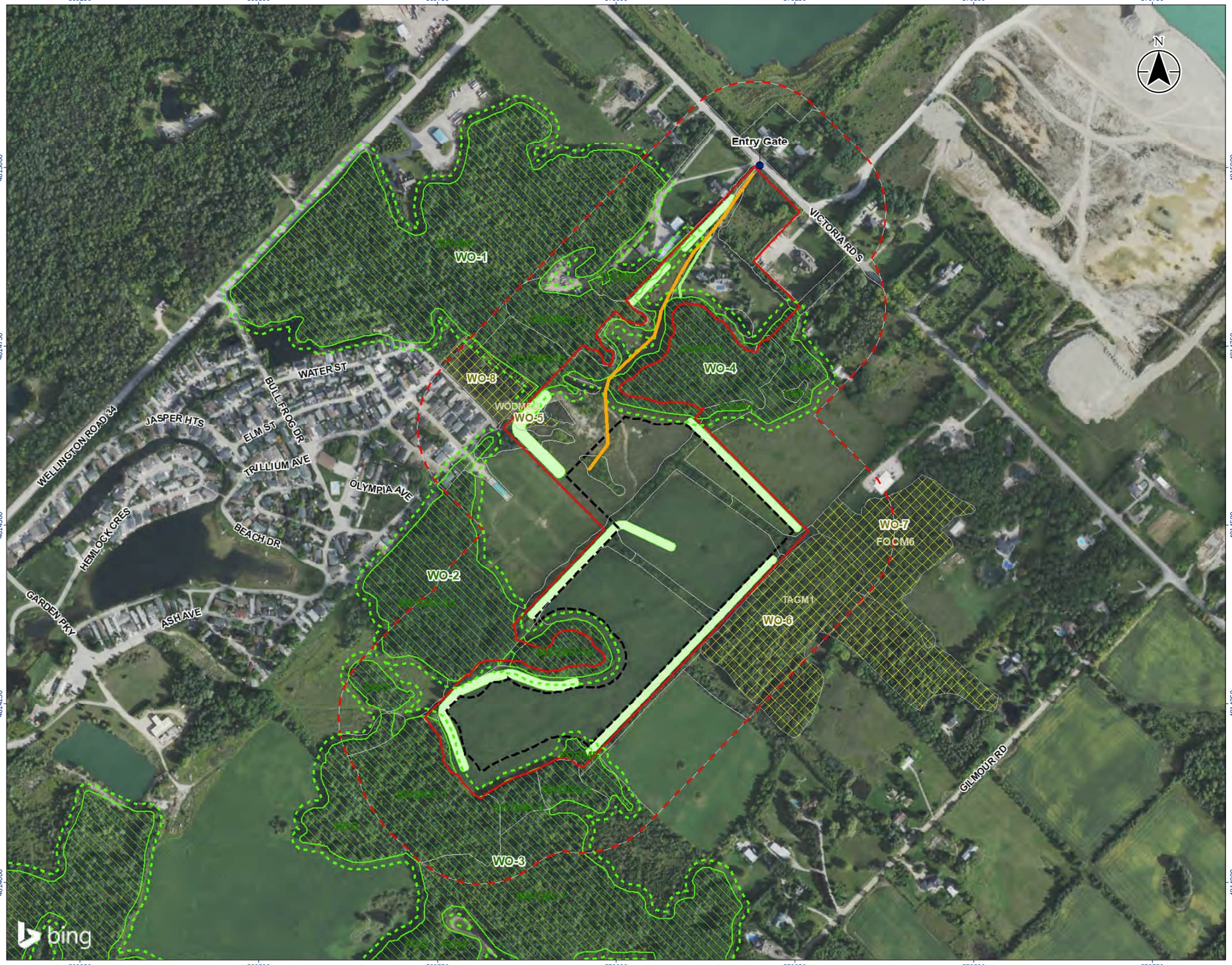

Stantec

Legend

- Site
- Adjacent Lands (120 m)
- Significant Wooland
- Other Woodland
- Significant Wooland Setback (10m)
- **FOCM6** - Naturalized Coniferous Plantation
- **FOD** - Deciduous Forest
- **FODM5-10** - Dry – Fresh Sugar Maple – White Birch – Poplar Deciduous Forest Type
- **FODM5** - Dry-Fresh Sugar Maple Deciduous Forest Ecosite
- **FOM** - Mixed Forest
- **SWCM1-1** - White Cedar Mineral Coniferous Swamp Type
- **SWD** - Deciduous Swamp
- **SWDM3-3** - Swamp Maple Mineral Deciduous Swamp Type
- **SWDM4-5** - Poplar Mineral Deciduous Swamp Type
- **SWDO2-3** - Swamp Maple Organic Deciduous Swamp Type
- **SWMO1-1** - White Cedar - Hardwood Organic Mixed Swamp
- **SWMO1** - White Cedar Organic Mixed Swamp Ecosite
- **THCM2-1** - Fresh - Moist White Cedar Coniferous Thickte Type

Project Component

- Proposed Acoustic Discretionary Noise Barrier
- Proposed Acoustic Berm Location
- Acces Route
- Extraction Site Footprint

0 100 200 metres

1:5,500 (At original document size of 11x17)

Notes
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Project Location
Township of Puslinch

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Prepared by PRM on 2026-02-12
Technical Review by MS on 2025-03-03

Client/Project
CBM AGGREGATES
ANTHONY PIT
NATURAL ENVIRONMENT REPORT

Figure No.
5

Title
Woodland Map

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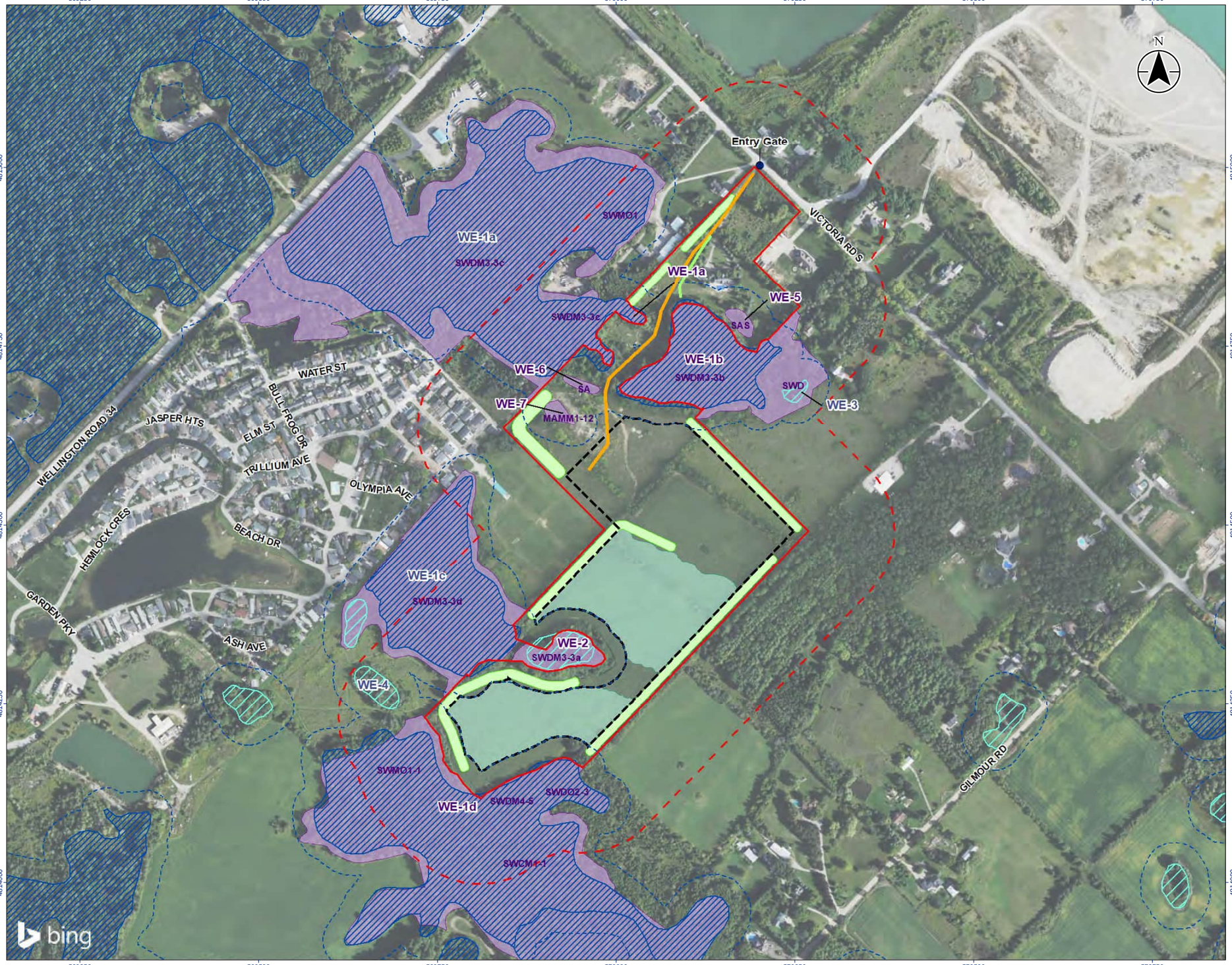

Stantec

Legend

- Site
- Adjacent Lands (120 m)
- Wetland (Stantec 2022-2024)
- Mill Creek Provincialy Significant Wetland (GEO)
- Unevaluated Wetland (GEO)
- Wetland Buffer (30m)

Project Component

- Proposed Acoustic Discretionary Noise Barrier
- Proposed Acoustic Berm
- Acces Route
- Extraction Site Footprint
- Below Water Table Extraction Footprint

ELC Description

MAMM1-12 - Common Reed Graminoid Mineral Meadow Marsh Type

SA - Shallow Water

SAS - Shallow Marsh

SWCM1-1 - White Cedar Mineral Coniferous Swamp Type

SWD - Deciduous Swamp

SWDM3-3 - Swamp Maple Mineral Deciduous Swamp Type

SWDM4-5 - Poplar Mineral Deciduous Swamp

SWDO2-3 - Swamp Maple Organic Deciduous Swamp Type

SWMO1-1 - White Cedar - Hardwood Organic Mixed Swamp

SWMO1 - White Cedar Organic Mixed Swamp Ecosite

SWT - Thicket Swamp

0 100 200 metres

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Notes

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Project Location
Township of Puslinch

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Technical Review by MS on 2026-02-13

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ANTHONY PIT
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Figure No.
6

Title
Wetlands

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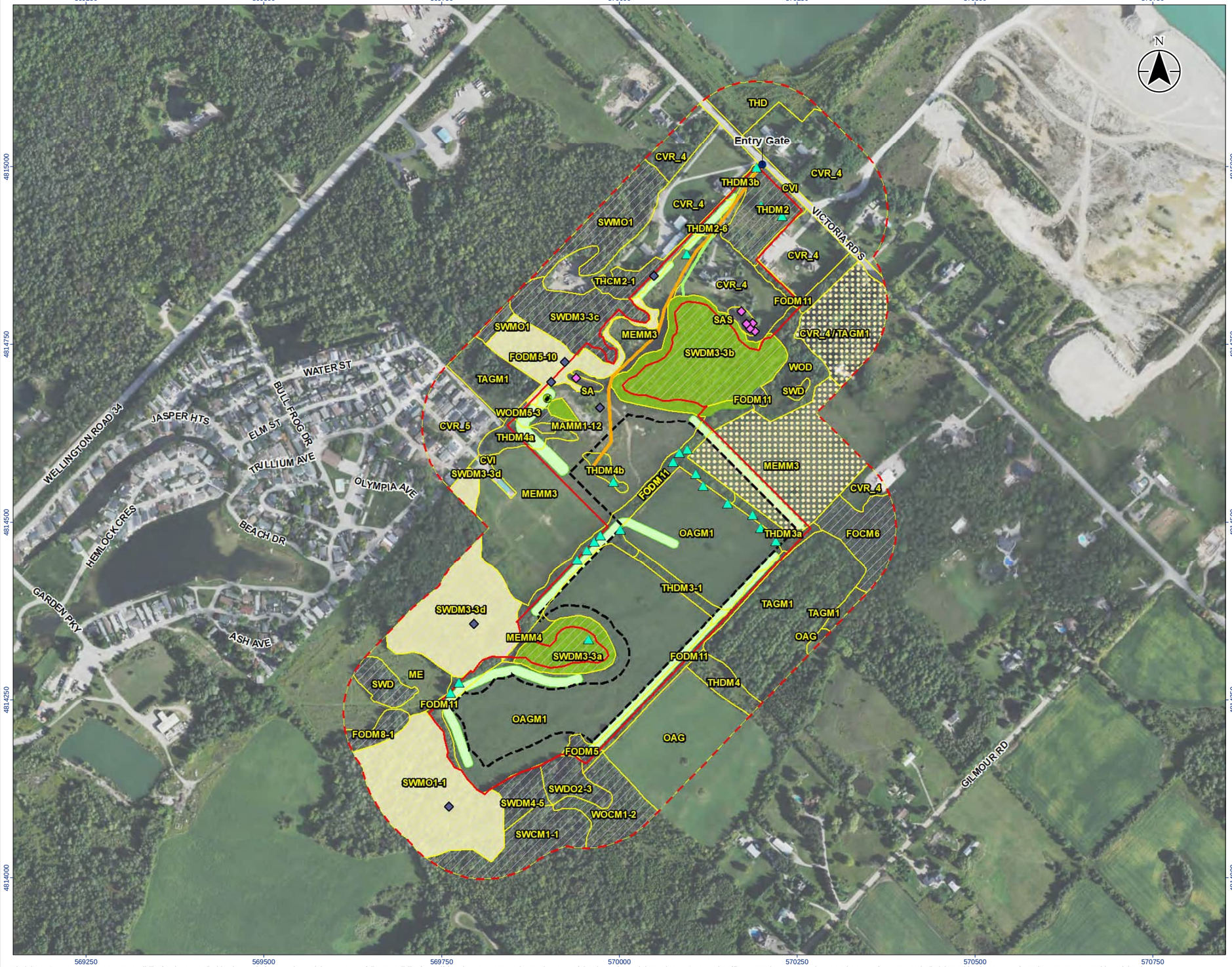

Stantec

Legend

- Site
- Adjacent Lands (120 m)
- Turtle Nesting Location
- Potential Bat Roost Tree
- ELC Boundary

Significant Wildlife Habitat

- Confirmed Amphibian Breeding Habitat (woodland)
- Habitat of SOCC – Monarch
- Candidate Bat Maternity Roost Habitat
- Eastern Wood-pewee Habitat (SOCC)

Species Observations

- Eastern Wood-pewee (SOCC)
- Midland Painted Turtle (SOCC)

Project Components

- Proposed Acoustic Discretionary Noise Barrier
- Proposed Acoustic Berm Location
- Access Road
- Extraction Area Footprint

0 100 200 metres

1:5,500 (At original document size of 11x17)

Notes

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Project Location
Township of Puslinch

160961457 REVA
Prepared by PRM on 2026-01-15
Technical Review by MS on 2025-03-03

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CBM AGGREGATES
ANTHONY PIT
NATURAL ENVIRONMENT REPORT

Figure No.
7

Title
Significant Wildlife Habitat

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Stantec

Legend

- Site
- Adjacent Lands (120 m)
- Potential Bat Roost Tree
- Eastern Meadowlark Observation
- Potential SAR Bat Habitat
- Eastern Meadowlark Habitat

Project Components

- Proposed Acoustic Discretionary Noise Barrier
- Proposed Acoustic Berm Location
- Access Road
- Extraction Area Footprint

0 100 200 metres

1:5,500 (At original document size of 11x17)

Notes

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Project Location
Township of Puslinch

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Technical Review by JB on 2025-09-16

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ANTHONY PIT
NATURAL ENVIRONMENT REPORT

Figure No.
8

Title
Habitat of Endangered or Threatened Species

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Appendix B Additional Tables

B.1 Significant Wildlife Habitat Assessment

Table B.1 Significant Wildlife Habitat Assessment

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
Seasonal Concentration Areas			
Waterfowl Stopover and Staging Area (Terrestrial)	Fields with sheet water during spring (mid-March to May), or annual spring melt water flooding found in any of the following Community Types: Meadow (CUM1), Thicket (CUT1). Agricultural fields with waste grains are commonly used by waterfowl, and these are not considered SWH unless they have spring sheet water available.	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Waterfowl Stopover and Staging Areas (Terrestrial).	There were no flooded meadows or fields on the Site or Adjacent Lands. Candidate habitat for waterfowl stopover or staging areas (terrestrial) is absent from the Site and Adjacent Lands.
Waterfowl Stopover and Staging Area (Aquatic)	The following Community Types: Meadow Marsh (MAM), Shallow Marsh (MAS), Shallow Aquatic (SA), Deciduous Swamp (SWD). Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. The combined area of the ELC ecosites and a 100 m radius area is the SWH. Sewage treatment ponds and storm water ponds do not qualify as a SWH; however, a reservoir managed as a large wetland or pond/lake does qualify.	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Waterfowl Stopover and Staging Areas (Aquatic).	There were no waterfowl species observed using the deciduous swamp (SWDM3-3) communities during spring field investigations when vernal pooling was present in the features. Candidate habitat for waterfowl stopover or staging areas (aquatic) is absent from the Site and Adjacent Lands.
Shorebird Migratory Stopover Area	Shorelines of lakes, rivers, and wetlands, including beach areas, bars, and seasonally flooded, muddy, and un-vegetated shoreline habitats. Great Lakes coastal shorelines, including groynes and other forms of amour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. Sewage treatment ponds and storm water ponds do not qualify as a significant wildlife habitat. The following community types: Meadow Marsh (MAM), Beach/Bar (BB), or Sand Dune (SD)	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Shorebird Migratory Stopover Areas.	Shoreline habitats and meadow marsh (MAM) are absent from the Site and Adjacent Lands. Therefore, candidate habitat for shorebird migratory stopover areas are considered absent from the Site and Adjacent Lands.
Raptor Wintering Area	At least one of the following Forest Community Types: Deciduous Forest (FOD), Mixed Forest (FOM) or Coniferous Forest (FOC), in combination with one of the following Upland Community Types: Meadow (CUM), Thicket (CUT), Savannah (CUS), Woodland (CUW) (<60% cover) that are >20 ha and provide roosting,	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Raptor Wintering Areas.	Upland meadow habitat (CUM) on the Site and Adjacent Lands is not large enough to meet the size criteria for raptor wintering areas. Therefore, candidate habitat for raptor wintering areas is considered absent from the Site and Adjacent Lands.

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
	foraging and resting habitats for wintering raptors. Upland habitat (CUM, CUT, CUS, CUW), must represent at least 15 ha of the 20-ha minimum size.		
Seasonal Concentration Areas			
Bat Hibernacula	Hibernacula may be found in caves, mine shafts, underground foundations, and karsts. May be found in these Community Types: Crevice (CCR), Cave (CCA).	ELC surveys and background review were used to determine the presence of candidate Bat Hibernacula.	No candidate hibernaculum features were identified on the Site and Adjacent Lands.
Bat Maternity Colonies	Maternity colonies considered significant wildlife habitat are found in forested ecosites. Community Types FOD, FOM, SWD, SWM that have>10/ha wildlife trees >25cm diameter at breast height (dbh). Maternity colonies can be found in tree cavities, vegetation and often in buildings (buildings are not considered to be SWH). Maternity Colonies are confirmed where they are in use by 10 Big Brown Bats.	ELC surveys and targeted bat maternity roost tree assessments were used to determine the presence of candidate Bat Maternity Colonies.	Targeted acoustic monitoring surveys detected high numbers of Big Brown Bats (i.e., 3,232 calls between June 3 and June 25, 2022); however, maternity roost confirmation was not possible. Detailed roost tree assessments were not completed outside of the Extraction Limit and as such a determination if the density criteria of 10 trees/ha were met is not possible. However, due to the presence of wooded habitat (e.g., FOD, SWD, SWM) as well as FOC and WOD, these areas are assumed to be candidate habitat for bat maternity colonies on the Site (WOD) and Adjacent Lands.
Turtle Wintering Areas	Snapping and Midland Painted Turtles utilize ELC community classes: Swamp (SW), Marsh (MA) and Open Water (OA). Shallow water (SA), Open Fen (FEO) and Open Bog (BOO). Northern Map turtle- open water areas such as deeper rivers or streams and lakes can also be used as over-wintering habitat. Water has to be deep enough not to freeze and have soft mud substrate. Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate dissolved oxygen. Significant when 5 over-wintering Midland Painted Turtles or one or more Northern Map Turtle or Snapping Turtle.	ELC surveys and aquatic habitat assessments were used to assess features withon the Site and Adjacent Lands that may support areas of permanent standing water but not deep enough to freeze.	Midland Painted Turtles were observed basking in both constructed ponds on the Site; however, a maximum of 3 turtles were noted at any one time (May 5, 30, 2022) and as such is not considered significant.

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
Seasonal Concentration Areas			
Snake Hibernacula	Hibernation occurs in sites located below frost lines in burrows, rock crevices, broken and fissured rock and other natural features. Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. Any ecosite in southern Ontario other than very wet ones may provide habitat. The following Community Types may be directly related to snake hibernacula: Talus (TA), Rock Barren (RB), Crevice (CCR), Cave (CCA), and Alvar (RBOA1, RBSA1, RBTA1).	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Snake Hibernacula.	No candidate hibernacula features were identified on the Site and Adjacent Lands.
Colonial-Nesting Bird Breeding Habitat (Bank and Cliff)	Eroding banks, sandy hills, borrow pits, steep slopes, sand piles, cliff faces, bridge abutments, silos, or barns found in any of the following Community Types: Meadow (CUM), Thicket (CUT), Bluff (BL), Cliff (CL). Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil, or aggregate stockpiles. Does not include a licensed/permitted Mineral Aggregate Operation.	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Colonial-Nesting Bird Breeding Habitat (Bank and Cliff).	No candidate habitat to support colonial bank/cliff nesting breeding birds was identified on the Site and Adjacent Lands.
Colonial-Nesting Bird Breeding Habitat (Tree/Shrubs)	Identification of stick nests in any of the following Community Types: Mixed Swamp (SWM), Deciduous Swamp (SWD), Treed Fen (FET). The edge of the colony and a minimum 300 m area of habitat or extent of the Forest Ecosite containing the colony or any island <15.0 ha with a colony is the SWH. Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used.	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Colonial-Nesting Bird Breeding Habitat (Tree/Shrubs).	No candidate habitat to support colonial tree/shrub nesting breeding birds was identified on the Site and Adjacent Lands.
Colonial-Nesting Bird Breeding Habitat (Ground)	Any rocky island or peninsula within a lake or large river. For Brewer's Blackbird close proximity to watercourses in open fields or pastures with scattered trees or shrubs found in any of the following Community Types: Meadow Marsh (MAM1-6), Shallow Marsh (MAS1-3), Meadow (CUM), Thicket (CUT), Savannah (CUS).	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Colonial-Nesting Bird Breeding Habitat (Ground).	No habitat to support colonial ground nesting breeding birds was identified on the Site and Adjacent Lands.

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
Seasonal Concentration Areas			
Migratory Butterfly Stopover Areas	Located within 5 km of Lake Ontario A combination of ELC communities, one from each land class is required: Field (CUM, CUT, CUS) and Forest (FOC, FOM, FOD, CUP) Minimum of 10 ha in size with a combination of field and forest habitat present	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Migratory Butterfly Stopover Areas.	The Site and Adjacent Lands are not located within 5 km of Lake Ontario.
Landbird Migratory Stopover Areas	The following community types: Forest (FOD, FOM, FOC) or Swamp (SWC, SWM, SWD) Woodlots must be >10 ha in size and within 5 km of Lake Ontario – woodlands within 2 km of Lake Ontario are more significant	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Landbird Migratory Stopover Areas.	The Site and Adjacent Lands are not located within 5 km of Lake Ontario.
Deer Yarding/Winter Congregation Areas	Woodlots typically > 100 ha in size unless determined by the MNR as significant. (If large woodlots are rare in a planning area >50ha) All forested ecosites within Community Series: FOC, FOM, FOD, SWC, SWM, SWD Conifer plantations much smaller than 50 ha may also be used	No studies required as the MNR determines this habitat.	There were no designated deer wintering areas identified on MNR mapping on the Site or Adjacent Lands.
Rare Vegetation Communities			
Cliffs and Talus Slopes	A Cliff is vertical to near vertical bedrock >3 m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris Any ELC Ecosite within Community Series: TAO, TAS, TAT, CLO, CLS, CLT Most cliff and talus slopes occur along the Niagara Escarpment	ELC surveys and botanical inventories were used to assess features withon the Site and Adjacent Lands that would be considered cliffs or talus slopes.	Cliffs and talus slopes were not present on the Site and Adjacent Lands.
Sand Barrens	Sand barrens typically are exposed sand, generally sparsely vegetated and cause by lack of moisture, periodic fires, and erosion. Vegetation can vary from patchy and barren to tree covered but less than 60%. Any of the following Community Types: SBO1 (Open Sand Barren Ecosite), SBS1 (Shrub Sand Barren Ecosite), SBT1 (Treed Sand Barren Ecosite).	ELC surveys and botanical inventories were used to assess features withon the Site and Adjacent Lands that would be considered to be sand barrens.	Sand barrens were not present on the Site and Adjacent Lands.

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
Rare Vegetation Communities			
Alvars	An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plant. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animal species. Vegetation cover varies from patchy to barren with a less than 60% tree cover. Any of the following Community Types: ALO1(Open Alvar Rock Barren Ecosite), ALS1 (Alvar Shrub Rock Barren Ecosite), ALT1 (Treed Alvar Rock Barren Ecosite), FOC1 (Dry-Fresh Pine Coniferous Forest), FOC2 (Dry-Fresh Cedar Coniferous Forest), CUM2 (Bedrock Cultural Meadow), CUS2 (Bedrock Cultural Savannah), CUT2-1 (Common Juniper Cultural Alvar Thicket), or CUW2 (Bedrock Cultural Woodland) An Alvar site > 0.5 ha in size	ELC surveys and botanical inventories were used to assess features withon the Site and Adjacent Lands that would be considered to be alvar communities.	Alvars were not present on the Site and Adjacent Lands.
Old-growth Forest	Old-growth forests tend to be relatively undisturbed, structurally complex, and contain a wide variety of trees and shrubs in various age classes. These habitats usually support a high diversity of wildlife species. No minimum size criteria t in any of the following Community Types: FOD (Deciduous Forest), FOM (Mixed Forest), FOC (Coniferous Forest) Forests greater than 120 years old and with no historical forestry management was the main criteria when surveying for old-growth forests.	ELC surveys and botanical inventories were used to assess features withon the Site and Adjacent Lands that would be considered to be old-growth forest communities.	Old-growth Forest was not present on the Site and Adjacent Lands.

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
Rare Vegetation Communities			
Savannahs	A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60%. In Ecoregion 6E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario). Any of the following Community Types: TPS1 (Dry-Fresh Tallgrass Mixed Savannah Ecosite), TPS2 (Fresh-Moist Tallgrass Deciduous Savannah Ecosite), TPW1 (Dry-Fresh Black Oak Tallgrass Deciduous Woodland Ecosite), TPW2 (Fresh-Moist Tallgrass Deciduous Woodland Ecosite), CUS2 (Bedrock Cultural Savannah Ecosite).	ELC surveys and botanical inventories were used to assess features withon the Site and Adjacent Lands that would be considered to be savannah communities.	Savannahs were not present on the Site and Adjacent Lands.
Tall-grass Prairies	A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover. In Ecoregion 6E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario). Any of the following Community Types: TPO1 (Dry Tallgrass Prairie Ecosite), TPO2 (Fresh-Moist Tallgrass Prairie Ecosite).	ELC surveys and botanical inventories were used to assess features withon the Site and Adjacent Lands that would be considered to be tall-grass communities.	Tall-grass prairies were not present on the Site and Adjacent Lands.
Other Rare Vegetation Communities	Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG	ELC surveys and botanical inventories were used to assess features withon the Site and Adjacent Lands that would be considered to be other rare vegetation communities.	The vegetation communities present on the Site and Adjacent Lands are common and widespread throughout the region and are not ranked S1-S3.

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
Specialized Habitat for Wildlife			
Waterfowl Nesting Area	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1, MAS2, MAS3, SAS1, SAM1, SAF1, MAM1, MAM2, MAM3, MAM4, MAM5, MAM6, SWT1, SWT2, SWD1, SWD2, SWD3, SWD4 Note: includes adjacency to Provincially Significant Wetlands	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Waterfowl Nesting Areas.	There were no congregations of nesting waterfowl observed in or adjacent to the deciduous swamp and marsh communities on the Site and Adjacent Lands during field investigations.
Specialized Habitat for Wildlife			
Bald Eagle and Osprey nesting, Foraging, and Perching Habitat	Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. Nests located on man-made objects are not to be included as SWH (e.g., telephone poles and constructed nesting platforms). ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds, and wetlands	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Bald Eagle and Osprey Nesting, Foraging, and Perching Habitat.	No large stick nests were observed on the Property during field investigations.
Woodland Raptor Nesting Habitat	All natural or conifer plantation woodland/forest stands combined >30 ha and with >4 ha of interior habitat. Interior habitat determined with a 200 m buffer. Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Coopers hawk nest along forest edges sometimes on peninsulas or small offshore islands. May be found in all forested ELC Ecosites. May also be found in SWC, SWM, SWD and CUP3	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Woodland Raptor Nesting Habitat.	The large forest and swamp communities on the Site and Adjacent Lands do not meet the minimum interior habitat criteria for woodland raptor nesting.
Turtle Nesting Areas	Exposed mineral soil (sand or gravel) areas adjacent (<100 m) or within the following ELC Ecosites: MAM1, MAM2, MAM3, MAM4, MAM5, MAM6, SAS1, SAM1, SAF1, BOO1, FEO1 Best nesting habitat for turtles is close to water, away from roads and sites less prone to loss of eggs by predation from skunks, raccoons, or other animals. For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Turtle Nesting Areas.	Predated turtle nests were observed north of the MAMM1-12 wetland in an exposed area with gravel and sand. This area is adjacent to a constructed pond where basking turtles were observed. However, the number and type of turtle nests is not known to confirm SWH but candidate habitat has been identified.

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
	and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH. Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used. To be significant, 5 or more nesting Midland Painted Turtle nests, or one or more Northern Map or Snapping Turtle nests are required.		
Seeps and Springs	Seeps/Springs are areas where ground water comes to the surface. Often, they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs. Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system	ELC surveys and wildlife habitat assessments were used to determine the presence of Seeps and Springs.	The entirety of the Property was visually assessed during field assessments. No seeps or springs were identified.
Specialized Habitat for Wildlife			
Amphibian Breeding Habitat (Woodland)	All Ecosites associated with these ELC Community Series; FOC, FOM, FOD, SWC, SWM, SWD Presence of a wetland, lake, or pond within or adjacent (within 120 m) to a woodland (no minimum size). Some small wetlands may not be mapped and may be important breeding pools for amphibians. Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat. **Species listed:** Eastern Newt, Blue-spotted Salamander, Spotted Salamander, Gray Treefrog, Spring Peeper, Western Chorus Frog, Wood Frog Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog species with Call Level Codes of 3 is required to meet criteria.	ELC surveys and amphibian call surveys were used to determine the presence of candidate Amphibian Breeding Habitat (Woodland).	The SWDM3-3a and SWDM3-3b communities met the significance criteria to qualify as confirmed amphibian breeding habitat (woodland) due to the presence of blue-spotted salamander. The SWDM3-3b community also had Spring Peeper with a Call Level Code of 3 and the presence of Wood Frog. Although Spring Peeper was recorded with a Call Level Code of 3 at the station adjacent to the SWTO1-1 community, the chorus was recorded beyond the 100m survey area, likely from a large pond west of the swamp. The SWTO1-1 community is therefore not considered as habitat for amphibian breeding habitat (woodland). MAMM1-12 qualifies as amphibian breeding habitat due to the presence of Blue-spotted Salamander and due to the proximity to nearby woodlands (i.e., <120 m) is considered woodland habitat.

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
Amphibian Breeding Habitat (Wetland)	ELC Community Classes SW, MA, FE, BO, OA, and SA. Wetland areas >120 m from woodland habitats. Wetlands and pools (including vernal pools) >500 m^2 (about 25 m diameter) supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNR mapping and could be important amphibian breeding habitats. Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog species with Call Level Codes of 3 is required to meet criteria.	ELC surveys and amphibian call surveys were used to determine the presence of candidate Amphibian Breeding Habitat (Wetland).	Wetlands >120 m from woodlands did not occur on the Site or Adjacent Lands. No amphibian breeding habitat (wetlands) is present.
Habitat for Species of Conservation Concern			
Marsh Bird Breeding Habitat	All wetland habitats with shallow water and emergent aquatic vegetation. May include any of the following Community Types: Meadow Marsh (MAM), Shallow Aquatic (SA), Open Bog (BOO), Open Fen (FEO), or for Green Heron: Swamp (SW), Marsh (MA) and Meadow (CUM) Community Types.	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Marsh Bird Breeding Habitat.	Marsh habitat on the Site and Adjacent Lands was either too small (MAS, MAMM1-12, SA) or did not provide adequate emergent vegetation to support marsh bird breeding habitat (SWD).
Woodland Area-sensitive Bird Breeding Habitat	Habitats >30ha where interior forest is present (at least 200 m from the forest edge); typically >60 years old. These include any of the following Community Types: Forest (FO), Treed Swamp (SW)	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Woodland Area-sensitive Bird Breeding Habitat.	The forest and swamp communities on the Site and Adjacent Lands do not meet the minimum interior habitat criteria for woodland area-sensitive birds.
Habitat for Species of Conservation Concern			
Open Country Bird Breeding Habitat	Grassland areas > 30 ha, not Class 1 or Class 2 agricultural lands, with no row-cropping or hay or livestock pasturing in the last 5 years, in the following Community Type: Meadow (CUM).	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Open Country Bird Breeding Habitat	Meadow habitat on the Site and Adjacent Lands did not meet the size criteria for open country breeding birds.
Habitat for Other Species of Conservation Concern (Excluding	Habitats used by Species of Conservation Concern for all or part of their lifecycle.	ELC surveys, targeted surveys, and wildlife habitat assessments were used to determine the presence of	Confirmed: • Midland Painted Turtle were observed in the two constructed ponds on the Site • Barn Swallow was recorded on the Site and

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
Species Listed as Endangered or Threatened)		candidate Habitat for Other Species of Conservation Concern.	Adjacent Lands during breeding bird surveys. No nests or nest building was observed; however, suitable nesting features (i.e., sheds, eaves) were identified onsite. • Eastern Wood-Pewee was identified in woodlands during breeding bird surveys and suitable breeding habitat is present. • Monarch was observed on the Site and Adjacent Lands during the insect survey. Common milkweed, Monarch's larval host plant, was also present on the Site, Adjacent Lands and extraction footprint. Candidate (Moderate Potential to Occur on the Site and Adjacent Lands): • Eastern Milksnake – potential habitat throughout the open habitat on the Site and Adjacent Lands for this habitat generalist. • Eastern Ribbonsnake – potential habitat adjacent to wetlands on the Site and Adjacent Lands • Betrothed Underwing Moth – associated with its larval host plants, honey locust or black walnut • Chestnut Schizura Moth – associated with its larval host plant, Viburnum species • Giant Leopard Moth – potential to occur throughout the Site and Adjacent Lands as its larvae feed on a diversity of plant species • Penitent Underwing Moth – associated with its larval host plant; ash, butternut, hickory, pecan and walnut trees • Walnut Caterpillar Moth – associated with its larval host plant, black walnut

Candidate Wildlife Habitat	Criteria	Methods	Habitat Assessment
Shrub/Early Successional Bird Breeding Habitat	Oldfield areas succeeding to shrub and thicket habitats >10 ha, not Class 1 or Class 2 agricultural lands, with no row-cropping or intensive hay or livestock pasturing in the last 5 years, in the following Community Types: Thickets (CUT), Savannahs (CUS), or Woodlands (CUW).	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Shrub/Early Successional Bird Breeding Habitat.	There were no early successional shrub communities large enough to support shrub/early successional bird breeding habitat on the Site and Adjacent Lands.
Terrestrial Crayfish	Meadow marshes and edges of shallow marshes (no minimum size). Vegetation communities include MAM1, MAM2, MAM3, MAM4, MAM5, MAM6, MAS1, MAS2, MAS3. Construct burrows in marshes, mudflats, meadows Can be found far from water.	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Terrestrial Crayfish habitat.	Burrowing crayfish chimneys were not observed during field investigations.
Animal Movement Corridors			
Amphibian Movement Corridor	Corridors may be found in all ecosites associated with water. Determined based on identifying significant amphibian breeding habitat (wetland).	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Amphibian Movement Corridors.	Amphibian movement corridors are absent due to the lack of wetland breeding amphibian habitat.
Deer Movement Corridors	Corridors may be found in all forested ecosites. Determined based on identifying significant deer wintering habitat (MNR).	ELC surveys and wildlife habitat assessments were used to determine the presence of candidate Deer Movement Corridors.	There were no designated deer wintering areas identified on MNR mapping; therefore, deer movement corridors are absent from the Site and Adjacent Lands.

B.2 Species of Conservation Concern

Table B.2 Species of Conservation Concern

Group	Common Name	Scientific Name	Provincial S-Rank	SARO Status	SARA Status	Record Source(s)	Habitat Description	Habitat Suitability Assessment	Potential to Occur on the Site and Adjacent Lands
Reptiles	Midland Painted Turtle	*Chrysemys picta marginata*	S4		SC	Ontario Nature 2020	Found in shallow, slow-moving water with abundant aquatic vegetation and basking sites. Occur in swamps, ponds, marshes, bogs, creeks, rivers.	Suitable habitat present in the dug ponds (SA, SAS) on the Site. Midland Painted Turtle observed during field surveys in 2022.	Confirmed (Site)
Reptiles	Snapping Turtle	*Chelydra serpentina*	S3	SC	SC	Ontario Nature 2020	Inhabits ponds, sloughs, streams, rivers, and shallow bays that are characterized by slow moving water, aquatic vegetation, and soft bottoms (COSEWIC 2008). It prefers to stay in shallow water, where it buries itself into mud and leaf litter and has easy access to the surface for air (MNR 2016). Females nest in sand or gravel, frequently using manmade surfaces such as road shoulders and aggregate pits, in May and early June (MNR 2016; COSEWIC 2008).	Suitable habitat present in the dug pond (SA) and shallow marsh (MAS) on the Property. Snapping Turtle not observed during turtle surveys in 2022.	Low
Reptiles	Eastern Milksnake	*Lampropeltis triangulum*	S4	NAR	SC	Ontario Nature 2020	Utilizes open habitats such as meadows, fields, rocky outcrops and forest edges. Overwintering sites include rock crevices, mammal burrows and the foundations of old buildings.	Suitable habitat present throughout the Property.	Moderate
Reptiles	Eastern Ribbonsnake	*Thamnophis sauritus*	S3	SC	SC	Ontario Nature 2020	Usually found close to water and is particularly characteristic of wetlands that have an abundance of small fish and frogs (MNR 2016). It hibernates in communal underground burrows over winter (MNR 2016).	Suitable Habitat present adjacent to wetlands on the Property.	Moderate
Birds	Barn Swallow	*Hirundo rustica*	S4B	SC	THR	Cadman et al. 2007	Barn Swallow commonly nests on walls or ledges of barns, bridges, culverts or other man-made structures (Cadman et al. 2007). Where suitable nesting structures occur, Barn Swallow often form small colonies, sometimes mixed with other swallow species (COSEWIC 2011). The Barn Swallow feeds on aerial insects while foraging over a variety of open habitats such as pastures, lawns, meadows and fields (COSEWIC 2011). It will also frequently forage in woodland clearings, over wetland habitats or open water where insect prey are abundant (Cadman et al. 2007).	Confirmed during field surveys, but no breeding evidence documented on the Property. Breeding habitat available on the Property (i.e., buildings).	Confirmed (Site, Adjacent Lands)
Birds	Black-crowned Night-heron	*Nycticorax nycticorax*	S3B, S2N, S4M			Cadman et al. 2007	Breeds in low shrubs around wetlands.	No suitable habitat on the Property (i.e., shrubs for breeding around wetlands).	Low
Birds	Black Tern	*Chlidonias niger*	S3B, S4M	SC	NAR	Cadman et al. 2007	Black Terns build nests on mats of floating vegetation in loose colonies in shallow marshes.	No suitable habitat on the Property (i.e., marshes, bays or ponds with emergent vegetation).	Low
Birds	Blue-winged Teal	*Spatula discors*	S3B, S4M	Not Listed	Not Listed	Cadman et al. 2007	Found in marshes, sloughs and river margins. Breeds in open areas with well-developed grassy cover, usually within 150m of a wetland.	No suitable habitat on the Property.	Low
Birds	Caspian Tern	*Hydroprogne caspia*	S3B, S5M	NAR	NAR	Cadman et al. 2007	Typically nests on more elevated areas of islands.	No suitable habitat on the Property (i.e., islands).	Low
Birds	Common Gallinule	*Gallinula galeata*	S3B			Cadman et al. 2007	Common Gallinule uses freshwater and brackish marshes, lakes or ponds that have a mixture of vegetation types (e.g., submerged,	No suitable habitat in the Property (i.e., marshes with	Low

Group	Common Name	Scientific Name	Provincial S-Rank	SARO Status	SARA Status	Record Source(s)	Habitat Description	Habitat Suitability Assessment	Potential to Occur on the Site and Adjacent Lands
							emergent, floating). Nesting occurs on top of mats of aquatic plants.	mats of aquatic plants for nesting).	
Birds	Common Nighthawk	*Chordeiles minor*	S4B	SC	SC-SC	Cadman et al. 2007	Common Nighthawk is found in open and partially-open habitats such as sand dunes and beaches, logged and recently burend forests, woodland clearings, praries, plains, sagebrush, grasslands, bogs and rock outcrops. Gravel rooftops are also used as nesting sites in urban areas (Cornell Lab of Ornithology 2019; COSEWIC 2018).	Suitable habitat present in the open meadow communities on the Property. Species was not observed during field investigations.	Low
Birds	Eastern Wood-Pewee	*Contopus virens*	S4B	SC	SC-NS	Cadman et al. 2007	Eastern Wood-Peewee is found in the mid-canopy layer of deciduous and mixedwood forests with open understories, and is commonly associated with edges and clearings (MNR 2016).	Suitable habitat present in the swamp and woodland communities on the Property. Breeding evidence confirmed during field investigations.	Confirmed (Site and Adjacent Lands)
Birds	Grasshopper Sparrow	*Ammodramus savannarum*	S4B	SC	SC-SC	Cadman et al. 2007	Grasshopper Sparrow is found in grasslands, prairies, hayfields, and open pastures with little to no scrub cover on well-drained (often poor) dry soil (Cornell Lab of Ornithology 2019; COSEWIC 2013).	Marginally suitable habitat present in the meadow communities on the Property and Adjacent Lands. Species was not observed during field investigations.	Low
Birds	Horned Grebe	*Podiceps auritus*	S1B, S3N, S4M	SC	SC	Cadman et al. 2007	Horned Grebe typically utilizes small ponds, shallow bays and marshes with emergent vegetation for nesting. The species occupies both natural habitat and man-made reservoirs.	No suitable habitat on the Property (i.e., marshes, bays or ponds with emergent vegetation).	Low
Birds	Purple Martin	*Progne subis*	S3B			Cadman et al. 2007	Breeds in colonies almost exclusively in nest boxes or artificial structures near lakes or waterbodies that provide suitable foraging habitat.	No suitable habitat on the Property (i.e. lakes).	Low
Birds	Redhead	*Aythya americana*	S2B, S4N			Cadman et al. 2007	The Redhead is a semi-parasitic species. Females often lay eggs in the nests of other waterfowl species. Nests in extensive marshes	No suitable habitat in the Property (i.e., extensive marshes).	Low
Birds	Red-shouldered Hawk	*Buteo lineatus*	S4B, S2N	NAR	NAR	Cadman et al. 2007	Breeds in a variety of forest types but prefers dense, mature hardwood forest near wetlands or lakes.	Large stick nests were not observed during field investigations. No suitable habitat on the Property.	Low
Birds	Wood Thrush	*Hylocichla mustelina*	S4B	SC	THR	Cadman et al. 2007	The Wood Thrush is found in deciduous and mixed forests with a developed understory and tall trees (MNR 2016). While it prefers large forest tracts, it will utilize smaller forest fragments (MNR 2016). Nests are constructed in shrubs or saplings, typically Sugar Maple or American Beech (MNR 2016).	Marginally suitable habitat present in the swamp communities, but they are not likely to be preferred. Species was not observed during field investigations.	Low
Mammals	Woodland Vole	*Microtus pinetorum*	S3?	SC	SC-SC	Dobbyn 1994	The Woodland Vole is primarily found in mature Carolinian forest with a dense leaf litter layer (MNR 2016), however it may also be found in sand dunes, swamps and orchards (COSEWIC 2010). The most important factor in habitat selection is a dense herbaceous layer and friable soils with low saturation (COSEWIC 2010).	No suitable habitat on the Property. Swamp communities have saturated soils and lack dense leaf litter layer. No nearby	Low

Group	Common Name	Scientific Name	Provincial S-Rank	SARO Status	SARA Status	Record Source(s)	Habitat Description	Habitat Suitability Assessment	Potential to Occur on the Site and Adjacent Lands
								recent records.	
Insects	Betrothed Underwing Moth	*Catocala innubens*	S3			Ontario Moth Atlas	Larvae feeds on honey locust or black walnut.	Black walnut is present on the Property.	Moderate
Insects	Chestnut Schizura Moth	*Schizura badia*	S3			Ontario Moth Atlas	Feeds on viburnum species.	Host plants are present on the Property.	Moderate
Insects	Giant Leopard Moth	*Hypercompe scribonia*	S3S4			Ontario Moth Atlas	Found along woodland edges, fields or meadows. The larvae of this species has a varied diet.	Suitable habitat present in the meadows and woodland edges on the Property.	Moderate
Insects	Little Underwing Moth	*Catocala minuta*	S3			Ontario Moth Atlas	Feeds on water locust or swamp locust (Gleditsia).	Host plants are absent from the Property.	Low
Insects	Monarch	*Danaus plexippus*	S4B, S2N	SC	SC-END	Ontario Butterfly Atlas; iNaturalist	Monarch is found in areas where Milkweed (Asclepias species) grows. Milkweed is the sole food source (host plant) for Monarch caterpillars, and grows in open and disturbed habitats such as roadsides, fields, wetlands, prairies, and open forests (COSEWIC 2016).	Common Milkweed is present on the Property. Monarch confirmed during insect survey in 2022.	Confirmed (Extraction Limit, Site, Adjacent Lands)
Insects	Pawpaw Sphinx	*Dolba hyloeus*	S3S4			Ontario Moth Atlas	Found in areas where host plants (pawpaw, littleleaf sweetfern, possum haw) are found.	Host plants are absent from Property.	Low
Insects	Penitent Underwing Moth	*Catocala piatrix*	S3			Ontario Moth Atlas	Larvae are found on ash, butternut, hickory, pecan and walnut trees.	Ash, bitternut hickory and black walnut are present on the Property.	Moderate
Insects	Walnut Caterpillar Moth	*Datana integerrima*	S3S4			Ontario Moth Atlas	Larvae are found on walnut and butternut trees.	Black Walnut is present on the Property.	Moderate
Insects	Yellow-banded Bumble Bee	*Bombus terricola*	S3S5	SC	SC	NHIC (MNR 2024)	Feeds on wild blueberry and agricultural crops such as apple trees. The species is a forage and habitat generalist. (COSSARO 2016).	Species was not observed during insect surveys.	Low
Plants	Western Stiff Gentian	*Gentianella quinquefolia ssp. occidentalis*	S1S2			iNaturalist 2024	Stream and river banks, marshy meadows; bluffs and forested hillsides; usually in calcareous sites.	Species was not observed during the botanical inventory.	Low

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B.3 Species at Risk Habitat Assessment

Table B.3 Species at Risk Habitat Assessment

Group	Common Name	*Scientific Name*	S-Rank	SARO Status	SARA Status	Record Source(s)	Habitat Description	Habitat Assessment	Potential to Occur on the Site and Adjacent Lands
Amphibians	Jefferson Salamander	*Ambystoma jeffersonianum*	S2	END	END	Ontario Reptile and Amphibian Atlas 2020	Inhabits deciduous and mixed forests, typically within a few hundred meters of a pond.	Suitable habitat present (i.e., SWDM3-3 communities); however, Jefferson Salamander was not recorded during eDNA surveys.	Low
Amphibians	Unisexual Ambystoma (Jefferson Salamander dependent population)	*Ambystoma hybrid pop. 1*	S2	END	END	Ontario Reptile and Amphibian Atlas 2020	Inhabits deciduous and mixed forests, typically within a few hundred meters of a pond.	Suitable habitat present (i.e., SWDM3-3 communities); however, Jefferson Salamander was not recorded during eDNA surveys.	Low
Reptiles	Blanding's Turtle	*Emydoidea blandingi*	S3	THR	THR	Ontario Reptile and Amphibian Atlas 2020	Blanding's Turtle prefers shallow water in heavily vegetated, large wetlands and lakes (MNR 2016). However, in Ontario it also commonly uses clear watered habitats such as streams, rivers and ponds (COSEWIC 2005a). Nests occur in a variety of loose substrates such as sand, gravel and cobblestone (COSEWIC 2005a). Blanding's Turtles can often be found hundreds of metres from the nearest aquatic habitat during the active season, as they search for mates or nest sites (MNR 2016). Overwintering sites are permanent pools approximately 1 m in depth (COSEWIC 2005a).	Blanding's Turtle was not observed during the turtle basing surveys on the Property. There is a low potential for Blanding's Turtle to enter the Site from adjacent wetlands.	Low
Birds	Bank Swallow	*Riparia riparia*	S4B	THR	THR	Cadman et al. 2007	Bank Swallow breeds on a variety of sites with vertical banks, including riverbanks, bluffs, aggregate pits and stock piles of sand and soil (COSEWIC 2013). Sand-silt substrates are preferred (COSEWIC 2013). Nesting sites are often near open habitats used for aerial foraging (COSEWIC 2013). Large wetlands are used as communal roosts during post-breeding, migration, and wintering periods (COSEWIC 2013).	No suitable nesting sites for Bank Swallow were identified on the Site or Adjacent Lands.	Low
Birds	Bobolink	*Dolichonyx oryzivorus*	S4B	THR	THR	Cadman et al. 2007; MNR 2024	The Bobolink is generally referred to as a “grassland species”. It nests primarily in forage crops with a mixture of grasses and broad-leaved forbs, predominantly hayfields and pastures. Preferred ground cover species include grasses such as Timothy and Kentucky bluegrass and forbs such as clover and dandelion (COSEWIC 2010b). Bobolink is an area-sensitive species, with reported lower reproductive success in small habitat fragments (COSEWIC 2010b).	Marginally suitable habitat present in the meadow communities on Adjacent Lands; however, Bobolink was not recorded during breeding bird surveys.	Low
Birds	Chimney Swift	*Chaetura pelagica*	S4B, S4N	THR	THR	Cadman et al. 2007	Chimney Swift uses chimneys for roosting and breeding, and less commonly, nest in large hollow trees (Cadman et al. 2007a). Nesting sites typically have a constant ambient temperature (COSEWIC 2007a). It is an aerial insectivore, and often forages near water (COSEWIC 2007a).	Suitable chimneys are not present on the Site. There is low potential for Chimney Swift to use hollow trees to nest on Adjacent Lands.	Low
Birds	Eastern Meadowlark	*Sturnella magna*	S4B	THR	THR	Cadman et al. 2007; MNR 2024	The Eastern Meadowlark is typically found in fields, meadows, golf courses, pastures, alfalfa fields, roadsides and other open areas (MNR 2016). Older sites with moderately tall grass, a substantial litter layer, low forb and shrub cover and dense grass are preferred (COSEWIC 2011a). Larger patch sizes (>5 ha) are also generally preferred (COSEWIC 2011a).	Species observed singing in during each breeding bird survey date in 2022.	Confirmed (Adjacent Lands)

Group	Common Name	*Scientific Name*	S-Rank	SARO Status	SARA Status	Record Source(s)	Habitat Description	Habitat Assessment	Potential to Occur on the Site and Adjacent Lands
Birds	Least Bittern	*Ixobrychus exilis*	S4B	THR	THR	Cadman et al. 2007	The Least Bittern prefers cattail marshes, but may be found in a variety of wetland habitats with stable water levels and dense vegetation interspersed with open water areas (MNR 2016; COSEWIC 2009b). Nests are built in dense vegetation near open water for foraging (MNR 2016).	No suitable habitat on the Site or Adjacent Lands (i.e., large cattail marsh).	Low
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*	S3	END	END	Cadman et al. 2007	Red-headed Woodpecker is found in decidious woodlands, groves of dead or dying trees, river bottoms, burned areas, recent clearings, beaver swamps, orchards, parks, farmlands, grasslands with scattered trees, cemeteries, golf courses, forest edges and roadsides (Cornell Lab of Ornithology 2019; COSEWIC 2018). Nests are constructed in cavities of dead (or almost dead) trees, and open canopy is prefered (Cornell Lab of Ornithology 2019; COSEWIC 2018).	Suitable habitat in the woodland communities on the Site and Adjacent Lands. Species was not detected during breeding bird surveys.	Low
Mammals	Little Brown Myotis	*Myotis lucifugus*	S4	END	END	Dobbyn 1994	The Little Brown Myotis roosts in tree cavities and abandoned buildings, and often forms roosting colonies in barns, attics and abandoned buildings (MNR 2016; COSEWIC 2013). They have been found in a wide variety of deciduous and coniferous tree stands (COSEWIC 2013). Hibernation typically occurs in caves and mines (MNR 2016).	Suitable habitat in the woodland, swamp, plantation, thicket, and hedgerow communities on the Site and Adjacent Lands. Species detected during the bat acoustic survey at all 9 stations.	Species presence confirmed but roosting habitat unconfirmed (Extraction Limit, Site and Adjacent Lands)
Mammals	Northern Myotis	*Myotis septentrionalis*	S3?	END	END	Dobbyn 1994	The Northern Myotis roosts in colonies in tree cavities (COSEWIC 2013) in a wide variety of deciduous and coniferous forest stands. Little is known about the effect of tree density on maternity roost selection for this species, but bats tend to avoid large open areas (COSEWIC 2013). Small forest gaps, such as over streams or ponds, are used for foraging (COSEWIC 2013).	Suitable habitat in the woodland, swamp, plantation, thicket, and hedgerow communities on the Site and Adjacent Lands; however, species was not detected during the bat acoustic survey.	Low
Mammals	Eastern Small-footed Myotis	*Myotis leibii*	S2S3	END		Dobbyn 1994	The Eastern Small-footed Myotis roosts in a variety of habitats, including hollow trees, under rocks or in rock outcrops, in buildings, caves, mines and under bridges (MNR 2016). Different roosting sites may be selected each day (MNR 2016). Hibernation occurs in abandoned mines and caves (MNR 2016).	Suitable habitat in the woodland, swamp, plantation, thicket, and hedgerow communities on the Site and Adjacent Lands; however, species was not detected during the bat acoustic survey.	Low
Mammals	Tri-coloured Bat	*Perimyotis subflavus*	S3?	END	END	Dobbyn 1994	Foraging habitat occurs over water, along road corridors and forest edges. Hibernation occurs in caves.	Suitable habitat in the woodland, swamp, plantation, thicket, and hedgerow communities on the Site and Adjacent Lands. Species detected during the bat acoustic survey at 2 out of 9 stations.	Species presence confirmed but roosting habitat unconfirmed (Extraction Limit, Site and Adjacent Lands)
Mammals	Eastern Red Bat	*Lasiurus borealis*	S4	END		Dobbyn 1994	Eastern Red Bat is a solitary, tree dwelling species that roosts exclusively in the terminal foliage of deciduous trees (MNR 1984; Dobbyn 1994). Eastern Red Bats typically forage near or above tree tops and water bodies such as streams, lakes, rivers, and riparian	Suitable habitat in the woodland, swamp, plantation, thicket, and hedgerow communities on	Species presence confirmed but roosting habitat unconfirmed (Extraction Limit, Site

Group	Common Name	*Scientific Name*	S-Rank	SARO Status	SARA Status	Record Source(s)	Habitat Description	Habitat Assessment	Potential to Occur on the Site and Adjacent Lands
							flood plains (MNR 1984).	the Site and Adjacent Lands. Species detected during the bat acoustic survey at 8 out of 9 stations.	and Adjacent Lands)
Mammals	Hoary Bat	*Lasiurus cinereus*	S4	END		Dobbyn 1994	Hoary Bat is a solitary, tree dwelling species that roosts in the terminal foliage of coniferous or deciduous trees (MNR 1984; Dobbyn 1994). Hoary Bats typically forage over glades or lakes in forested areas (MNR 1984).	Suitable habitat in the woodland, swamp, plantation, thicket, and hedgerow communities on the Site and Adjacent Lands. Species detected during the bat acoustic survey at all 9 stations.	Species presence confirmed but roosting habitat unconfirmed (Extraction Limit, Site and Adjacent Lands)
Mammals	Silver-haired Bat	*Lasionycteris noctivagans*	S4	END		Dobbyn 1994	Silver-haired Bat is a solitary, tree dwelling species that forms maternity colonies in hollow trees, woodpecker holes and birds' nests, and typically does not utilize anthropogenic structures, but has been found in sheds/garages (MNR 1984; Dobbyn 1994). Silver-haired Bats typically forage over woodland lakes and streams (MNR 1984).	Suitable habitat in the woodland, swamp, plantation, thicket, and hedgerow communities on the Site and Adjacent Lands. Species detected during the bat acoustic survey at all 9 stations.	Species presence confirmed but roosting habitat unconfirmed (Extraction Limit, Site and Adjacent Lands)
Plants	Black Ash	*Fraxinus nigra*	S4	END		Field Observation	Typically occurs in wetland areas, particularly along the edges of streams, rivers, and ponds. These habitats are often characterized by saturated soils and are frequently found in areas with moderate to high moisture levels. Black ash is a dominant species in specific forest types, including bottomland hardwood forests and floodplain forests.	This species was confirmed in the FODM5-10, SWDM4-5, SWDM3-3 and SWMO1-1 communities on Adjacent Lands during the botanical inventory.	Confirmed (Adjacent Lands, not protected)
Plants	Butternut	*Juglans cinerea*	S3?	END	END	MECP 2024	Generally grows in rich, moist, and well-drained soils often found along streams. It may also be found on well-drained gravel sites, especially those made up of limestone. It is also found, though seldomly, on dry, rocky and sterile soils. In Ontario, the Butternut generally grows alone or in small groups in deciduous forests as well as in hedgerows	Species was not identified on the Property during the botanical inventory.	Low
Plants	Smooth Yellow False Foxglove	*Aureolaria flava*	S2?	THR	THR	MNR 2024	Found in dry, open to semi-open upland oak forests. Also found in well-drained soils including sand dunes. The species is shade-intolerant.	Species and species habitat was not identified on the Property during the botanical inventory.	Low

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Appendix C Species Lists

C.1 Vascular Plant Species List

Appendix C.1: Vascular Plant Species List

MEADOW (MEMM3)	THICKETS (THD) & HEDGEROWS	HEDGEROWS	POPLAR FOREST (FODM5-10, FODM8-1)	MARSH (MAM / MAS)	DECIDUOUS SWAMPS (SWDM3-3)	MIXED SWAMP (SWMO1-1)	SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	SARA STATUS	RARE IN WELLINGTON COUNTY	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
							PTERIDOPHYTES (FERNS & FERN ALLIES)							
						x	*Athyrium filix-femina*	Common Lady Fern	S5				4	0
					x	x	*Cystopteris bulbifera*	Bulblet Bladder Fern	S5				5	-3
			x		x	x	*Dryopteris carthusiana*	Spinulose Wood Fern	S5				5	-3
						x	*Dryopteris clintoniana*	Clinton's Wood Fern	S4			X	7	-3
x				x	x	x	*Equisetum arvense*	Field Horsetail	S5				0	0
x							*Equisetum hyemale ssp. affine*	Common Scouring-rush	S5				2	0
x				x			*Equisetum variegatum*	Variegated Scouring-rush	S5				5	-3
						x	*Gymnocarpium dryopteris*	Common Oak Fern	S5				7	3
	x	x					*Matteuccia struthiopteris*	Ostrich Fern	S5				5	0
					x	x	*Onoclea sensibilis*	Sensitive Fern	S5				4	-3
					x		*Osmunda regalis var. spectabilis*	Royal Fern	S5				7	-5
						x	*Osmundastrum cinnamomeum*	Cinnamon Fern	S5				7	-3
					x		*Parathelypteris noveboracensis*	New York Fern	S4/S5				7	0
					x		*Thelypteris palustris*	Marsh Fern	S5				5	-3
							GYMNOSPERMS (CONIFERS)							
						x	*Abies balsamea*	Balsam Fir	S5				5	-3
x							*Juniperus communis*	Common Juniper	S5				4	3
x							*Juniperus virginiana*	Eastern Red Cedar	S5				4	3
						x	*Larix laricina*	Tamarack	S5				7	-3
	x					x	*Pinus strobus*	Eastern White Pine	S5				4	3
x							*Pinus sylvestris*	Scots Pine	SE5					3
x	x	x	x		x	x	*Thuja occidentalis*	Eastern White Cedar	S5				4	-3
						x	*Tsuga canadensis*	Eastern Hemlock	S5				7	3
							ANGIOSPERMS (DICOTS)							
	x	x					*Acer negundo*	Manitoba Maple	S5				0	0
						x	*Acer rubrum*	Red Maple	S5				4	0
x	x	x	x		x		*Acer saccharum*	Sugar Maple	S5				4	3
						x	*Acer spicatum*	Mountain Maple	S5				6	3
				x	x		*Acer x freemanii*	Freeman's (swamp) maple	S5				6	-5
x							*Achillea millefolium*	Common Yarrow	SE5?					3
						x	*Actaea pachypoda*	White Baneberry	S5				6	5
x							*Ambrosia artemisiifolia*	Common Ragweed	S5				0	3
					x		*Anemonastrum canadense*	Canada Anemone	S5				3	-3
			x			x	*Anemone virginiana*	Tall Anemone	S5				4	3
x							*Antennaria sp.*	Pussytoes Species						
x							*Apocynum androsaemifolium*	Spreading Dogbane	S5				3	5
x							*Apocynum cannabinum*	Hemp Dogbane	S5				3	0
			x			x	*Aralia nudicaulis*	Wild Sarsaparilla	S5				4	3
x							*Arctium minus*	Common Burdock	SE5					3
			x		x		*Asarum canadense*	Canada Wild-ginger	S5				6	5
x							*Asclepias syriaca*	Common Milkweed	S5				0	5
						x	*Betula alleghaniensis*	Yellow Birch	S5				6	0
x			x		x	x	*Betula papyrifera*	Paper Birch	S5				2	3

MEADOW (MEMM3)	THICKETS (THD) & HEDGEROWS	HEDGEROWS	POPLAR FOREST (FODM5-10, FODM8-1)	MARSH (MAM / MAS)	DECIDUOUS SWAMPS (SWDM3-3)	MIXED SWAMP (SWMO1-1)	SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	SARA STATUS	RARE IN WELLINGTON COUNTY	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
					x		*Bidens frondosa*	Devil's Beggarticks	S5				3	-3
					x	x	*Boehmeria cylindrica*	Small-spike False Nettle	S5				4	-5
			x		x		*Carpinus caroliniana*	Blue-beech	S5				6	0
	x	x					*Carya cordiformis*	Bitternut Hickory	S5				6	0
x							*Centaurea sp.*	Knapweed Species						
x							*Cichorium intybus*	Wild Chicory	SE5					5
			x		x		*Circaea canadensis*	Enchanter's Nightshade	S5				2	3
	x						*Cirsium arvense*	Canada Thistle	SE5					3
x	x	x			x	x	*Clematis virginiana*	Virginia Clematis	S5				3	0
						x	*Coptis trifolia*	Goldthread	S5				7	-3
x	x	x	x		x	x	*Cornus alternifolia*	Alternate-leaved Dogwood	S5				6	3
x				x	x		*Cornus sericea*	Red-osier Dogwood	S5				2	-3
x	x						*Daucus carota*	Wild Carrot	SE5					5
x							*Echium vulgare*	Common Viper's Bugloss	SE5					5
x							*Elaeagnus umbellata*	Autumn Olive	SE3					3
						x	*Endotropis alnifolia*	Alder-leaved Buckthorn	S5				7	-5
x							*Erigeron annuus*	Annual Fleabane	S5				0	3
x							*Erigeron pulchellus*	Robin's-plantain Fleabane	S5				7	3
				x			*Eupatorium perfoliatum*	Common Boneset	S5				2	-3
x				x			*Euthamia graminifolia*	Grass-leaved Goldenrod	S5				2	0
				x			*Eutrochium maculatum*	Spotted Joe Pye Weed	S5				3	-5
x	x						*Fragaria virginiana*	Wild Strawberry	S5				2	3
x				x	x	x	*Frangula alnus*	Glossy Buckthorn	SE5					0
	x	x	x				*Fraxinus americana*	White Ash	S4				4	3
			x		**x**	**x**	***Fraxinus nigra***	**Black Ash**	**S4**	**END**	**THR**		**7**	**-3**
						x	*Galium triflorum*	Three-flowered Bedstraw	S5				4	3
					x		*Geranium robertianum*	Herb-Robert	S5				2	3
					x		*Hedera helix*	English Ivy	SE1					3
x							*Hypericum perforatum*	Common St. John's-wort	SE5					5
					x	x	*Ilex verticillata*	Common Winterberry	S5				5	-3
						x	*Impatiens capensis*	Spotted Jewelweed	S5				4	-3
	x		x				*Juglans nigra*	Black Walnut	S4?				5	3
x							*Leucanthemum vulgare*	Oxeye Daisy	SE5					5
	x	x					*Linaria vulgaris*	Butter-and-eggs	SE5					5
x							*Lotus corniculatus*	Garden Bird's-foot Trefoil	SE5					3
				x	x	x	*Lycopus uniflorus*	Northern Water-horehound	S5				5	-5
						x	*Lysimachia borealis*	Northern Starflower	S5				6	0
					x		*Lysimachia thyrsiflora*	Tufted Yellow Loosestrife	S5				7	-5
				x			*Lythrum salicaria*	Purple Loosestrife	SE5					-5
	x	x					*Malus pumila*	Common Apple	SE4					5
x	x						*Malus sp.*	Crabapple Species	SE					
x							*Medicago sativa*	Alfalfa	SE5					5
x							*Melilotus albus*	White Sweet-clover	SE5					3
					x		*Mentha canadensis*	Canada Mint	S5				3	-3
x							*Oenothera sp.*	Evening-primose Species						

MEADOW (MEMM3)	THICKETS (THD) & HEDGEROWS	HEDGEROWS	POPLAR FOREST (FODM5-10, FODM8-1)	MARSH (MAM / MAS)	DECIDUOUS SWAMPS (SWDM3-3)	MIXED SWAMP (SWMO1-1)	SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	SARA STATUS	RARE IN WELLINGTON COUNTY	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
	x	x					*Ostrya virginiana*	Eastern Hop-hornbeam	S5				4	3
x	x	x	x		x	x	*Parthenocissus vitacea*	Thicket Creeper	S5				4	3
x							*Physalis heterophylla*	Clammy Ground-cherry	S4				3	5
	x	x					*Physalis longifolia*	Long-leaved Ground-cherry	S4				1	5
x							*Pilosella officinarum*	Mouse-ear Hawkweed	SE5					5
x	x						*Plantago lanceolata*	English Plantain	SE5					3
x							*Plantago major*	Common Plantain	SE5					3
x							*Plantago rugelii*	Rugel's Plantain	S5				1	0
						x	*Polygaloides paucifolia*	Fringed Milkwort	S5			X	6	3
x	x	x	x				*Populus balsamifera*	Balsam Poplar	S5				4	-3
x	x						*Populus deltoides ssp. deltoides*	Eastern Cottonwood	S5				4	0
x			x			x	*Populus grandidentata*	Large-toothed Aspen	S5				5	5
x	x		x			x	*Populus tremuloides*	Trembling Aspen	S5				2	0
x	x						*Potentilla recta*	Sulphur Cinquefoil	SE5					5
x							*Poterium sanguisorba*	Small Burnet	SE4					0
x							*Prunella vulgaris*	Common Self-heal	S5				0	0
	x	x	x		x	x	*Prunus serotina*	Black Cherry	S5				3	3
			x			x	*Prunus virginiana*	Chokecherry	S5				2	3
x							*Ranunculus acris*	Common Buttercup	SE5					0
						x	*Ranunculus recurvatus*	Hooked Buttercup	S5				4	-3
x	x	x	x		x	x	*Rhamnus cathartica*	European Buckthorn	SE5					0
x	x	x					*Rhus typhina*	Staghorn Sumac	S5				1	3
					x		*Ribes cynosbati*	Eastern Prickly Gooseberry	S5				4	3
						x	*Ribes triste*	Swamp Red Currant	S5				6	-5
x							*Robinia pseudoacacia*	Black Locust	SE5					3
x	x				x		*Rubus idaeus ssp. strigosus*	N. American Red Raspberry	S5				2	3
					x		*Rubus occidentalis*	Black Raspberry	S5				2	5
			x		x	x	*Rubus pubescens*	Dwarf Raspberry	S5				4	-3
x							*Rudbeckia hirta*	Black-eyed Susan	S5				0	3
				x			*Salix amygdaloides*	Peach-leaved Willow	S5				6	-3
x							*Salix discolor*	Pussy Willow	S5				3	-3
x							*Salix eriocephala*	Cottony Willow	S5				4	-3
x							*Salix interior*	Sandbar Willow	S5				1	-3
				x			*Salix lucida*	Shining Willow	S5				5	-3
	x			x			*Salix sp.*	Exotic Willow Species	SE					
						x	*Sambucus cf. canadensis*	Common Elderberry	S5				5	-3
					x		*Sanguinaria canadensis*	Bloodroot	S5				5	3
x							*Silene vulgaris*	Bladder Campion	SE5					5
					x		*Sium suave*	Common Water-parsnip	S5				4	-5
					x	x	*Solanum dulcamara*	Bittersweet Nightshade	SE5					0
x	x	x					*Solidago canadensis*	Canada Goldenrod	S5				1	3
			x		x	x	*Solidago flexicaulis*	Zigzag Goldenrod	S5				6	3
x							*Solidago nemoralis*	Grey-stemmed Goldenrod	S5				2	5
						x	*Solidago rugosa*	Rough-stemmed Goldenrod	S5				4	0
x							*Symphyotrichum ericoides*	White Heath Aster	S5				4	3

MEADOW (MEMM3)	THICKETS (THD) & HEDGEROWS	HEDGEROWS	POPLAR FOREST (FODM5-10, FODM8-1)	MARSH (MAM / MAS)	DECIDUOUS SWAMPS (SWDM3-3)	MIXED SWAMP (SWMO1-1)	SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	SARA STATUS	RARE IN WELLINGTON COUNTY	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
x	x			x	x		*Symphyotrichum lanceolatum*	Panicled Aster	S5				3	-3
						x	*Symphyotrichum lateriflorum*	Calico Aster	S5				3	0
x	x	x					*Symphyotrichum novae-angliae*	New England Aster	S5				2	-3
x	x						*Symphyotrichum pilosum var. pilosum*	Old Field Aster	S5				1	3
x	x						*Symphyotrichum urophyllum*	Arrow-leaved Aster	S4				6	5
	x						*Syringa vulgaris*	Common Lilac	SE5					5
	x	x					*Tanacetum vulgare*	Common Tansy	SE5					5
x							*Taraxacum officinale*	Common Dandelion	SE5					3
						x	*Tiarella stolonifera*	Heart-leaved Foamflower	S5				6	3
	x	x	x			x	*Tilia americana*	Basswood	S5				4	3
	x	x					*Toxicodendron radicans*	Poison Ivy	S5				2	0
x							*Tragopogon dubius*	Yellow Goatsbeard	SE5					5
x							*Trifolium pratense*	Red Clover	SE5					3
x							*Trifolium repens*	White Clover	SE5					3
x					x		*Tussilago farfara*	Coltsfoot	SE5					3
x	x	x			x	x	*Ulmus americana*	White Elm	S5				3	-3
	x	x					*Ulmus rubra*	Slippery Elm	S5				6	0
x							*Veronica officinalis*	Common Speedwell	SE5					5
	x						*Viburnum opulus var. opulus*	Cranberry Viburnum	SE4?					-3
x	x	x	x		x		*Vitis riparia*	Riverbank Grape	S5				0	0
							ANGIOSPERMS (MONOCOTS)							
x							*Agrostis gigantea*	Redtop	SE5					-3
					x	x	*Arisaema triphyllum*	Jack-in-the-pulpit	S5				5	-3
x							*Asparagus officinalis*	Garden Asparagus	SE					3
x	x	x					*Bromus inermis*	Smooth Brome	SE5					5
x				x			*Carex aurea*	Golden Sedge	S5				4	-3
						x	*Carex castanea*	Chestnut Sedge	S5			X	7	-3
						x	*Carex disperma*	Two-seeded Sedge	S5				8	-5
				x			*Carex flava*	Yellow Sedge	S5				5	-5
						x	*Carex gracillima*	Graceful Sedge	S5				4	3
x							*Carex granularis*	Limestone Meadow Sedge	S5				3	-3
						x	*Carex intumescens*	Bladder Sedge	S5				6	-3
					x		*Carex lupulina*	Hop Sedge	S5			X	6	-5
						x	*Carex pedunculata*	Long-stalked Sedge	S5				5	3
					x		*Carex retrorsa*	Retrorse Sedge	S5				5	-5
					x		*Carex tuckermanii*	Tuckerman's Sedge	S5				7	-5
				x			*Carex viridula*	Greenish Sedge	S5				5	-5
						x	*Cinna latifolia*	Drooping Woodreed	S5				7	-3
						x	*Clintonia borealis*	Yellow Clintonia	S5				7	0
						x	*Cypripedium parviflorum var. makasin*	Northern Yellow Lady's-slipper	S4S5				5	0
x	x						*Dactylis glomerata*	Orchard Grass	SE5					3
x							*Danthonia spicata*	Poverty Oatgrass	S5				5	5
				x			*Dichanthelium cf. implicatum*	Slender-stemmed Panicgrass	S5				3	0
						x	*Epipactis helleborine*	Broad-leaved Helleborine	SE5					3

MEADOW (MEMM3)	THICKETS (THD) & HEDGEROWS	HEDGEROWS	POPLAR FOREST (FODM5-10, FODM8-1)	MARSH (MAM / MAS)	DECIDUOUS SWAMPS (SWDM3-3)	MIXED SWAMP (SWMO1-1)	SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	SARA STATUS	RARE IN WELLINGTON COUNTY	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
					x		*Erythronium americanum*	Yellow Trout-lily	S5				5	5
						x	*Glyceria striata*	Fowl Mannagrass	S5				3	-5
					x		*Iris versicolor*	Harlequin Blue Flag	S5				5	-5
				x			*Juncus articulatus*	Jointed Rush	S5				5	-5
					x		*Leersia oryzoides*	Rice Cutgrass	S5				3	-5
					x	x	*Maianthemum canadense*	Wild Lily-of-the-valley	S5				5	3
						x	*Maianthemum racemosum*	False Solomon's Seal	S5				4	3
	x	x					*Panicum capillare*	Common Panicgrass	S5				0	0
					x		*Phalaris arundinacea*	Reed Canarygrass	S5				0	-3
x							*Phleum pratense*	Common Timothy	SE5					3
				x	x		*Phragmites australis ssp. australis*	European Reed	SE5					-3
x				x			*Poa compressa*	Canada Bluegrass	SE5					3
x	x						*Poa pratensis*	Kentucky Bluegrass	S5				0	3
						x	*Polygonatum pubescens*	Hairy Solomon's Seal	S5				5	5
x							*Setaria pumila*	Yellow Foxtail	SE5					0
x							*Sisyrinchium montanum*	Strict Blue-eyed-grass	S5				4	0
						x	*Streptopus lanceolatus*	Rose Twisted-stalk	S5				7	3
			x			x	*Trillium erectum*	Red Trillium	S5				6	3
				x			Typha angustifolia	Narrow-leaved Cattail	SE5					-5

FLORISTIC SUMMARY	TOTAL
Total Species	190
Native Species	141
Introduced (exotic) species	49
Species at Risk in Ontario (END, THR or SC)	1
Species at Risk in Canada (END, THR or SC)	1
Rare in Ontario (S1, S2 or S3)	0
Uncommon to common in Ontario (S4)	9
Common to very common in Ontario (S5)	132
Rare in Wellington County	4
Highly sensitive plant species with C value of 8, 9 or 10	1
Wetland Plant Species (-5, -4 or -3)	62

C.2 Wildlife Species List

Wildlife Recorded from 4454 Victoria Road South, Township of Puslinch

COMMON NAME	*SCIENTIFIC NAME*	ONTARIO STATUS	GLOBAL STATUS	SARO	SARA	*Stantec Survey*	
ODONATA							
Emerald Spreadwing	*Lestes dryas*	S5	G5			Insect Survey	
Sweetflag Spreadwing	*Lestes forcipatus*	S4	G5			Insect Survey	
Slender Spreadwing	*Lestes rectangularis*	S5	G5			Insect Survey	
Violet Dancer	*Argia fumipennis violacea*	S5	G5T5			Insect Survey	
Familiar Bluet	*Enallagma civile*	S5	G5			Insect Survey	
Eastern Forktail	*Ischnura verticalis*	S5	G5			Insect Survey	
Lance-Tipped Darner	*Aeshna constricta*	S5	G5			Insect Survey	
Common Green Darner	*Anax junius*	S5	G5			Insect Survey	
Lancet Clubtail	*Gomphus exilis*	S5	G5			Insect Survey	
Common Baskettail	*Epitheca cynosura*	S5	G5			Insect Survey	
Eastern Pondhawk	*Erythemis simplicicollis*	S5	G5			Insect Survey	
Dot-tailed Whiteface	*Leucorrhinia intacta*	S5	G5			Insect Survey	
Widow Skimmer	*Libellula luctuosa*	S5	G5			Insect Survey	
Twelve-Spotted Skimmer	*Libellula pulchella*	S5	G5			Insect Survey	
Common Whitetail	*Plathemis lydia*	S5	G5			Insect Survey	
Saffron-bordered Meadowhawk	*Sympetrum costiferum*	S4	G5			Insect Survey	
Black Saddlebags	*Tramea lacerata*	S4	G5			Insect Survey	
BUTTERFLIES							
Juvenal's Duskywing	*Erynnis juvenalis*	S5	G5			Insect Survey	
Columbine Duskywing	*Erynnis lucilius*	S4	G5			Insect Survey	
Common Sootywing	*Pholisora catullus*	S4	G5			Insect Survey	
Leonard's Skipper	*Hesperia leonardus*	S4	G5			Insect Survey	
Fiery Skipper	*Hylephila phyleus*	SNA	G5			Insect Survey	
Black Swallowtail	*Papilio polyxenes*	S5	G5			Insect Survey	
Cabbage White	*Pieris rapae*	SNA	G5			Insect Survey	
Clouded Sulphur	*Colias philodice*	S5	G5			Insect Survey	
Orange Sulphur	*Colias eurytheme*	S5	G5			Insect Survey	
Eastern Tailed Blue	*Everes comyntas*	S5	G5			Insect Survey	
Summar Azure	*Celastrina neglecta*	S5	G5			Insect Survey	
Silvery Blue	*Glaucopsyche lygdamus*	S5	G5			Insect Survey	
Meadow Fritillary	*Boloria bellona*	S5	G5			Insect Survey	
Viceroy	*Limenitis archippus*	S5	G5			Insect Survey	
Eyed Brown	*Satyrodes eurydice*	S5	G4			Insect Survey	
Common Ringlet	*Coenonympha tullia*	S5	G5			Insect Survey	
Common Wood-Nymph	*Cercyonis pegala*	S5	G5			Insect Survey	

COMMON NAME	*SCIENTIFIC NAME*	ONTARIO STATUS	GLOBAL STATUS	SARO	SARA	*Stantec Survey*	
Monarch	*Danaus plexippus*	S4B, S2N	G4	SC	END	Insect Survey	
BUMBLE BEES							
Common Eastern Bumble Bee	*Bombus impatiens*	S5	G5			Insect Survey	
AMPHIBIANS							
Blue-spotted Salamander	*Ambystoma laterale*	S4	G5	NAR		eDNA Survey, Salamander Survey	
Unisexual Ambystoma Blue-spotted Dependent	*Ambystoma (2) laterale - jeffersonianum*	S4	G5	NAR	NAR	eDNA Survey	
American Toad	*Anaxyrus americanus*	S5	G5			Amphibian Survey, eDNA Survey	
Tetraploid Gray Treefrog	*Dryophytes versicolor*	S5	G5			Amphibian Survey, eDNA Survey	
Spring Peeper	*Pseudacris crucifer*	S5	G5			Amphibian Survey, eDNA Survey	
Bullfrog	*Lithobates catesbeiana*	S4	G5			eDNA Survey, Incidental Observation	
Northern Green Frog	*Lithobates clamitans*	S5	G5			eDNA Survey, Incidental Observation	
Wood Frog	*Lithobates sylvatica*	S5	G5			Amphibian Survey, eDNA Survey	
Northern Leopard Frog	*Lithobates pipiens*	S5	G5	NAR	NAR	eDNA Survey	
REPTILES							
Midland Painted Turtle	*Chrysemys picta marginata*	S5	G5T5	NAR	SC		
Eastern Gartersnake	*Thamnophis sirtalis*	S5	G5			Incidental Observation	
BIRDS							
Canada Goose	*Branta canadensis*	S5	G5			Breeding Bird Survey	
Tundra Swan	*Cygnus colombianus*	S2B,S4N,S	G5			Incidental Observation	
Wood Duck	*Aix sponsa*	S5B,S3N	G5			eDNA Survey	
Mallard	*Anas platyrhynchos*	S5	G5			Breeding Bird Survey	
Hooded Merganser	*Lophodytes cucullatus*	S5	G5			eDNA Survey	
Wild Turkey	*Meleagris gallopava*	S5	G5			Breeding Bird Survey	
Ruffed Grouse	*Bonasa umbellus*	S5	G5			Incidental Observation	
Mourning Dove	*Zenaida macroura*	S5	G5			Breeding Bird Survey	
Ruby-throated Hummingbird	*Archilochus colubris*	S5B	G5			Breeding Bird Survey	
Killdeer	*Charadrius vociferus*	S5B, S5N	G5			Breeding Bird Survey	
American Woodcock	*Scolopax minor*	S4B	G5			Incidental Observation	
Ring-billed Gull	*Larus delawarensis*	S5B,S4N	G5			Breeding Bird Survey	
Great Blue Heron	*Ardea herodias*	S5	G5			Breeding Bird Survey	
Green Heron	*Butorides virescens*	S4B	G5			eDNA Survey	
Turkey Vulture	*Cathartes aura*	S5B	G5			Breeding Bird Survey	
Cooper's Hawk	*Accipiter cooperii*	S4	G5	NAR	NAR	Incidental Observation	
Red-tailed Hawk	*Buteo jamaicensis*	S5	G5	NAR	NAR	Breeding Bird Survey	
Eastern Screech-Owl	*Megascops asio*	S5	G5	NAR	NAR	Nocturnal Bird Survey	
Red-bellied Woodpecker	*Melanerpes carolinus*	S4	G5			Breeding Bird Survey	

COMMON NAME	*SCIENTIFIC NAME*	ONTARIO STATUS	GLOBAL STATUS	SARO	SARA	*Stantec Survey*	
Downy Woodpecker	*Dryobates pubescens*	S5	G5			Breeding Bird Survey	
Hairy Woodpecker	*Dryobates villosus*	S5	G5			eDNA Survey, Incidental Observation	
Northern Flicker	*Colaptes auratus*	S4B	G5			Breeding Bird Survey	
Pileated Woodpecker	*Dryocopus pileatus*	S5	G5			Breeding Bird Survey	
Eastern Wood-Pewee	*Contopus virens*	S4B	G5	SC	SC	Breeding Bird Survey	
Great Crested Flycatcher	*Myiarchus crinitus*	S4B	G5			Breeding Bird Survey	
Eastern Kingbird	*Tyrannus tyrannus*	S4B	G5			Breeding Bird Survey	
Warbling Vireo	*Vireo gilvus*	S5B	G5			Breeding Bird Survey	
Red-eyed Vireo	*Vireo olivaceus*	S5B	G5			Breeding Bird Survey	
Blue Jay	*Cyanocitta cristata*	S5	G5			Breeding Bird Survey	
American Crow	*Corvus brachyrhynchos*	S5B	G5			Breeding Bird Survey	
Horned Lark	*Eremophila alpestris*	S5B	G5			Incidental Observation	
Tree Swallow	*Tachycineta bicolor*	S4B	G5			Breeding Bird Survey	
Barn Swallow	*Hirundo rustica*	S4B	G5	SC	THR	Breeding Bird Survey	
Black-capped Chickadee	*Poecile atricapillus*	S5	G5			Breeding Bird Survey, eDNA Survey	
Red-breasted Nuthatch	*Sitta canadensis*	S5	G5			Breeding Bird Survey	
White-breasted Nuthatch	*Sitta carolinensis*	S5	G5			Breeding Bird Survey	
House Wren	*Troglodytes aedon*	S5B	G5			Breeding Bird Survey	
Carolina Wren	*Thryothorus ludovicianus*	S4	G5			Breeding Bird Survey	
American Robin	*Turdus migratorius*	S5B	G5			Breeding Bird Survey	
Gray Catbird	*Dumetella carolinensis*	S4B	G5			Breeding Bird Survey	
Brown Thrasher	*Toxostoma rufum*	S4B	G5			Incidental Observation	
European Starling	*Sturnus vulgaris*	SNA	G5			Breeding Bird Survey	
Cedar Waxwing	*Bombycilla cedrorum*	S5B	G5			Breeding Bird Survey	
Pine Siskin	*Spinus pinus*	S5	G5			Incidental Observation	
American Goldfinch	*Spinus tristis*	S5B	G5			Breeding Bird Survey	
Chipping Sparrow	*Spizella passerina*	S5B	G5			Breeding Bird Survey	
Field Sparrow	*Spizella pusilla*	S4B	G5			Breeding Bird Survey	
Dark-eyed Junco	*Junco hyemalis*	S5B	G5			Incidental Observation	
Savannah Sparrow	*Passerculus sandwichensis*	S4B	G5			Breeding Bird Survey	
Song Sparrow	*Melospiza melodia*	S5B	G5			Breeding Bird Survey	
Eastern Towhee	*Pipilo erythrophthalmus*	S4B	G5			Breeding Bird Survey	
Eastern Meadowlark	*Sturnella magna*	S4B	G5	THR	THR	Breeding Bird Survey	
Baltimore Oriole	*Icterus galbula*	S4B	G5			Breeding Bird Survey	
Red-winged Blackbird	*Agelaius phoeniceus*	S4	G5			Breeding Bird Survey	
Brown-headed Cowbird	*Molothrus ater*	S4B	G5			Breeding Bird Survey	

COMMON NAME	*SCIENTIFIC NAME*	ONTARIO STATUS	GLOBAL STATUS	SARO	SARA	*Stantec Survey*	
Common Grackle	*Quiscalus quiscula*	S5B	G5			Breeding Bird Survey	
Ovenbird	*Seiurus aurocapilla*	S4B	G5			Breeding Bird Survey	
Northern Waterthrush	*Parkesia noveboracensis*	S5B	G5			Breeding Bird Survey	
Black-and-white Warbler	*Mniotilta varia*	S5B	G5			Incidental Observation	
Yellow Warbler	*Setophaga petechia*	S5B	G5			Breeding Bird Survey	
Northern Cardinal	*Cardinalis cardinalis*	S5	G5			Breeding Bird Survey	
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	S4B	G5			Breeding Bird Survey	
Indigo Bunting	*Passerina cyanea*	S4B	G5			Breeding Bird Survey	
Duck species	*Anatidae sp.*					eDNA Survey	
Sparrow species	*Passeriformes sp.*					eDNA Survey	
Thrush species	*Turdus sp.*					eDNA Survey	
MAMMALS							
Little Brown Myotis	*Myotis lucifugus*	S3	G3G4	END	END	Bat Acoustic Survey	
Silver-haired Bat	*Lasionycteris noctivagans*	S3	G3G4	END		Bat Acoustic Survey	
Tri-colored Bat	*Perimyotis subflavus*	S3?	G3G4	END	END	Bat Acoustic Survey	
Eastern Red Bat	*Lasiurus borealis*	S3	G3G4	END		Bat Acoustic Survey	
Big Brown Bat	*Eptesicus fuscus*	S4	G5			Bat Acoustic Survey	
Hoary Bat	*Lasiurus cinereus*	S3	G3G4	END		Bat Acoustic Survey	
Eastern Cottontail	*Sylvilagus floridanus*	S5	G5			eDNA Survey, Incidental Observation	
Grey Squirrel	*Sciurus carolinensis*	S5	G5			eDNA Survey, Incidental Observation	
Porcupine	*Erethizon dorsatum*	S5	G5			eDNA Survey, Incidental Observation	
Coyote	*Canis latrans*	S5	G5			Incidental Observation	
Red Fox	*Vulpes vulpes*	S5	G5			Incidental Observation	
Raccoon	*Procyon lotor*	S5	G5			eDNA Survey	
White-tailed Deer	*Odocoileus virginianus*	S5	G5			Incidental Observation	
FISHES							
Goldfish	*Carassius auratus*	SNA	G5			eDNA Survey	
Largemouth Bass	*Micropterus salmoides*	S5	G5			Incidental Observation	
Northern Redbelly Dace	*Chrosomus eos*	S5	G5			eDNA Survey	
Explanation of Status and Acronymns							
COSSARO: Committee on the Status of Species at Risk in Ontario							
COSEWIC: Committee on the Status of Endangered Wildlife in Canada							
S1: Critically Imperiled—Critically imperiled in the province (often 5 or fewer occurrences)							

COMMON NAME	*SCIENTIFIC NAME*	ONTARIO STATUS	GLOBAL STATUS	SARO	SARA	*Stantec Survey*	
S2: Imperiled—Imperiled in the province, very few populations (often 20 or fewer),							
S3: Vulnerable—Vulnerable in the province, relatively few populations (often 80 or fewer)							
S4: Apparently Secure—Uncommon but not rare							
S5: Secure—Common, widespread, and abundant in the province							
SX: Presumed extirpated							
SH: Possibly Extirpated (Historical)							
SNR: Unranked							
SU: Unrankable—Currently unrankable due to lack of information							
SNA: Not applicable—A conservation status rank is not applicable because the species is not a suitable target for conservation activities.							
S#S#: Range Rank—A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species							
S#B- Breeding status rank							
S#N- Non Breeding status rank							
?: Indicates uncertainty in the assigned rank							
G1: Extremely rare globally; usually fewer than 5 occurrences in the overall range							
G1G2: Extremely rare to very rare globally							
G2: Very rare globally; usually between 5-10 occurrences in the overall range							
G2G3: Very rare to uncommon globally							
G3: Rare to uncommon globally; usually between 20-100 occurrences							
G3G4: Rare to common globally							
G4: Common globally; usually more than 100 occurrences in the overall range							
G4G5: Common to very common globally							
G5: Very common globally; demonstrably secure							
GU: Status uncertain, often because of low search effort or cryptic nature of the species; more data needed.							
GNR: Unranked—Global rank not yet assessed.							
T: Denotes that the rank applies to a subspecies or variety							
Q: Denotes that the taxonomic status of the species, subspecies, or variety is **questionable**.							
END: Endangered							
THR: Threatened							
SC: Special Concern							
2, 3 or NS after a COSEWIC ranking indicates the species is either on Schedule 2, Schedule 3 or No Schedule of the Species At Risk Act (SARA)							
NAR: Not At Risk							
IND: Indeterminant, insufficient information to assign status							
DD: Data Deficient							
All rankings for birds refer to breeding birds unless the ranking is followed by N							

Appendix D eDNA Results

D.1 Salamander eDNA Results (Nature Metrics, August 8, 2022)

VERTEBRATE METABARCODING **RESULTS**

Order number:	NA-SO00022
Report number:	NM-CAM746
Company:	Stantec
Contact:	Andrew Taylor
Project:	Jefferson Salamander Survey
Sample type:	Smith-Root self-preserving filter
Date of report:	08-Aug-2022
Number of samples:	10

Thank you for sending your samples for analysis by NatureMetrics. Your samples have been **metabarcoded** following our **eDNA** survey - Vertebrates pipeline. A taxon-by-sample table of your samples and a frequency of occurrence table are attached to this report (NM-CAM746.NA-SO00022.Vertebrate.xlsx). Each row in the table represents one taxon (**OTU**), shown with the lowest possible taxonomic assignment based on currently available reference data. Each column represents a sample, showing the proportion of sequence reads per detected OTU. Care should be taken in interpreting the numbers in terms of relative species abundance, but a high sequence proportion can be interpreted as lending greater confidence to a detection. This report contains biodiversity information that may be sensitive, particularly with respect to endangered or protected species. It is the responsibility of the client to ensure that due consideration is given to the data and that the information is shared in a responsible way.

Here we present an overview of the key results, followed by a more detailed report that starts with the taxonomic composition of the samples followed by a more detailed look at the steps taken to extract, amplify, sequence, and analyse your DNA. A glossary for terms in bold is provided at the end of the report to define key terms used within the report.

OVERVIEW OF YOUR RESULTS

- A total of 22 taxa were detected.
- Average taxonomic richness was 6.8 and ranged from 3 to 9.
- Most abundant sequences: wood frog (*Lithobates sylvaticus*).
- Most commonly detected taxa: wood frog (*Lithobates sylvaticus*), blue-spotted salamander (*Ambystoma laterale*) and wood duck (*Aix sponsa*).
- Blue-spotted salamander (*Ambystoma laterale*) and unisexual salamander (*Ambystoma unisexual*) were detected.

FULL REPORT

Sample composition

A total of 22 taxa were detected (Table 1). 63.6% (14 taxa) were at least 99% similar to a species in the global reference databases, and species names are suggested. The remaining taxa were identified to the lowest possible taxonomic level: 27.3% to genus (6 taxa), 4.5% to family (1 taxon), and the remaining taxon to order. A total of 2 unique fish, 8 amphibians, 8 birds and 4 mammals were detected. The taxa belong to 10 orders, 14 families, and 17 genera.

Blue-spotted salamander (*Ambystoma laterale*) and unisexual salamander (*Ambystoma unisexual*) were detected.

The average taxon richness was 6.8 and ranged from 3 ('stantec-160961457-05192022-01meta') to 9 ('stantec-160961457-05192022-03meta' and 'stantec-160961457-05192022-10meta'). The relative proportion of the sequences found in each of the samples is shown in Figure 1 and Table 1 and the diversity is summarised in Table 2 and Table 3.

Wood frog (*Lithobates sylvaticus*) which accounted for 57.5% of the total sequence reads, was among the most abundant in terms of sequences. Among the most commonly detected species were wood frog (*Lithobates sylvaticus*), blue-spotted salamander (*Ambystoma laterale*) and wood duck (*Aix sponsa*) which were detected in 10, 7 and 6 samples, respectively.

High-quality vertebrate sequence data were obtained for 9 of the 10 eDNA samples. Sample 'stantec-160961457-05192022-07meta' produced fewer than expected target reads; results for this sample are therefore considered tentative. All laboratory controls behaved as expected.

Table 1 (attached separately). Taxon-by-sample table.

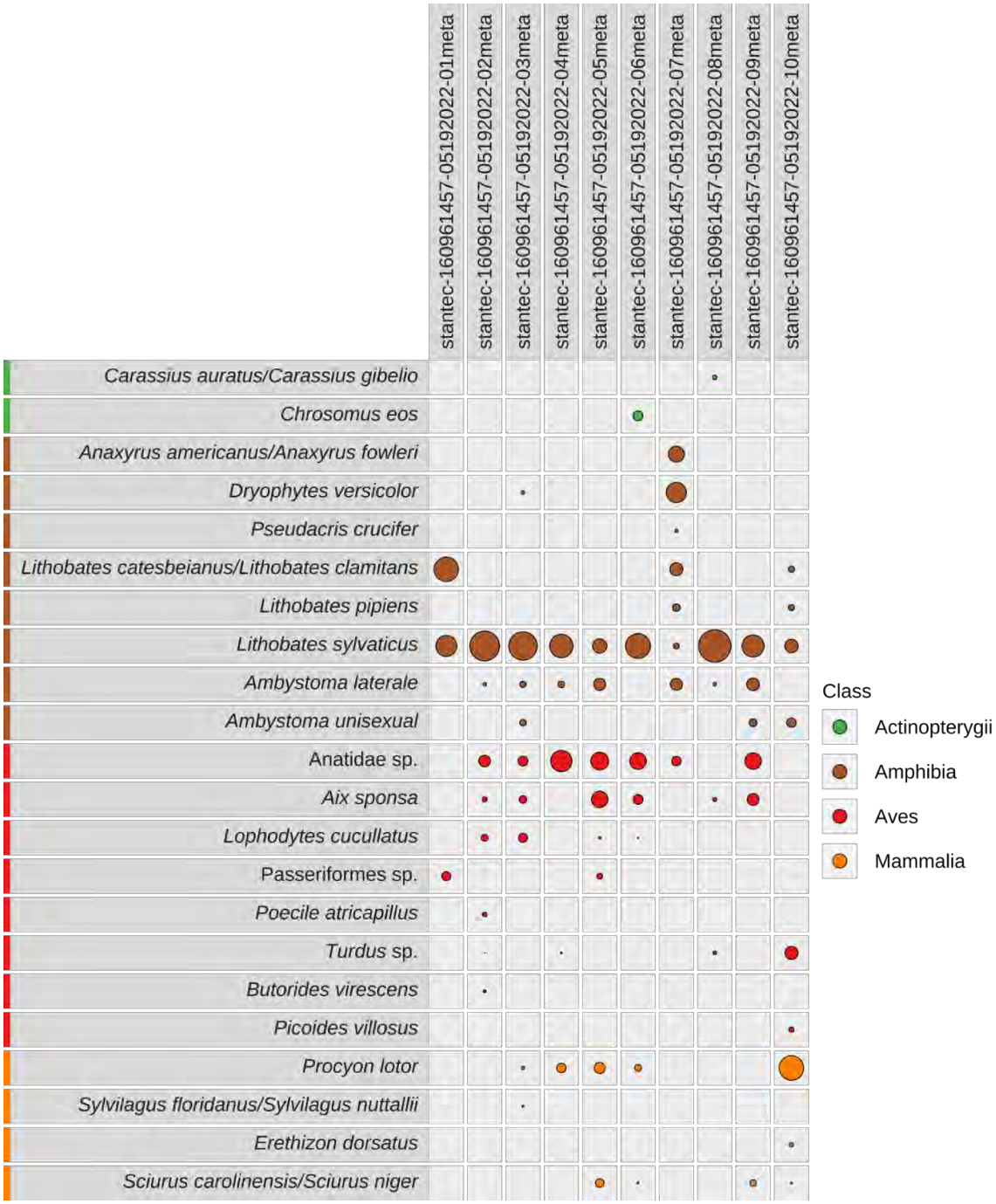

Figure 1. The proportion of the sequencing output allocated to the different taxa (rows) within each sample (columns). Each bubble per sample represents the proportion of DNA for each taxon for that sample. The size of the bubble is relative to the number of sequences from all taxa detected in that sample.

Table 2. Taxon richness among the samples.

Sample ID	Class	Order	Family	Genus	Taxa (Species)
stantec-160961457-05192022-01meta	2	2	1	1	3 (1)
stantec-160961457-05192022-02meta	2	5	6	7	8 (5)
stantec-160961457-05192022-03meta	3	5	6	7	9 (6)
stantec-160961457-05192022-04meta	3	5	5	4	5 (3)
stantec-160961457-05192022-05meta	3	6	5	6	8 (4)
stantec-160961457-05192022-06meta	4	5	5	6	7 (4)
stantec-160961457-05192022-07meta	2	3	5	5	8 (5)
stantec-160961457-05192022-08meta	3	5	5	5	5 (2)
stantec-160961457-05192022-09meta	3	4	4	4	6 (3)
stantec-160961457-05192022-10meta	3	6	7	7	9 (6)

Table 3 (attached separately). The frequency of occurrence of all detected families. Numbers correspond to the number of taxa belonging to those families in those samples.

METHODS

DNA from each filter was extracted using a commercial DNA extraction kit with a protocol modified to increase DNA yields. An extraction blank was also processed for the extraction batch. DNA was purified to remove PCR inhibitors using a commercial purification kit.

Comment: DNA yields were as expected.

Purified DNAs were amplified with PCR for a hypervariable region of the 12S rRNA gene to target vertebrates as part of the eDNA survey Vertebrate pipeline. Our standard analysis includes 12 replicate PCRs per sample.

All PCRs were performed in the presence of both a negative control and a positive control sample (a mock community with a known composition). Amplification success was determined by gel electrophoresis.

Comment: PCR reactions were successful for all 10 samples. Electrophoresis bands were strong and of the expected size. Overall, 11-12 successful PCRs replicates were obtained for each of the 10 samples submitted for sequencing. No bands were observed on electrophoresis gels for the extraction blank or negative controls.

PCR replicates were pooled and purified, and sequencing adapters were added. Success was determined by gel electrophoresis.

Comment: All samples were successfully indexed, electrophoresis bands were strong and of the expected size. No repeat reactions were necessary.

Amplicons were purified and checked by gel electrophoresis, these were then quantified using a Qubit high sensitivity kit according to the manufacturer's protocol.

Comment: All amplicons were successfully purified.

All purified index PCRs were pooled into a final library with equal concentrations. The final library was sequenced using an Illumina MiSeq V3 kit at 10.5 pM with a 20% PhiX spike in.

Sequence data were processed using a custom bioinformatics pipeline for quality filtering, OTU clustering, and taxonomic assignment.

Comment: Very few sequences were discarded prior to dereplication, which is indicative of high-quality data with minimal PCR and sequencing errors. A total of 548,181 high-quality sequences were included in the final dataset.

Consensus taxonomic assignments were made for each OTU using sequence similarity searches against the NCBI nt (GenBank) reference database. Assignments were made to the lowest possible taxonomic level where there was consistency in the matches. Conflicts were flagged and resolved manually. Minimum similarity thresholds of 99%, 97%, and 95% were used for species-, genus- and higher-level assignments respectively. In cases where there were equally good matches to multiple species, public records from GBIF were used to assess which were most likely to be present in Canada. Higher-level taxonomic identifications or multiple potential identifications were reported in cases that could not be resolved in this way.

The OTU table was then filtered to remove low abundance OTUs from each sample (<0.025% or <10 reads, whichever is the greater threshold for the sample). Unidentified, non-target, and common contaminant sequences such as human and livestock were then removed.

Note that unidentified or misidentified taxa can result from incomplete or incorrect reference databases, and taxa may be missed due to low quality DNA, environmental contaminants, or the dominance of other species in the sample.

Please note that the abundance of taxa cannot be directly inferred from the proportion of total sequence reads. While the proportion of sequence reads is a consequence of abundance, it is also impacted by biomass, activity, surface area, condition, distance from the physical sample, primer bias, and species-specific variation in the genome.

Table 4. Sample information table.

Kit ID	Label	Volume filtered	Date received
NAS-01-00297	stantec-160961457-05192022-01meta	750ml	27-May-22
NAS-01-00298	stantec-160961457-05192022-02meta	500ml	27-May-22
NAS-01-00299	stantec-160961457-05192022-03meta	500ml	27-May-22
NAS-01-00300	stantec-160961457-05192022-04meta	500ml	27-May-22
NAS-01-00301	stantec-160961457-05192022-05meta	500ml	27-May-22
NAS-01-00302	stantec-160961457-05192022-06meta	500ml	27-May-22
NAS-01-00303	stantec-160961457-05192022-07meta	400ml	27-May-22
NAS-01-00304	stantec-160961457-05192022-08meta	500ml	27-May-22
NAS-01-00305	stantec-160961457-05192022-09meta	500ml	27-May-22
NAS-01-00306	stantec-160961457-05192022-10meta	250ml	27-May-22

END OF REPORT

Report issued by: Laura Balcells

Contact: team@naturemetrics.co.uk

GLOSSARY

BMWP	Short for biological monitoring working party, an index that can be used to measure water quality by scoring the presence of aquatic invertebrate indicator taxa. The index is reliant on taxa that are less tolerant of polluted water bodies (e.g. Ephemeroptera, Plecoptera, Trichoptera).
BOLD	Barcode Of Life Database - A database from which reference sequences are taken
NCBI	National Centre for Biotechnology Information - A database from which reference sequences are taken.
OTU	Operational Taxonomic Unit; similar sequences are clustered into OTUs at a defined similarity threshold. OTUs are approximately equivalent to species and are treated as such in our analyses. Species-level taxonomic assignments may or may not be possible, depending on the availability of reference sequences and the similarity between closely related species in the amplified marker. It may be possible to refine the taxonomic assignment for an OTU later as more sequences are added to reference databases.
PCR	Polymerase Chain Reaction; a process by which millions of copies of a particular DNA segment are produced through a series of heating and cooling steps. Known as an 'amplification' process. One of the most common processes in molecular biology and a precursor to most sequencing-based analyses.
adapter	short, artificially synthesised nucleotide sequence which attaches to the ends of the target DNA or RNA sequences prior to sequencing. They are typically used to aid in attachment of the target sequence to other functional molecules/sequences.
amplicon	A sequence of DNA which is the source/product of PCR amplification.
bioinformatics	An interface between genetics, computational biology, statistics, and programming in which DNA or other biological data is processed, analysed and integrated into research or communications.

contaminant sequences	The sensitivity of high-throughput sequencing of eDNA means that contamination is always a concern that needs to be minimised. The sources of contamination are threefold: Natural - Examples of natural contaminants include: frequent visitors to site, faecal discharge from predators, livestock, wastewater, and fishing bait. This type of contamination is typically unavoidable and very difficult to quantify. Sequences of this type are typically flagged and conservatively removed from the sequencing output. Typical contaminant species include cow, pig, dog, cat, sheep, etc. Sampling - Human contamination of sampling equipment can reduce the efficiency of the sequencing. This type of contamination can be minimised by stringent contamination protocols, such as PPE. Laboratory - Residual DNA can contaminate other samples processed at the same time in other labs. At NatureMetrics this is mitigated by a designated eDNA laboratory, strict decontamination procedures, negative controls, and good laboratory practices.
dereplication	The identification of unique sequences so that only one copy of each sequence is reported.
eDNA	Short for 'environmental DNA'. Refers to DNA deposited in the environment through excretion, shedding, mucous secretions, saliva etc. This can be collected in environmental samples (e.g. water, sediment) and used to identify the organisms that it originated from. eDNA in water is broken down by environmental processes over a period of days to weeks. It can travel some distance from the point at which it was released from the organism, particularly in running water. eDNA is sampled in low concentrations and can be degraded (i.e. broken into short fragments), which limits the analysis options.
extraction blank	A DNA extraction with no soil added to assess potential contamination during the DNA extraction process.
gel electrophoresis	The process in which DNA is separated according to size and electrical charge via an electric current, while in a gel. The process is used to confirm the successful amplification of a specifically sized fragment of DNA.
metabarcoding	Refers to identification of species assemblages from community DNA using barcode genes. PCR is carried out with non-specific primers, followed by high-throughput sequencing and bioinformatics processing. Can identify hundreds of species in

	each sample, and 100+ different samples can be processed in parallel to reduce sequencing cost.
negative control	Used to determine whether PCR reactions are contaminated.
nt	NCBI nucleotide database
positive control	Used to determine whether the PCR is working correctly.
rRNA	Ribosomal RNA
reference databases	Over time, the DNA sequences of many species have been compiled into publicly accessible databases by scientists from around the world. These databases serve as a reference against which unknown sequences can be queried to obtain a species identification. The most commonly accessed database is NCBI (National Center for Biotechnology Information), which is maintained by the US National Institute of Health. Anyone can search for DNA sequences at https://www.ncbi.nlm.nih.gov
richness	The total number of taxa within a sample.

D.2 Salamander eDNA Results (Nature Metrics, 2022)

Table 1. Taxon-by-sample table with proportions.

NMSeqID	Sequence	Kingdom	Phylum	Class	Order	Family	Genus	Species	Similarity	IUCN Red List	Comments	stantec-160961457-05192022-01meta	stantec-160961457-05192022-02meta	stantec-160961457-05192022-03meta	stantec-160961457-05192022-04meta	stantec-160961457-05192022-05meta	stantec-160961457-05192022-06meta	stantec-160961457-05192022-07meta	stantec-160961457-05192022-08meta	stantec-160961457-05192022-09meta	stantec-160961457-05192022-10meta
IM-J7759Q	ACTATGCTCAGCCG	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	*Carassius*	*Carassius auratus/Carassius gibelio*	100.00	Least Concern (Carassius auratus)/Not found (Ca		-	-	-	-	-	-	-	1.32	-	-
IM-2B5UCT	ACTATGCTCAGCCA	Animalia	Chordata	Actinopterygii	Cypriniformes	Cyprinidae	*Chrosomus*	*Chrosomus eos*	100.00	Least Concern	Species identification b	-	-	-	-	-	7.74	-	-	-	-
IM-J41EPL	ACTATGCCTAGCCG	Animalia	Chordata	Amphibia	Anura	Bufonidae	*Anaxyrus*	*Anaxyrus americanus/Anaxyrus fowleri*	100.00	Least Concern (Anaxyrus	Species identification b	-	-	-	-	-	-	22.45	-	-	-
IM-8MURK3	ACTATGCTCAGCCG	Animalia	Chordata	Amphibia	Anura	Hylidae	*Dryophytes*	*Dryophytes versicolor*	100.00	Least Concern	This sequence was also	-	-	0.81	-	-	-	36.28	-	-	-
IM-1J014W	ACTATGTCTAGCCG	Animalia	Chordata	Amphibia	Anura	Hylidae	*Pseudacris*	*Pseudacris crucifer*	100.00	Least Concern		-	-	-	-	-	-	0.58	-	-	-
IM-D81T3L	ACTATGCCTAGCCG	Animalia	Chordata	Amphibia	Anura	Ranidae	*Lithobates*	*Lithobates catesbeianus/Lithobates clamitans*	100.00	Least Concern (Lithobates catesbeianus)/Least C		54.00	-	-	-	-	-	14.53	-	-	2.68
IM-T1LZF1	ACTATGCCTAGCCG	Animalia	Chordata	Amphibia	Anura	Ranidae	*Lithobates*	*Lithobates pipiens*	100.00	Least Concern		-	-	-	-	-	-	4.38	-	-	2.69
IM-6KZY4J	ACTATGCCTAGCCG	Animalia	Chordata	Amphibia	Anura	Ranidae	*Lithobates*	*Lithobates sylvaticus*	100.00	Least Concern		39.61	81.18	73.63	49.27	17.66	55.76	2.27	96.34	43.44	15.39
IM-I69VWH	ACTATGCTTAGCCA	Animalia	Chordata	Amphibia	Caudata	Ambystomatidae	*Ambystoma*	*Ambystoma laterale*	100.00	Least Concern	Species identification b	-	0.66	2.84	3.27	12.27	-	12.38	0.66	13.53	-
IM-J67JAC	ACTATGCCTAGCCA	Animalia	Chordata	Amphibia	Caudata	Ambystomatidae	*Ambystoma*	*Ambystoma unisexual*	100.00	Not found	Species identification b	-	-	3.01	-	-	-	-	-	4.61	7.03
IM-3JS8PY	ACTATGCCTGGCCC	Animalia	Chordata	Aves	Anseriformes	Anatidae	*Aix*	*Aix sponsa*	100.00	Least Concern	Species identification b	-	1.69	4.47	-	23.65	8.18	-	1.02	11.40	-
IM-T3K84Y	ACTATGCCTGGCCC	Animalia	Chordata	Aves	Anseriformes	Anatidae	*Lophodytes*	*Lophodytes cucullatus*	100.00	Least Concern	Species identification b	-	3.61	6.57	-	0.24	0.05	-	-	-	-
IM-V99L52	ACTATGCCTGGCCC	Animalia	Chordata	Aves	Anseriformes	Anatidae						-	11.15	7.96	40.38	28.15	24.45	7.12	-	23.84	-
IM-L05YHO	ACTATGCCTGGCCC	Animalia	Chordata	Aves	Passeriformes	Paridae	*Poecile*	*Poecile atricapillus*	100.00	Least Concern	Species identification b	-	1.28	-	-	-	-	-	-	-	-
IM-1VT300	ACTATGCCTGGCCC	Animalia	Chordata	Aves	Passeriformes	Turdidae	*Turdus*					-	0.04	-	0.14	-	-	-	0.66	-	14.74
IM-M16C9I	ACTATGCCTGGCCC	Animalia	Chordata	Aves	Passeriformes							6.39	-	-	-	2.32	-	-	-	-	-
IM-9SWT80	ACTATGCTCAGCCC	Animalia	Chordata	Aves	Pelecaniformes	Ardeidae	*Butorides*	*Butorides virescens*	100.00	Least Concern (Butorides	Species identification b	-	0.39	-	-	-	-	-	-	-	-
IM-X46XJJ	ACTATGCCTGGCCG	Animalia	Chordata	Aves	Piciformes	Picidae	*Picoides*	*Picoides villosus*	100.00	Least Concern (Leuconot	Species identification b	-	-	-	-	-	-	-	-	-	1.83
IM-D860JK	ACTATGCCTAGCCC	Animalia	Chordata	Mammalia	Carnivora	Procyonidae	*Procyon*	*Procyon lotor*	100.00	Least Concern		-	-	0.57	6.94	9.98	3.66	-	-	-	54.25
IM-3U76J3	ACTATGCTTAGCCC	Animalia	Chordata	Mammalia	Lagomorpha	Leporidae	*Sylvilagus*	*Sylvilagus floridanus/Sylvilagus nuttallii*	100.00	Least Concern (Sylvilagu	Species identification to	-	-	0.13	-	-	-	-	-	-	-
IM-CQ1QQJ	ACTATGCCTAACCA	Animalia	Chordata	Mammalia	Rodentia	Erethizontidae	*Erethizon*	*Erethizon dorsatus*	100.00	Not found		-	-	-	-	-	-	-	-	-	1.21
IM-52E2S4	ACTATGCTTAGCCC	Animalia	Chordata	Mammalia	Rodentia	Sciuridae	*Sciurus*	*Sciurus carolinensis/Sciurus niger*	100.00	Least Concern (Sciurus c	Species identification to	-	-	-	-	5.73	0.17	-	-	3.18	0.18

Table 3. The frequency of occurrence of all detected families.

Class	Order	Family	160961457-05192022	160961457-05192022	160961457-05192022	160961457-05192022	160961457-05192022	160961457-05192022	160961457-05192022	160961457-05192022	160961457-05192022	160961457-05192022	# samples
Actinopterygii	Cypriniformes	Cyprinidae	0	0	0	0	0	1	0	1	0	0	2
Amphibia	Anura	Bufonidae	0	0	0	0	0	0	1	0	0	0	1
Amphibia	Anura	Hylidae	0	0	1	0	0	0	2	0	0	0	2
Amphibia	Anura	Ranidae	2	1	1	1	1	1	3	1	1	3	10
Amphibia	Caudata	Ambystomatidae	0	1	2	1	1	0	1	1	2	1	8
Aves	Anseriformes	Anatidae	0	3	3	1	3	3	1	1	2	0	8
Aves	Passeriformes	Paridae	0	1	0	0	0	0	0	0	0	0	1
Aves	Passeriformes	Turdidae	0	1	0	1	0	0	0	1	0	1	4
Aves	Pelecaniformes	Ardeidae	0	1	0	0	0	0	0	0	0	0	1
Aves	Piciformes	Picidae	0	0	0	0	0	0	0	0	0	1	1
Mammalia	Carnivora	Procyonidae	0	0	1	1	1	1	0	0	0	1	5
Mammalia	Lagomorpha	Leporidae	0	0	1	0	0	0	0	0	0	0	1
Mammalia	Rodentia	Erethizontidae	0	0	0	0	0	0	0	0	0	1	1
Mammalia	Rodentia	Sciuridae	0	0	0	0	1	1	0	0	1	1	4

D.3 Salamander Tail Clip Results (Dr. Jim Bogart, 2024)

From: Jim P Bogart
To: Straus, Melissa
Subject: Fw: Identification of your salamanders
Date: Friday, July 12, 2024 12:02:07 PM
Attachments: Samples from Stantec 2024.xls

You don't often get email from jbogart@uoguelph.ca. Learn why this is important

From: Jim P Bogart
Sent: Friday, July 12, 2024 11:53 AM
To: melissa.straus@stantec <melissa.straus@stantec>
Subject: Identification of your salamanders

Hi Melissa,

It has been a while but I have finally worked out my new system for identifying Ambystoma complex salamanders. I am sending a spread sheet that includes results obtained from your salamander tail tips you gave me in April. I ran three loci AjeD 75 and AjeD346 amplifies microsatellites from both *A. jeffersonianum* and *A. laterale* but the sizes of the microsatellites are different for the two genomes. Sizes only found in *A. laterale* are labelled blue and sizes for *A. jeffersonianum* are tan. AjeD378 only amplifies *A. jeffersonianum* microsatellites so no amplification is labelled blue. Three samples turned out to be *Ambystoma* 2-*laterale jeffersonianum* or LLJ and one was *A. laterale* (LL). Let me know If you have any questions.

Sorry it took so long - I am still optimizing my new system,

Jim Bogart

Caution: This email originated from outside of Stantec. Please take extra precaution.
Attention: Ce courriel provient de l'extérieur de Stantec. Veuillez prendre des précautions supplémentaires.
Atención: Este correo electrónico proviene de fuera de Stantec. Por favor, tome precauciones adicionales.

23 April 2024 DNA Plate Stantec samples

Plate	XDNA#	JPB#	Geno	Locality	AjeD75				AjeD346				AjeD378		
D 9	21445	50967	LLJ	Stantec - 4454 Victoria Road South	124	132	184		268				252		
E 7	21446	50968	LLJ	Stantec - 4454 Victoria Road South	124				268				252		
E 8	21447	50969	LL	Stantec - 4454 Victoria Road South	132				0				0		
E 9	21448	50970	LLJ	Stantec - 4454 Victoria Road South	124	132	184		0				252		

Appendix E Curricula Vitae

Melissa A. Straus M.Sc.

Terrestrial Ecologist · 20 Years of Experience · Waterloo, Ontario

Melissa is a senior terrestrial ecologist with technical expertise in wildlife and plant community ecology, wetland science, botany, species at risk, and long-term monitoring programs across various sectors (e.g., federal, municipal, oil and gas, and renewable energy) with the ability to lead and deliver complex environmental projects.

Melissa has a proven track record in implementing key environmental regulations such as the Migratory Birds Convention Act, the Species at Risk Act, and Endangered Species Act. Her skillset includes construction monitoring, vegetation community assessments using Ecological Land Classification (ELC), wetland delineations according to the Ontario Wetland Evaluation System (OWES), Butternut health assessments, and extensive species-specific experience for species at risk, including Jefferson's Salamander, Blanding's Turtle, Bank Swallow, Butler's Gartersnake, Eastern Foxsnake, Massasauga, Bobolink, Eastern Meadowlark, Barn Swallow, Chimney Swift, Eastern Whip-poor-will, Cerulean Warbler and bats.

Melissa has been a lead author and reviewer on numerous technical memorandums and reports during her 20-year career, including environmental impact studies, natural heritage assessments, environmental reports, and existing condition reports. Melissa’s experience also includes working and consulting with various indigenous groups and regulatory agencies, including the City of Guelph, Ministry of Environment, Conservation and Parks, and Canadian Wildlife Services.

EDUCATION

M.Sc. in Biology, Trent University, Peterborough, Ontario, Canada, 2009

B.Sc. in Environmental Sciences, Co-op Program, University of Guelph, Guelph, Ontario, Canada, 2003

CERTIFICATIONS & TRAINING

Certificate, St. John Ambulance / Standard First Aid with CPR C + AED, Guelph, Ontario, 2025

Certificate, Ontario Ministry of Natural Resources / Ecological Land Classification System for Southern Ontario, Kemptville, Ontario, Canada, 2010

Certificate, Ontario Ministry of Natural Resources / Ontario Wetland Evaluation System, North Bay, Ontario, Canada, 2012

Certificate, Ontario Ministry of Natural Resources / Butternut Health Assessor, Hamilton, Ontario, 2015

PROJECT EXPERIENCE

Multi-Unit / Family Residential

Natural Heritage Evaluation Peer Reviews, Peterborough, ON, Canada (Peer Reviewer, Present)

Client: County of Peterborough

Conducted peer reviews of Natural Heritage Evaluation reports submitted to support two private severance applications on behalf of the County of Peterborough.

Melissa A. Straus M.Sc.

Terrestrial Ecologist · 20 Years of Experience · Waterloo, Ontario

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Environmental Impact Studies/Development Applications - Various, Municipality Of Thames Centre, ON, Canada (Peer Reviewer, Present)
Client: Municipality of Thames Centre
Conducted peer reviews of Environmental Impact Studies/ Development Application Reports for various proposed developments on behalf of the County of Thames Centre Development application scopes ranged from private single-home alterations to full subdivisions.

Watford East Proposed Subdivision, Watford, ON, Canada (Senior Ecologist, 2025-present)
Quality reviewer and task manager for the 2025 field program and forthcoming Environmental Impact Study in support of a residential subdivision.

Cambridge Lands, Proposed Subdivision, Cambridge, ON (Terrestrial Ecologist, 2021-present)
Client: Madison Riverbank Holdings Limited
Assisted with coordination and conducting field studies and the impact study.

1250 Gordon Development, Guelph, ON (Terrestrial Ecologist)
Client: Tricar Developments Inc.
Participated in botanical field studies and corridor surveys in support of a proposed plan of condominium on the property. Lead writer of the forthcoming Environmental Impact Study, which includes ongoing consultation with the City of Guelph.

71 Wyndham Development, Guelph, ON (Terrestrial Ecologist, 2018-2024)
Client: Tricar Developments Inc.
Author of the Environmental Implementation Report and developer of the post-construction bird monitoring program.

220 Arkell Road, Guelph, ON (Terrestrial Ecologist/Task Manager, 2019-2024)
Client: Rockpoint Properties Inc.
Coordinated and participated in a multi-year field program that included movement studies where small mammals, amphibians, and reptiles were trapped and trail cameras were deployed. Additional surveys included targeted searches for Milksnakes, winter raptor surveys, as well as ELC, botanical, and breeding birds. Author of the associated Environmental Impact Studies.

Bluewater Development, Guelph, ON (Project Manager, 2020)
Client: 2204086 Ontario Inc.
Coordinator and participated in a road mortality monitoring program for amphibians and reptiles along a busy 4-lane roadway in Guelph, the results of which were used to develop mitigation measures in consultation with the City of Guelph. Lead writer of the submitted Environmental Impact Study and Environmental Implementation Report.

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Daniels High Park Condominiums, High Park Village and Minto High Park, Toronto, ON (Coordinator, 2015-2019)
Client: The Daniels Corporation, Minto Properties Inc.
Development and coordinator of a bird-building collision monitoring program for three condominium developments near High Park in Toronto. This work led to collaboration with the City of Toronto, Canadian Wildlife Service, and FLAP on the creation of bird collision monitoring requirements for new developments in the City of Toronto. These protocols have since been issued by the Canadian Standards Association.

Metalworks Development, Guelph, ON (Project Manager, 2013-2021)
Client: 2278570 Ontario Inc.
Project manager and lead writer of the Environmental Impact Study, Environmental Implementation Report, and environmental briefs (Phases 2-4 and 6) for the multi-phase Metalworks brownfield development. Based on recommendations contained within the EIR, bird friendly building design was implemented, and a historic chimney will be retained for Chimney Swifts.

148-152 MacDonnell and 150 Wellington Condominium Developments, Guelph, Ontario (Terrestrial Ecologist / Task Manager, 2013)
Client: Tricar Developments Inc.
Vegetation removal surveys and lead writer of the Environmental Impact Study for both properties, including attendance at Environmental Advisory Committee meetings with the City

Federal Government

Multi-seasonal Species at Risk Surveys, Canadian Forces Base, 22 Wing, North Bay, ON (Field Ecologist, 2018 and Project Manager, 2025, 2018)
Client: Defence Construction Canada (on behalf of Department of National Defence (DND))
Participated in the breeding bird, vegetation, amphibian and reptile field program at CFB 22 Wing in 2018. Project manager for 2025 field program.

Nighttime Amphibian Surveys, Canadian Forces Base Borden, Borden, ON (Terrestrial Ecologist, 2018)
Client: Defence Construction Canada (on behalf of Department of National Defence (DND))
Participated in the evening field program and associated reporting to determine the abundance and distribution of amphibians at CFB Borden.

Phase II Species at Risk Surveys, Tremblay Road (Field Ecologist, 2019)
Client: Public Services and Procurement Canada
Completed site surveys of existing conditions, including habitat assessment and targeted surveys to document site existing conditions, including habitat assessments and targeted surveys for Butternut, Western Chorus Frog, Monarch and Eastern Milksnake.

Swift Habitat Assessment and Evidence of Use Surveys, Various Garrisons, Various Locations, ON (Terrestrial Ecologist, 2020-2022)
Client: Defence Construction Canada (on behalf of Department of National Defence (DND))
Implemented field program and assisted with reporting to assess habitat use by Chimney Swifts at various military buildings throughout southern and central Ontario.

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Oil and Gas Pipelines

Annual Integrity Dig Program, Various Sites, Various Locations, ON (Project Manager, Quality Reviewer, 2020-present)
Client: Enbridge Gas Inc.
Oversaw the execution environment programs for numerous oil and gas integrity programs conducted annually throughout Ontario, comprised of background and site condition screening, mitigation plan development, and providing recommendations for consideration under the Endangered Species Act.

Sarnia Industrial Line: DOW to Bluewater, Sarnia, ON, Canada (Lead Terrestrial Ecologist / Environmental Inspector, 2020-2025)
Client: Enbridge Gas Inc.
Secured an overall benefit permit and amendment for Butler's Gartersnake followed by coordinating the annual field program and developing environmental training resources for the Project.

Bobcaygeon Community Expansion Project, Bobcaygeon, Kawartha Lakes, ON, Canada (Senior Ecologist, 2022-2025)
Client: Enbridge Gas Inc.
Assisted with environmental reporting, species at risk permit consultation, oversaw the pre-construction field program and supported the environmental inspection team during construction.

Tweed Community Expansion Project, Tweed, ON, Canada (Senior Ecologist, 2025-2025)
Client: Enbridge Gas Inc.
Assisted with environmental reporting and species at risk permit consultation.

GTA Project, Greater Toronto Area, ON (Wildlife Lead, 2015)
Client: Enbridge Gas Distribution
Worked as part of a multidisciplinary team to coordinate the bird nest sweep program for compliance with the Migratory Bird Convention Act during installation of a new gas pipeline within the Greater Toronto Area. This entailed tracking positive locates, establishing construction buffers based on bird species, and coordinating deployment of technical staff for follow-up checks to determine activity status of nests.

Kimball Road Pipeline Extension Project, Corunna, ON (Lead Terrestrial Ecologist / Environmental Inspector, 2015)
Client: NOVA Chemicals
Coordinated and conducted environmental surveys including vegetation, amphibian and bird surveys, as well as during construction inspection and compliance monitoring for Butler's Gartersnake and Snapping Turtle.

Sarnia Integrity Dig Program, Sarnia, ON (Lead Terrestrial Ecologist/Environmental Inspector, 2017-2021)
Client: Plains Midstream Canada
Consulted with First Nations and Environment and Climate Change Canada to secure appropriate Species at Risk Act permits, developed a mitigation plan, and coordinated and conducted compliance inspections for Butler’s Gartersnake as part of annual integrity dig work.

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Dawn Compressor Station Expansion, Dresden, ON (Lead Terrestrial Ecologist, 2015)
Client: Union Gas Ltd.
Coordinated and conducted portions of the extensive 2015 field program for the proposed Dawn Compressor Station Expansion Environmental Impact Study. Tasks included coordination with First Nations groups, meeting with the local conservation authority to discuss permitting, as well as consultation with the Ministry of Natural Resources and Forestry regarding wetland evaluation, and species at risk permitting for Eastern Foxsnake, a listed plant species, and bats.

Kirkwall-Hamilton, Waterdown, ON (Terrestrial Ecologist, 2020)
Client: Enbridge Gas Inc.
Developed, participated, and oversaw the 2020 field program that targeted amphibians, breeding birds (including species at risk), turtles, and terrestrial insects, included consultation during program development with local conservation authorities.

Renewable Energy

Grand Valley III Wind Project, Grand Valley, ON (Coordinator, 2015-2021)
Client: Grand Valley II LP
Coordinator for the 2016-2021 mortality and compensation land monitoring programs, including oversight, data management, reporting, species identification, and agency notification.

Henvey Inlet Wind Energy Centre, Henvey Inlet, ON (Terrestrial Ecologist, 2013-2024)
Client: Pattern Energy
Completed fall migratory raptor surveys during baseline studies as well as led and participated in the restoration monitoring program implemented in 2020, which included adherence to site-specific species at risk protocols.

Amherst Island Wind Energy Project, Amherst Island, ON (Terrestrial Ecologist, 2011-2015)
Client: Algonquin Power & Utilities Corp.
Conducted dusk surveys for Short-eared Owls, winter raptor surveys, auditory surveys for Eastern Whip-poor-will and during-construction monitoring for Blanding's Turtle.

Adelaide Wind Power Project, Strathroy, ON (Coordinator, 2015-2021)
Client: Suncor Energy Products Inc.
Conducted ELC and wildlife habitat assessments pre-construction surveys. Coordinator for the 2015-2021 mortality monitoring program, including oversight of monitoring, data management, reporting, species identification, agency notification for raptors and species at risk, as well as the development of a targeted raptor behavioral monitoring program for review by regulatory agencies.

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Port Dover and Nanticoke Wind Project, Port Dover, ON (Terrestrial Ecologist / Coordinator, 2014-2016)
Client: Capital Power GP Holdings Inc.
Performed environmental monitoring tasks related to migrating Tundra Swans, Bald Eagle behavioral monitoring, and identification and notification of bat and bird species at risk during post-construction monitoring programs. Responsible for coordinating daily monitoring, data management and reporting of post-construction monitoring program.

Roadways

Talbotville Bypass and Highway 4 Widening, Talbotville, ON, Canada (Senior Ecologist, 2025)
Client: MTO West Region
Onsite assessment, consultation, and reporting to Environment and Climate Change Canada during the implementation of a Pileated Woodpecker nest permit.

Highway 401 and Lauzon Parkway Interchange, Windsor, ON (Senior Ecologist, 2025)
Client: MTO West Region
Managed the 2025 field program, comprised of ELC, bat acoustic, and snake coverboard surveys and oversaw the existing conditions and impact assessment report.

Removal of Lawrence Station Bridges and Highway 401 Reconstruction, Township Of Southwold, ON, Canada (Senior Ecologist, 2025)
Client: MTO West Region
Assisted with the existing conditions and preliminary impact assessment.

Highway 401 Roseville Road Bridge Replacement, Cambridge, ON (Terrestrial Ecologist, 2021)
Client: MTO West Region
Assessed existing culverts and bridges for nesting birds, conducted ELC surveys, and conducted significant wildlife habitat assessments.

Highway 40 Improvements, Chatham, Ontario (Terrestrial Ecologist, 2011)
Client: MTO West Region
Conducted reptile and species at risk surveys and habitat assessments.

Highway 24 Improvements, Cambridge, Ontario (Terrestrial Ecologist, 2011)
Client: MTO West Region
Conducted reptile and avian species at risk surveys and habitat assessment.

Highway 6 Bridge Rehabilitations, Guelph, ON (Terrestrial Ecologist, 2020)
Client: MTO West Region
Conducted ELC and habitat assessments for bird species at risk at the Westwood Road overpass and CN overpass.

Aggregates & Rock

Private Pit Development (Senior Ecologist, 2022-present)
Client: CBM Aggregates
Conducted salamander trapping, vegetation surveys and natural environment reporting.

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Natural Environment Report, Pit Application (Peer Reviewer, 2024-2025)
Client: Municipality of Thames Centre
Conducted a peer review of a Natural Environment Report prepared in support of a Class A aggregate pit application on behalf of the County of Thames Centre

Hillsburgh Quarry, Hillsburgh, ON (Terrestrial Ecologist, 2018-2021)
Client: CBM Aggregates
Conducted species at risk surveys for bats and Barn Swallows in onsite buildings, and leading onsite permitting for Barn Swallow.

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PUBLICATIONS & WHITEPAPERS

Straus, M. Multiple paths after grad school: transition to for-profit companies. Western University Panelist. 2016, 2017, and, 2018.

Straus, M., N. Kopysh, and A. Taylor. Bat Species at Risk and Implication to Infrastructure Projects in Ontario. Canadian Society for Civil Engineering Conference Paper, 2016.

Straus, M.A., K. Bavrlic, E. Nol, D.M. Burke, K.A. Elliott. Reproductive success of cavity-nesting birds in partially harvested woodlots. Canadian Journal of Forest Research, 41: 1004-1017, 2011.

Burke, D., K. Elliott, K. Falk, and T. Pirano. (M. Straus, contributing author). A land manager's guide to conserving habitat for forest birds in southern Ontario. Minstry of Natural Resources and Trent University, 2011.

Straus, M. Reproductive success of cavity-nesting birds in partially harvested woodlots in southwestern Ontario. M.Sc. Thesis, Department of Biology, Trent University, Ontario, Canada, 2009.

Straus, M. The effects of partial harvesting on cavity-nesting bird communities in southwestern Ontario. Society of Canadian Ornithologists (SCO-SOC) Conference Poster, 2007.

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Janice is a Terrestrial Ecologist with 20 years of experience in the field of Ecology. She is certified/trained in Ecological Land Classification (ELC) and the Ontario Wetland Evaluation System (OWES), with proven technical skills in completing botanical, bird, mammal, reptile, and amphibian surveys, targeted surveys for species at risk and significant wildlife habitat assessments. Janice has good working knowledge of municipal policy documents, including official plans, as well as the provincial and federal regulatory and legislative requirements related to the protection of natural heritage features, species, and species habitat.

Janice provides support to a variety of projects both in the field and as a contributing author to Environmental Impact Studies (EIS) and other natural heritage assessment reports. This includes the completion of terrestrial field surveys and compilation of reports for projects in various sectors, including Urban Development, Municipal Infrastructure, Transportation, Oil and Gas, and Power and Renewable Energy.

EDUCATION

Bachelor of Science / Honours Biology, University of Western Ontario / Biology, London, Ontario, Canada, 2000

CERTIFICATIONS & TRAINING

Ontario Wetlands Evaluation System (OWES) for Southern Ontario, Ontario Ministry of Natural Resources and Forestry, North Bay, Ontario, 2018

Ecological Land Classification (ELC) for Southern Ontario, Ontario Ministry of Natural Resources, Tobermory, Ontario, Canada, 2007

Government of Canada Security Screening Clearance , Reliability Status (valid until 2028-11-09), Ottawa, Ontario, Canada, 2018

PROJECT EXPERIENCE

Environmental Impact Assessments

710 Huron Road Environmental Impact Study, Kitchener, Ontario (Terrestrial Ecologist, 2014)
Completed breeding bird surveys, ELC surveys and botanical inventories in support of a proposed residential development. Drafted an EIS to assess potential constraints and opportunities associated with the development.

Fairway / Lackner Environmental Impact Study and Environmental Implementation Brief, Kitchener, Ontario (Terrestrial Ecologist, 2014-2017)
Client: Waterloo District School Board
Drafted the natural heritage component of an EIS, in support of a mixed use development proposal. Implemented the post-construction monitoring program as required in the EIB.

Huron South Draft Environmental Impact Study, Kitchener, Ontario (Terrestrial Ecologist, 2014-2018)
Conducted amphibian surveys, breeding bird surveys, ELC surveys and a botanical inventory in support of a proposed residential development. Prepared an EIS to assess potential constraints and opportunities associated with the development. Conducted a site walk with the Region of Waterloo to delineate the woodland boundary. Provided a response to agency comments on the EIS.

Sharp Road and Telephone City Aggregate Lands Environmental Impact Study, Paris, Ontario (Terrestrial Ecologist, 2013)
Completed breeding bird surveys and drafted the natural heritage component of an EIS in support of a mixed use development project.

** denotes projects completed with other firms*

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Richardson Farms Environmental Impact Study, London, Ontario (Terrestrial Ecologist, 2014)
Conducted breeding bird surveys, ELC surveys and botanical inventories in support of a residential development in south London. Drafted an EIS to assess potential constraints and opportunities associated with the proposed development

Victoria Park Village Environmental Implementation Report, Guelph, Ontario (Terrestrial Ecologist, 2015)
Drafted an update to the EIR for a residential development. Conducted a turtle nesting survey as part of the EIR.

Idlewood Creek Restoration Environmental Impact Study, Kitchener, Ontario (Terrestrial Manager, 2017-2018)
Client: City of Kitchener
Total Construction Cost: CAD 1.4M
Confirmed ELC communities and conducted a bat tree roost assessment. Drafted a scoped EIS to assess positive and negative impacts of the Project. Contributed to an Information Gathering Form to summarize terrestrial species at risk habitat and recommend mitigation measures to reduce impacts. Prepared a Species at Risk Mitigation Plan for endangered bats.

Hastings Village Existing Conditions Report, Hastings, Ontario (Terrestrial Manager, 2018)
Completed an ELC survey, summer botanical and wildlife habitat assessment in support of a proposed development. Prepared an Existing Conditions Report to determine constraints and opportunities for the property.

825-875 Main St. Scoped Environmental Impact Study, Cambridge, Ontario (Terrestrial Task Manager, 2016-2017)
Completed a site visit to document existing conditions and prepared a scoped EIS to assess potential impacts on a wetland adjacent to a proposed residential development.

1888 Gordon St. Scoped Environmental Impact Study and Species at Risk Assessment, Guelph, Ontario (Terrestrial Ecologist, 2016-2018)
Client: Tricar
Completed an ELC survey, 3-season botanical inventory, breeding bird surveys, terrestrial crayfish surveys and a wildlife habitat assessment in support of a residential development. Prepared a scoped EIS to describe the natural heritage features in the conservation authority regulation limit and recommend mitigation measures to reduce impacts on the features. Represented the client at a City of Guelph Environmental Advisory Committee meeting to discuss report requirements.

Waterloo Westside Employment Lands Environmental Impact Study, Waterloo, Ontario (Terrestrial Ecologist, 2017-2019)
Client: City of Waterloo
Conducted an ELC survey, a botanical inventory, a wetland delineation, amphibian call count surveys, breeding bird surveys and a wildlife habitat assessment in support of a development in northwest Waterloo. Prepared an EIS to identify natural heritage features and recommend mitigation measures. Consulted with the Grand River Conservation Authority regarding the regulated wetlands on the Project site.

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Chicopee Ski Hill Environmental Impact Study, Kitchener, Ontario (Terrestrial Ecologist, 2017)
Client: Chicopee Ski Hill
Conducted an ELC survey and a spring botanical inventory in support of proposed grading/fill operations to improve the ski slopes. Prepared a scoped EIS to describe the natural heritage features in the conservation authority regulation limit and to recommend mitigation measures to reduce impacts on the features. Submitted an Information Gathering Form to the MNRF to discuss potential species at risk habitat and mitigation measures.

Federal Government

CFB Borden Forest Resource Inventory, Borden, Ontario (Terrestrial Ecologist, 2018)
Client: Department of National Defence
Completed evening amphibian call count surveys and daytime chorus frog call count surveys throughout the base.

Phase II Update Species at Risk Surveys, Ottawa, ON (Terrestrial Ecologist, 2020)
Client: Public Services and Procurement Canada (PSPC)
Completed targeted surveys for SAR Bats were completed according to PSPC's (2019) National Species at Risk Protocol to address requirements of the federal Species At Risk Act, 2002 and the provincial Endangered Species Act, 2007.

Phase I and II Species at Risk Site Surveys and Tree Assessment , Ottawa, ON (Terrestrial Ecologist, 2020)
Client: Public Services and Procurement Canada (PSPC)
Completed targeted surveys for SAR Bats were completed at the Sir John Carling West Annex according to PSPC's (2019) National Species at Risk Protocol to address requirements of the federal Species At Risk Act, 2002 and the provincial Endangered Species Act, 2007.

Municipal

Norval West By-Pass Municipal Class Environmental Assessment, Halton Hills, ON, Canada (Terrestrial Ecologist, 2020-present)
Client: Regional Municipality of Halton
Completed the terrestrial field program in support of the Norval By-Pass Municipal Class Environmental Assessment. Surveys included Ecological Land Classification, a botanical inventory, amphibian surveys, breeding bird surveys, a bat maternity roost survey, bat acoustic monitoring surveys, a woodland plot assessment and a wildlife habitat assessment. Compiled the draft Environmental Existing Conditions and Impact Assessment Reports.

Scheifele Bridge Improvements Environmental Impact Study, Waterloo, ON, Canada (Terrestrial Ecologist, 2020-present)
Client: Region of Waterloo
Completed the terrestrial field program in support of the Scheifele Bridge Improvements Project and assisted with the drafting of the Environmental Impact Study. Surveys included Ecological Land Classification, a botanical inventory, breeding bird surveys, turtle basking surveys, a bat maternity roost survey and a wildlife habitat assessment.

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Cambridge Landfill, Cambridge, Ontario (Terrestrial Ecologist, 2015-2016)
Client: City of Cambridge
Confirmed ELC and conducted a botanical inventory in support of an EIS for the construction of a system forcemain and electrical conduit for the Cambridge Landfill site. Prepared an EIS to outline mitigation measures to protect natural heritage features.

Waterloo Park Central Promenade Environmental Impact Study, Waterloo, Ontario (2017)
Client: City of Waterloo
Completed ELC, a 3-season botanical inventory, a bat roost survey, amphibian surveys, breeding bird surveys and a wildlife habitat assessment in support of a trail improvement project in Waterloo. Prepared a scoped EIS to address impacts to the natural heritage features identified in the floodplain.

Silver Lake Environmental Impact Study, Waterloo, Ontario (2017-2018)
Client: City of Waterloo
Completed ELC, a 3-season botanical inventory, amphibian surveys, breeding bird surveys and a wildlife habitat assessment in support of improvements to Silver Lake and Laurel Creek in Waterloo. Prepared an EIS to outline the significant natural heritage features in the Study Area and potential impacts related to the improvement areas.

Victoria Park Lake Improvement Project, Kitchener, Ontario (Terrestrial Ecologist, 2013-2014)
Client: City of Kitchener
Completed ELC, vegetation monitoring transect assessments and waterfowl and gull roost surveys for years 2 and 3 of a three year post-construction monitoring program. Authored the natural heritage sections of the year 2 and 3 Post-Construction Monitoring Reports.

City of Kitchener Trail, Kitchener, Ontario (Terrestrial Ecologist, 2015)
Client: City of Kitchener
Completed amphibian surveys, breeding bird surveys and a botanical inventory for lands proposed to be developed for a school access trail, and prepared a field investigation summary for the City of Kitchener.

Oil & Gas

Enbridge Kirkwall-Hamilton Pipeline (Terrestrial Ecologist, 2019-2020)
Client: Enbridge
Completed botanical surveys, breeding bird surveys, amphibian surveys and turtle basking surveys in support of an expansion to the existing pipeline.

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Union Gas Existing Conditions Summaries, Various Locations, Ontario (Terrestrial Ecologist, 2017-2018)
Client: Union Gas
Completed species at risk habitat and wildlife habitat assessments to support maintenance activities and integrity digs within the pipeline right of way in Puslinch, Cambridge, St. George, Brantford and Ancaster, Ontario, and provided Existing Conditions Summaries with recommendations to mitigate potential negative impacts. Prepared a species at risk Mitigation Plan for endangered bats for the NPS 12 Pipeline in Brantford.

Enbridge Integrity Digs, Various Sites, Ontario (Terrestrial Ecologist, 2014)
Conducted nest search surveys prior to the removal of vegetation in support of integrity digs to assess the condition of the Enbridge pipeline. Surveys were conducted in various locations throughout southern and eastern Ontario.

Union Gas Brantford to Kirkwall Pipeline, Region of Waterloo to City of Hamilton, Ontario (Terrestrial Ecologist, 2013-2014)
Client: Union Gas
Completed ELC and various wildlife surveys including breeding bird point counts, amphibian call count surveys, salamander surveys, turtle surveys and nightjar surveys in support of an expansion to the existing pipeline.

Union Gas Limited Burlington to Oakville Pipeline, Burlington to Oakville, Ontario (Terrestrial Ecologist, 2014-2015)
Client: Union Gas
Completed snake coverboard surveys, terrestrial crayfish surveys and a bat maternity colony survey in support of an expansion to the existing pipeline.

Union Gas Hamilton to Milton Pipeline Project, Hamilton and Milton, Ontario (Terrestrial Ecologist, 2014-2015)
Client: Union Gas
Completed botanical inventories and various wildlife surveys including snake coverboard surveys, bat maternity colony surveys and salamander surveys in support of an expansion to the existing pipeline.

Union Gas Bright Compressor Station, Bright, Ontario (Terrestrial Ecologist, 2015)
Client: Union Gas
Completed ELC, botanical inventories and amphibian surveys to support an expansion of the Union Gas Bright Compression Station. Assisted in drafting the EIS report, and responded to agency comments to obtain approval of the report.

Railroads

CN Rail Milton Intermodal Terminal Project, Milton, Ontario (Terrestrial Ecologist, 2015-2017)
Client: CN
Completed ELC and botanical inventories and various wildlife surveys including amphibian call count surveys, salamander egg mass surveys, turtle basking surveys, snake coverboard surveys and grassland breeding bird surveys for the proposed CN Intermodal Terminal.

Metrolinx Bowmanville Rail Expansion, Oshawa, Ontario (Terrestrial Ecologist, 2018-present)
Client: Metrolinx
Completed vegetation, bat, amphibian and breeding bird surveys, as well as Species at Risk and Significant Wildlife Habitat assessments in the Project Footprint and the Study Area. Authored the Natural Environment Technical Report Addendum (Version 1).

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Metrolinx Ontario Line, Toronto, ON, Canada (Terrestrial Ecologist, 2020-present)
Client: Metrolinx
Completed field investigations in support of the Natural Environment Technical Report (NETR) and Species at Risk (SAR) Technical Memos. Compiled the NETR, the Lower Don Natural Heritage Impact Study (NHIS), SAR Technical Memos, and contributing SAR survey recommendations to Environmental Work Plans.

Stouffville Rail Corridor Grade Separation Program and Scarborough Junction Technical Advisor, Stouffville, ON, Canada (Terrestrial Ecologist, 2019-2021)
Client: Metrolinx
Completed vegetation, amphibian, and breeding bird surveys, and bat, Species at Risk, and Significant Wildlife Habitat assessments for four Sites included as part of the Stouffville Rail Corridor Project. Compiled the Natural Environment Technical Reports for each of the four Sites based on the field survey results.

Environmental Monitoring

Terrestrial Monitoring Program, Milton, Ontario (Terrestrial Ecologist, 2019-2022)
Client: Menkes Milton Industrial
Established and assessed long-term vegetation monitoring plots and conducted amphibian surveys in support of an ongoing monitoring project for the Menkes Milton Industrial Lands.

Carriage Crossing Terrestrial Monitoring Program, Waterloo, Ontario (2017-2022)
Client: Activa Holdings Inc.
Monitored the integrity of the construction fencing and the health of adjacent natural heritage features during construction of the Carriage Crossing residential subdivision, and immediately reported issues to the Project Manager. Compiled field investigation summaries for inclusion in the annual Monitoring Reports.

781 Victoria Road Terrestrial Monitoring Program, Guelph, Ontario (Terrestrial Ecologist, 2015-2022)
Client: Reid's Heritage Homes
Assessed 9 vegetation plots and 7 vegetation monitoring stations as part of an ongoing monitoring program, as outlined in the Environmental Implementation Report

University of Waterloo Northwest Campus Environmental Monitoring, Waterloo, Ontario (Terrestrial Manager, 2014-2022)
Client: University of Waterloo
Monitored the integrity of the construction fencing and the health of the preserved vegetation during construction on the Northwest Campus lands, and reported issues immediately to the Project Manager. Compiled field investigation summaries for incorporation into the annual Monitoring Reports.

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Waterloo Westside Lands, Environmental Monitoring, Waterloo, Ontario (Terrestrial Manager, 2014-2022)
Client: Activa Holdings Inc.
Monitored the integrity of the construction fencing and the health of adjacent natural heritage features during construction of the Waterloo Westside residential subdivision, and immediately reported issues to the Project Manager. Compiled field investigation summaries for inclusion in the annual Monitoring Reports.

Roadways

Highway 401 Rehabilitation Sweaburg Road, Woodstock, Ontario, Canada (Terrestrial Ecologist, 2020)
Client: Ministry of Transportation
Completed roadside ELC surveys, SAR habitat assessments and wildlife habitat assessments in support of Highway 401 improvements between Norwich Avenue and Sweaburg Road. Contributed to the Terrestrial Ecosystems Existing Conditions and Impact Assessment Report for the Project.

Beaver Creek Road and Conservation Drive Road Improvements, Waterloo, Ontario (Terrestrial Ecologist, 2014-present)
Client: City of Waterloo
Completed roadside ELC surveys and wildlife habitat assessments in support of a road improvement project through an environmentally sensitive landscape. Compiled a Natural Heritage Report that summarized the field investigations and provided a background review of previous studies. Submitted an Information Gathering Form to the Ministry of Natural Resources and Forestry with recommendations to mitigate impacts on species at risk.

Guelph Line Improvement Project, Milton, Ontario (Terrestrial Ecologist, 2013-2015)
Consulted with MNRF and Conservation Halton staff regarding field work requirements and prepared a detailed workplan based on the discussions. Implemented a comprehensive terrestrial field program in support of proposed road improvements that included ELC, a botanical inventory, amphibian call count surveys, salamander egg mass surveys, turtle basking surveys, bat maternity colony surveys, breeding bird surveys and a wildlife habitat assessment. Drafted the Natural Heritage Report for the Project.

Glendon Drive Streetscape Improvement Project, Municipality of Middlesex Centre, Ontario (Terrestrial Ecologist, 2015)
Client: Municipality of Middlesex Centre
Completed roadside ELC surveys and wildlife habitat assessments and prepared an Existing Conditions Report for the Glendon Drive Streetscape Improvement Project.

Ministry of Transportation Ontario (MTO) Highway 17 Re-route Project, Ignace, Ontario (Terrestrial Ecologist, 2015)
Client: Ontario Ministry of Transportation
Completed a vegetation assessment using the Ecosites of Ontario classification system, a spring botanical inventory and a wildlife habitat assessment for the proposed re-route of Highway 17 at the Revell River. Prepared an Existing Conditions and Preliminary Impact Assessment Report to summarize the natural heritage features along the proposed re-route and identify potential impacts to these features.

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Ministry of Transportation Ontario (MTO) Highway 401 Improvements Between Hespeler Road and Wellington Road 32, Cambridge, Ontario (Terrestrial Ecologist, 2014, 2018)
Client: Ministry of Transportation
Completed roadside ELC surveys and wildlife habitat assessments in support of Highway 401 improvements between Hespeler Road and Wellington Road 32. Authored the Terrestrial Ecosystems Existing Conditions and Impact Assessment Report for Phase 2 of the Project.

Power

Bruce Power Expansion, Tiverton, Ontario (Terrestrial Ecologist, 2014-2015)
Client: Bruce Power
Completed a comprehensive terrestrial field program in support of proposed building expansions, including ELC, botanical, amphibian, turtle, bat and breeding bird surveys and a wildlife habitat assessment. Drafted a Natural Heritage Report to assess potential constraints and opportunities associated with the proposed development. Participated in the consultation with MNRF regarding proposed removal of species at risk habitat.

Bruce Power Existing Conditions and Impact Assessment, Kincardine, Ontario (Terrestrial Ecologist, 2017-2018)
Client: Bruce Power
Completed ELC, grassland bird surveys and a wildlife habitat assessment for a proposed commercial development. Contributed to an Existing Conditions and Impact Assessment report for the Site.

Renewable Energy

Niagara Region Wind Farm, Townships of West Lincoln and Wainfleet and the Town of Lincoln, Ontario (Terrestrial Ecologist, 2013-2014)
Client: Niagara Region Wind Corporation
Provided input to the NHA/EIS for the Niagara Region Wind Farm. Completed fall migratory landbird surveys, bat maternity colony surveys, turtle overwintering surveys, snake hibernacula surveys and turtle nesting habitat assessments. Compiled wildlife survey data into a pre-construction monitoring report, as required by the NHA/EIS.

Cedar Point Wind Energy Project, Lambton County, Ontario (Terrestrial Ecologist, 2013)
Conducted bat maternity colony surveys, amphibian call count and egg mass surveys and compiled an amphibian field memo to fulfill pre-construction monitoring requirements related to the NHA/EIS.

Bow Lake Wind Farm, Townships of Smilsky and Peever, Algoma District, Ontario (Terrestrial Ecologist, 2013)
Completed targeted species at risk breeding bird point count surveys, snake hibernaculum assessments, waterfowl nesting surveys, amphibian call count and egg mass surveys, and turtle overwintering surveys in support of the NHA/EIS for the Bow Lake Wind Farm Renewable Energy Act Approval.

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Natural Sciences & Heritage Resources

Ecological Land Classification, Parks Canada*, Mallorytown, Ontario (Field Technician, 2005-2007)
Client: Parks Canada
Completed Ecological Land Classification surveys in support of a large-scale remote sensing project led by the Ministry of Natural Resources.

Management Planning, Wildlife Surveys and Monitoring, Credit Valley Conservation Authority*, Mississauga, Ontario (Natural Heritage Technician, 2010-2012)
Client: Credit Valley Conservation Authority
Completed ELC assessments and salamander, amphibian call count and turtle surveys in support of management planning initiatives. Assisted with the compilation of a natural heritage report to summarize the field investigations. Completed various avian surveys including winter raptor, owl and shorebird surveys and targeted species at risk surveys. Monitored a population of Midland Painted Turtles in Mississauga via radio-telemetry and trapping surveys.

** denotes projects completed with other firms*

Debbie Giesbrecht M.Sc.

Terrestrial Ecologist · 24 Years of Experience · Hamilton, Ontario

Stantec

Debra is a Senior Terrestrial Ecologist with experience in the transportation, oil and gas and mining sectors. She has extensive experience in avian biology, technical report writing, survey techniques and protocols. Debra has participated in recovery planning for various avian species at risk, served on many species at risk management and recovery teams, developed, designed and implemented bird monitoring and stewardship programs, and provided scientific oversight, program design and delivery. Debra has strong skills in collecting, compiling, managing, analyzing and reporting field data for large study areas, as well as recruiting, training and supervising field crew members. In her previous role as Ontario Program Manager with Bird Studies Canada, she oversaw a multitude of bird monitoring, research, stewardship, education and outreach initiatives.

Debra is a strong communicator, and has overseen communications materials, prepared media releases, delivered public presentations, coordinated stakeholder workshops, and delivered media interviews. She is accustomed to collaborating with government, non-government, and industry partners, and is skilled at the efficient management of large projects and project budgets. Debra holds memberships in several committees and councils of various natural heritage organizations in both Canada and the United States, and has authored many scientific studies in peer-reviewed journals, and many technical reports including status updates for the Committee of Endangered Wildlife in Canada (COSEWIC).

EDUCATION

M.Sc., Trent University / Watershed Ecosystems Graduate Program, Peterborough, Ontario, Canada, 2001

B.Sc. (Hons.), Ecology and Evolution (Area of Concentration in Environmental Science), University of Western Ontario / Environmental Science, London, Ontario, Canada, 1996

CERTIFICATIONS & TRAINING

Standard First Aid with CPR C + AED, St. John Ambulance, Hamilton, Ontario, 2018

MEMBERSHIPS

Bird Studies Canada, Member

Society of Canadian Ornithologists, Member

American Ornithologists' Union, Member

Society of Canadian Ornithologists, Councillor (2008-2012)

The Ontario Road Ecology Group, Member

Ontario Field Ornithologists, Member

PROJECT EXPERIENCE

Transportation Planning

Municipal and Provincial Road Improvement Projects, Various Sites, Ontario (Terrestrial Ecologist)

Collected wildlife and wildlife habitat data, including Species at Risk, determined potential impacts and mitigation options, contributed to preliminary design route selection and detailed design, prepared technical reports.

** denotes projects completed with other firms*

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Terrestrial Ecologist · 24 Years of Experience · Hamilton, Ontario

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Oil and Gas Pipelines

Energy East Pipeline (Ontario Wildlife Discipline Lead, 2013-2015)
Client: Trans Canada Pipelines
Prepared Environmental and Socioeconomic Assessments for the National Energy Board for 104 km of new build pipeline, and 30 pump stations across Ontario; designed and implemented field programs; managed data and reporting.

Mining

De Beers Tango Extension of Victor Mine, Hudson Bay Lowlands, Ontario (Project Manager)
Client: De Beers
Designed and implemented a bird monitoring project in consultation with the client using autonomous recording devices to meet Environment Canada's new guidelines for bird monitoring at mining sites. Prepared reports for client; supervised collection of data.

Eagle River Proposed Tailings Management Facility, Wawa, Ontario (Senior Terrestrial Ecologist)
Client: Wesdome
Species at Risk approvals for Woodland Caribou and Eastern Whip-poor-will, senior QC review of baseline reports.

Endangered Species/Species at Risk Assessments

Various Projects
Prepared construction phase mitigation plans for Blanding's Turtle, Barn Swallow and Massasauga Rattlesnake; registered SAR projects under O Reg. 242/08 of the Endangered Species Act; prepared Bobolink Habitat Management Plans.

Wildlife Ecology, Multiple Sites, Ontario
Familiar with all Ontario wildlife with expertise in terrestrial Species at Risk. Experience conducting field work for birds, amphibians, turtles, snakes and bats. Strong knowledge of life-history, habitat requirements and population threats for Ontario wildlife species.

Best Management Practices for Excluding Barn Swallows and Chimney Swifts from Buildings and Structures, Multiple Sites, Ontario
Lead author on this document which was prepared for the Ministry of Natural Resources and Forestry.

Species at Risk, Multiple Sites, Ontario
Extensive experience with federal and provincial Species at Risk, including field identification and monitoring, design and delivery of monitoring programs, recovery planning, and permits/authorizations under the Endangered Species Act. Developed research projects to address habitat requirements for Species at Risk, including Chimney Swift, Barn Swallow and Bank Swallow. Developed mitigation plans and habitat management plans for SAR turtles, snakes and birds. Prepared Notice of Activity forms and Information Gathering Forms.

** denotes projects completed with other firms*

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Natural Sciences & Heritage Resources

Bird Studies Canada (BSC)*, Port Rowan, Ontario
(Ontario Program Manager, 2007-2013)

Oversaw all Ontario bird monitoring, research, stewardship, education and outreach initiatives in Ontario, including the Ontario Nocturnal Owl Survey, Bald Eagle Monitoring Program, SwiftWatch, Bank Swallow Project, Forest Birds at Risk, Great Lakes Marsh Monitoring Program, and the Bird Science and Education Program. Participated in recovery planning for Hooded Warbler / Acadian Flycatcher, Barn Owl, Chimney Swift, Golden-winged Warbler, Short-eared Owl, Whip-poor-will, Barn Swallow. Member of Hooded Warbler / Acadian Flycatcher Recovery Team, Southern Ontario Bald Eagle management team, Chimney Swift Recovery Team, Ontario Eastern Habitat Joint Venture Advisory Committee, Bank Swallow Working Group, and Barn Swallow Recovery Working Group. Developed, designed and implemented bird monitoring and stewardship programs, including scientific oversight, program design and delivery. Developed field research projects, analyzed data, and reported on findings to partner organizations. Delivered public presentations, coordinated stakeholder workshops, and delivered media interviews. Secured sufficient funding to support Ontario staff and meet administrative overhead targets through preparing funding proposals to foundations, government agencies, and corporations. Identified new opportunities for programs, and developed new partnerships and opportunities to increase revenue.

Bird Studies Canada (BSC)*, Port Rowan, Ontario
(Bird Population Biologist, 1999-2007)

Analyzed bird migration data from across Canada to estimate bird population trends. Compiled bird data and prepared written site descriptions on Important Bird Areas in Canada. Coordinated summer field work for Hooded Warblers, which included nest searching, monitoring, mist netting, colour banding, vegetation sampling. Coordinated field work for Bald Eagles, which included nest access, blood sampling, banding, deployment of satellite telemetry units. Coordinated Ontario Nocturnal Owl Survey, Red-shouldered Hawk and Spring Woodpecker Survey, and Ontario Breeding Bird Survey. Managed and analyzed data, prepared technical reports and funding proposals.

Current Research Projects/Partnerships

Recipient of Stantec R&D Fund grant to investigate habitat selection of Barn Swallows at bridges and culverts in Ontario. Collaborative research project with Bird Studies Canada, Environment and Climate Change Canada and Ministry of Natural Resources and Forestry. Industry supervisor for an NSERC Industrial Post-graduate Scholarship. M.Sc. Student. Collaborative research project looking at movements of juvenile Bald Eagles from the lower Great Lakes. Partners: Bird Studies Canada, University of New Brunswick, Ministry of Natural Resources and Forestry.

** denotes projects completed with other firms*

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Roadways

Highway 401 Expansion, GWPs 3024-18-00, 3073-17-00, 3025-18-00, 3078-18-00, 3079-18-00, 3038-19-00 , Tilbury to London, Ontario (Senior Terrestrial Ecologist, 2019-present)
Client: MTO West Region
This project includes the preliminary design, environmental assessment and design build ready work to address the future needs of the Highway 401 corridor from Tilbury to London (129 km) within Chatham-Kent, Elgin, Middlesex, and London. The project has been broken down into six GWPs—four to focus on reconstruction and widening of Highway 401 from four to six lanes, and two to focus on interchange improvements. The terrestrial discipline includes study design, mitigation recommendations, impact assessment, and Species at Risk approvals.

Highway 6 Little Current Swing Bridge, Planning, Preliminary Design and Class EA Study, GWP 5268-14-0, Manitoulin Island, Ontario (2018-present)
Client: MTO Northeastern Region
The purpose of the EA for replacement of the Highway 6 Little Current Swing Bridge is to identify a Recommended Plan to address current and future transportation needs at the bridge crossing. Field data were collected at four alignment alternatives to document existing conditions and the information was used to and assess the sensitivity and potential impacts, including consideration of the design alternatives (crossing type), for each alignment. Coordinated field data collection for terrestrial resources and authored the Existing Conditions report for the project.

Large Value Retaine, Southwestern Ontario (Natural Sciences Quality Reviewer, 2018-2020)
Client: MTO West Region
Under the terms of a three year Retainer Agreement for Highway Engineering and Other Services Throughout West Region (Agreement 3017-E-0004/0005, 3017-E-0006/0007), many of the individual assignments had a natural sciences component. The terrestrial ecosystems reports documented existing conditions, assessed site sensitivities and impacts of the contract and recommended environmental mitigation measures.

Agreement 4015-E-0033: Preliminary Design Retainer Services (Senior Ecologist, 2016-2020)
Client: MTO Eastern Region
Lead author for preliminary design and detail design study for carpool lots expansion at Highway 417 (interchange 79) and Highway 416 (interchange 57), including terrestrial resources and SAR.
Senior Reviewer for Class EA preliminary design study for the future widening of Highway 401 from Cobourg to Colborne, involving the replacement and rehabilitation of structures, interchange modifications, and commuter parking lot expansions, including terrestrial resources and SAR.

Detail Design and Class Environmental Assessment Highway 400 North Canal Overpass Replacement, County of Simcoe, Ontario (Senior Ecologist, 2016-2019)
Client: MTO
Senior Reviewer for existing conditions and impact assessment report.

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Detail Design and Class Environmental Assessment Replacement of South Saugeen River Bridge, County of Grey, Ontario (Senior Ecologist, 2017-2018)
Client: MTO
Prepared existing conditions and impact assessment report, conducted site visit to document existing conditions.

Preliminary Design, Detail Design and Class Environmental Assessment for 145 Culvert Rehabilitation/Replacements, Multiple Sites, Ontario (Senior Ecologist, 2013-2017)
Client: MTO
Senior Reviewer, prepared Species at Risk Mitigation Plan, Notice of Activity Form for Ministry of Natural Resources and created Species at Risk Factsheets for Barn Swallow and Massasauga.

Environmental Retainer Services, East Region , Multiple Sites, Ontario (Senior Ecologist, 2016-2018)
Client: MTO
Lead author of existing conditions and impact assessment reports.

Detail Design and Class Environmental Assessment Highway 401 Reconstruction, Multiple Sites, Ontario (Senior Ecologist, 2014-2017)
Client: MTO
Contributing author to the Terrestrial Ecosystems Existing Conditions and Impact Assessment Report. Senior Reviewer and advisor for the project. Preparation of mitigation plans and ESA authorizations.

Detail Design and Class Environmental Assessment Highway 24 from Brant Road 5/Blue Lake Road to Glen Morris Road, County of Brant, Ontario (Terrestrial Ecologist, 2014-2016)
Client: MTO
Coordinated and performed the site investigations including a road mortality study. Author of Terrestrial Ecosystems Existing Conditions and Impact Assessment Report. Provided recommendation for wildlife enhancements to reduce wildlife mortality and enhance habitat connectivity. These included the installation of large culverts, funnel fencing and the creation of artificial nesting habitat.

Municipal

Heart Lake Road, Brampton, Ontario (Senior Terrestrial Ecologist, 2017-2018)
Client: City of Brampton
Gathered background information; lead author on report which describes the existing conditions including high levels of road mortality.

Dundas Street Road Widening and Grade Separation, Halton, Ontario (Senior Terrestrial Ecologist, 2016-2019)
Client: Regional Municipality of Halton
As Discipline Lead, conducted field work, performed background review, completed bat habitat assessment for SAR, prepared impact assessment report, consulted with MNRF to obtain SAR authorizations.

Regional Road 25 Municipal Class Environmental Assessment, Halton, Ontario (Senior Terrestrial Ecologist, 2018-2019)
Client: Regional Municipality of Halton
Lead author for Natural Environment report.

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Bramalea Road (Queen Street to South City Limit)
Municipal Class Environmental Assessment,
Brampton, Ontario (Senior Terrestrial Lead /
QA/QC Reviewer, 2018-2019)
Client: City of Brampton

** denotes projects completed with other firms*

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PUBLICATIONS & WHITEPAPERS

Invited Plenary Presentation. Society of Canadian Ornithologists Annual Meeting, Winnipeg, MB. Badzinski, D.S. The power of people - engaging citizens in bird and habitat conservation., 2013.

Fitzgerald, T., J. Nocera, E. van Stam, and D. Badzinski. Is habitat limiting the Chimney Swift population in Ontario? Oral Presentation. Society of Canadian Ornithologists Annual Meeting, Winnipeg, MB, 2013.

Naujokaitis-Lewis, I., J. Curtis, I. Thischendorf, D. Badzinski, K. Lindsay, and M.J. Fortin. Predicting metapopulation dynamics at the range margin while accounting for uncertainties in coupled species distribution-metapopulation dynamics models for risk assessments under climate change. Diversity and Distributions 19:541-554, 2013.

Tozer, D.C., C.M. Falconer, and D.S. Badzinski. Common Loon reproductive success in Canada: the west is best but not for long. http://dx.doi.org/10.5751/ACE-00569-080101. Avian Conservation and Ecology 8(1):1, 2013.

Melles, S.J., M.J. Fortin, D. Badzinski, and K. Lindsay. Relative importance of nesting habitat and measures of connectivity in predicting the occurrence of a forest songbird in fragmented landscapes. Avian Conservation and Ecology 7(2):3, 2012.

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Falconer, M., and D.S. Badzinski. ARE BANK SWALLOW POPULATIONS ERODING AWAY? Oral Presentation. 5th North American Ornithological Conference, Vancouver, BC, 2012.

COSEWIC assessment and status report on the Hooded Warbler Setophaga citrina in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 39 pp, 2012.

Calvert and D.S. Badzinski. Population dynamics of a Neotropical migrant at the edge of its range. Oral Presentation. Society of Canadian Ornithologists Annual Meeting, Moncton, NB, 2011.

Melles, S.J., M.J. Fortin, K. Lindsay, and D. Badzinski. Expanding northward: Influence of climate change, forest connectivity, and population processes on a threatened species' range shift. Global Change Biology 17:17-31, 2011.

Badzinski, D.S., P.E. Nye, and E. van Stam. NATAL DEPARTURE AND NOMADIC MOVEMENTS OF JUVENILE BALD EAGLES IN THEIR FIRST YEAR OF INDEPENDENCE. Presentation. American Ornithological Union and Society of Canadian Ornithologists Joint Meeting, San Diego, CA, 2010.

Bowman, J., D.S. Badzinski, R.J. Brooks. The numerical response of breeding Northern Saw-whet Owls (Aegolius acadicus) suggests nomadism. Journal of Ornithology 151:499-506, 2010.

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Blancher, P.J., D. Phoenix, D.S. Badzinski, M.D. Cadman, T.L. Crewe, C.M. Downes, D. Fillman, C.M. Francis, J. Hughes, D.J.T. Hussell, D. Lepage, J.D. McCracken, D.K. McNicol, B.A. Pond, R.K. Ross, R. Russell, L.A. Venier, and R.C. Weeber. Population trend status of Ontario's forest Birds. The Forestry Chronicle 85:184-201, 2009.

Melles, S.J., D.S. Badzinski, M.J. Fortin, and K. Lindsay. Differentiating between habitat and social drivers of clustered nesting patterns in territorial songbirds. Landscape Ecology 24:519-531, 2009.

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COSEWIC assessment and update status report on the Red-shouldered Hawk Buteo lineatus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 27 pp, 2006.

Badzinski, D.S. Five Species Accounts (2001-2005): Hooded Warbler, Northern Saw-whet Owl, Boreal Owl, Barn Owl, Red-shouldered Hawk. Atlas of the Breeding Birds of Ontario. Cadman, M.D., D.A. Sutherland, G.G. Beck, D. LePage, and A.R. Couturier, eds, 2005.

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Badzinski, D.S. Population dynamics of Semipalmated Plovers (Charadrius semipalmatus) breeding at Churchill, Manitoba. Masters Thesis, 2001.

Giesbrecht, D., and C.D. Ankney. Predation risk and foraging behaviour: an experimental study of birds at feeders. Canadian Field Naturalist 112(4):668-675, 1998.

Giesbrecht, D.S. The effects of predation risk on foraging behaviour: an experimental study of birds at feeders. Baccalaureate Thesis, 1996.

Badzinski, D., B. Holden, S. Spisani and K. Richardson. Best Management Practices for Excluding Barn Swallows and Chimney Swifts from Bridges and Structures. Ontario Ministry of Natural Resources. Queen’s Printer for Ontario, 2017, pp. 22.

Fitzgerald, T.M., van Stam, E., Nocera, J.J. D.S. Badzinski. Loss of nesting sites is not a primary factor limiting northern Chimney Swift populations. Population Ecology 56, 2014, pp. 507-512.

Zanchetta, C., D. C. Tozer, T. M. Fitzgerald, K. Richardson and D. Badzinski. Tree cavity use by Chimney Swifts: implications for forestry and population recovery. Avian Conservation and Ecology 9(2), 2014, pp. 1.

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Heagy, A., D. Badzinski, D. Bradley, M. Falconer, J. McCracken, R.A. Reid and K. Richardson. Recovery Strategy for the Barn Swallow (Hirundo rustica) in Ontario. Ontario Recovery Strategy Series. Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario, 2014, pp. vii + 64.

COSEWIC assessment and status report on the Bank Swallow Riparia riparia in Canada. Committee on the Status of Endangered Wildlife in Canada, 2013, pp. ix + 48.

CBM Anthony Pit – Noise Impact Assessment Report

Final Report

January 6, 2026

Prepared for:
CBM Aggregates
55 Industrial Street
Toronto, Ontario M4G 3W9

Prepared by:
Stantec Consulting Ltd.

Project Number:
160961457

Stantec

Limitations and Sign-off

The conclusions in the Report titled CBM Anthony Pit – Noise Impact Assessment Report are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from CBM Aggregates (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

Prepared by: _____
Signature

Fabian Alvarado, M.Eng., P.Eng.
Noise and Acoustics Engineer
Printed Name

Reviewed by: _____
Signature

Mohammed Salim, MBA., P.Eng.
Associate, Senior Noise and Acoustics Engineer
Printed Name

Approved by: _____
Signature

Frank Babic, P.Eng., INCE
Principal – Acoustics Practice Area Lead Ontario
Printed Name

Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada), to conduct a noise impact assessment for the CBM Anothony Pit (the Project), a proposed gravel pit in located at 4454 Victoria Road in the Township of Puslinch, Wellington County, Ontario.

Project operations are not expected to generate significant vibration from the site; therefore, a vibration assessment has not been included in this report.

The noise impact assessment is intended to support the Project's application for a Class A license under the *Aggregate Resources Act, 1990* (ARA), permitting extraction of more than 20,000 tonnes annually on private land, including extraction above and below the established water table. As such, this noise impact assessment has been prepared in accordance with the following provincial guidelines:

- Ontario Ministry of Natural Resources (MNR) Publication entitled "Aggregate Resources of Ontario: Technical Reports and Information Standards" (MNR 2020)
- Ontario Ministry of the Environment Conservation and Parks (MECP) Publication entitled "Environmental Noise Guideline - Stationary and Transportation Sources - Approval and Planning (NPC-300) " (MOECC 2013)

This noise impact assessment, conducted in accordance with applicable guidelines, evaluates whether noise levels from Project operations comply with the NPC-300 daytime noise limit of 50 dBA. The gravel pit will operate from 07:00 to 19:00 Monday through Friday and from 08:00 to 16:00 on Saturday.

This assessment considers noise sources, and their operating scenarios identified from the information provided by CBM. Sound power levels and operating conditions of the Project noise sources were used as inputs into a predictive acoustic model developed using Cadna/A (Datakustik GmbH 2025), a noise modelling software implementing the ISO 9613-2 (ISO 1996) environmental sound propagation algorithms The assessment models a predicable worst-case hour of operation, analyzing four separate scenarios for the above water and below water extraction phases.

Eleven (11) representative points of reception (PORs), including an on-site residence, were identified for this assessment based on a review of local aerial imagery and zoning maps. These PORs represent the plane of window of the highest storey and outdoor locations where applicable, including a dwelling located within the Project property parcel.

The noise assessment, based on the operating conditions and assumptions identified in this report, predicts that Project noise levels will meet the applicable MECP noise criteria, provided the noise controls identified in Section 8 are implemented.

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Appendix B **Instrumentation Calibration Certificates and Weather Data**
Appendix C **Sound Power Level Data**
Appendix D **Noise Model Sample Calculations**
Appendix E **Curriculum Vitae**

Acronyms / Abbreviations

ARA	Aggregate Resources Act
CBM	CBM Aggregates
dB	Decibel
dBA	Decibel, A-weighted
ISO	International Organization for Standardization
MECP	Ontario Ministry of the Environment, Conservation and Parks (formerly MOECC, Ontario Ministry of the Environment and Climate Change)
MOECC	Ontario Ministry of the Environment and Climate Change
MNR	Ontario Ministry of Natural Resources
m	Metres
ASL	Above sea level
NPC	Noise Pollution Control Guideline - Ontario
NRC	Noise reduction coefficient
POR	Point of Reception
OPOR	Outdoor Point of Reception
SLM	Sound Level Meter
Stantec	Stantec Consulting Ltd.

1 Introduction

Stantec Consulting Ltd. (Stantec) was retained by CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada), to conduct a noise impact assessment for the CBM Anthony Pit (the Project), a proposed gravel pit to be located at 4454 Victoria Road in the Township of Puslinch, Wellington County, Ontario. The noise impact assessment is intended to support the Project's application for a Class A licence under the *Aggregate Resources Act, 1990* (ARA) which would permit aggregate extraction above and below the established water table.

This noise impact assessment has been prepared in accordance with the following provincial guidelines:

- Ontario Ministry of Natural Resources (MNR) Publication entitled "Aggregate Resources of Ontario: Technical Reports and Information Standards" (MNR 2020)
- Ontario Ministry of the Environment Conservation and Parks (MECP) Publication entitled "Environmental Noise Guideline - Stationary and Transportation Sources - Approval and Planning (NPC-300) " (MOECC 2013)

This noise impact assessment, conducted in accordance with applicable guidelines, evaluates whether noise levels from Project operations comply with the NPC-300 noise criteria.

Project operations are not expected to generate significant vibration from the site; therefore, a vibration assessment has not been included in this report.

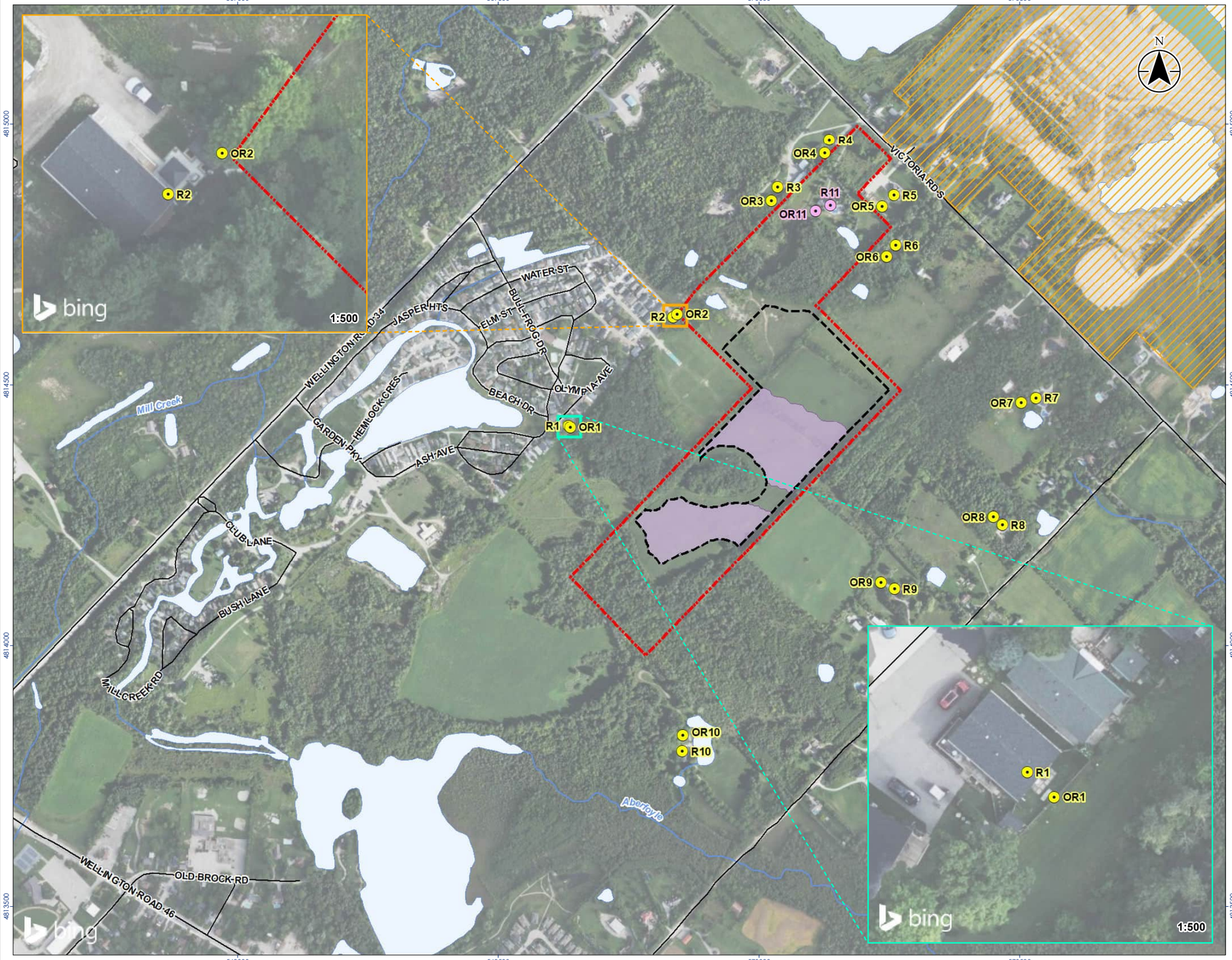
2 Project and Surrounding Area

The Project is located at 4454 Victoria Road South, in the Township of Puslinch, Wellington County, Ontario. The Project site is bounded by the following roadways, with access from Victoria Road South:

- Victoria Road South to the northeast
- Wellington Road 34 to the northwest
- Brock Road South to the southwest
- Gilmour Road to the southeast

The surrounding lands are mainly a mix of agricultural, residential, mixed-use, and natural environment zoned land under the Puslinch Zoning By-law (Corporation of the Township of Puslinch 2018). Noise-sensitive land uses near the Project include the Mini Lakes residential subdivision to the west, as well as residential subdivisions along Victoria Road and Gilmour Road. Along Brock Road, there are community facilities such as Aberfoyle Public School and Puslinch Community Centre serving these neighborhoods. The lands north of the Project, across Victoria Road, include extractive industrial zoned lands where an existing aggregate pit is located and operated by Dufferin Aggregates.

A map showing the Project site, extraction limits and surrounding area is provided in Figure 1. A land use zoning map of the area surrounding the Project is provided in Appendix A.



Stantec

Legend

- Property Boundary
- Points of Reception
- Discretionary Points of Reception
- Road
- Watercourse
- Waterbody
- Dufferin Aggregate Pit

Extraction Footprint

- Above Water Extraction Footprint
- Below Water Table Extraction Footprint

0 100 200 metres

1:7,500 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Orthoimagery © © 2025 Microsoft Corporation © 2025 Maxar ©CNES (2025) Distribution Airbus DS

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2025-12-19
Technical Review by FA on 2025-12-19

Client/Project
CBM ANTHONY PIT
NOISE IMPACT ASSESSMENT REPORT
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
1

Title
Project Area and Points of Reception

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

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3 Project Operations

The Project will operate under a Class 'A' licence application under the Ontario ARA for a below groundwater pit operation extracting more than 20,000 tonnes annually on private land, which includes both above and below water gravel extraction. The above and below water extraction limits for the Project are shown in Figure 1.

The following list outlines the future above and below water extraction operations considered for this assessment:

- The gravel pit will typically operate from 07:00 to 19:00 Monday through Friday and from 08:00 to 16:00 on Saturdays. No aggregate (e.g., extraction, loading and hauling) operations will occur outside of these hours.
- The above water extraction phase will begin at the northwest end of the extraction area and then proceed generally south, concluding the phase at the southwest end of the extraction area.
- During the above water extraction phase, the excavation and loading will be carried out using one (1) loader.
- Following the above water extraction phase, the below water extraction phase will begin at the southernmost part of the below water extraction area and progress northward to the separate area further north.
- For the below water extraction phase, the excavation and loading will be carried out using one (1) dragline or excavator and one (1) loader.
- For both above and below water extraction phases, the equipment will operate at approximately 0.5 m above the water table, which varies between 320 and 323 m ASL within the extraction limits.
- During the busiest hour, twelve (12) trucks are expected to arrive and depart the site.
- Material processing (e.g., crushing) will not occur on site.

4 Noise Sources

This assessment considers noise sources and operating scenarios identified from the information provided by CBM. An excavator may be used for below water extraction; however, a dragline was considered for the assessment as it generates higher noise emissions. The noise emissions for the sources are expressed in terms of sound power levels, which were obtained from field measurements from a similar site (CBM's Neubauer Pit) and published reference sound data (BSI 2008) for comparable equipment intended for use in the Project. The following sub-sections provide details on the field measurements, sound power level calculations and a summary of the noise sources identified for this assessment.

4.1 Field Measurements

Stantec personnel visited the Neubauer Pit on October 24, 2022, to conduct sound level measurements of equipment similar to those intended for the Project. The sound level measurements were conducted using a Larson Davis model 831 sound level meter (SLM). The SLM was factory calibrated within 2 years of the site visit and was field calibrated before and after the site visit using a Larson Davis CAL200 acoustic calibrator. Calibration certificates for the measurement instrumentation are provided in Appendix B.

The sound pressure level measurements were conducted in accordance with MECP Publication NPC-103 (MOE 1978) under suitable weather conditions. The weather conditions during the measurements are provided in Appendix B and were obtained from available online weather data from the nearest Environment Canada weather station.

4.2 Sound Power Level Calculations

Sound power levels were calculated from measured sound pressure levels or obtained from published reference data for equipment similar to those intended in the Project. The sound power calculations consider the source measurement distance and where applicable, directivity of the source. Spectral sound power levels for the assessed noise sources are provided in Appendix C.

MECP Publication NPC-104 (MOE 1978) prescribes adjustments for sources with special qualities or characteristics of sound. These are punitive adjustments which apply to noise sources with subjectively annoying characteristics, including tonal sounds, quasi-impulsive sounds and beating sounds (sounds with cyclically varying amplitudes). The sources considered in this assessment were neither observed or expected to exhibit such characteristics. Therefore, the source sound power levels in this assessment do not include adjustments for NPC-104 sound characteristics.

4.3 Noise Source Summary

The types of noise sources considered in this assessment are summarized in Table 4-1, including the overall sound power level and sound characteristics.

Table 4-1 Noise Source and Sound Power Level Summary

Noise Source	Overall Sound Power Level (dBA)	Source Location [b]	Sound Characteristics [c]
Loader	108	O	S
Dragline [d]	114	O	S
Moving Truck	106	O	S
Idling Truck	91	O	S

Notes:

a. The listed sound power level does not reflect the time-weighting considered in the model
b. "O" indicates Outdoor
c. Sound Characteristics per NPC-104: S = Steady
d. Although an excavator may be alternatively used for below water extraction, only the dragline is considered as it generates higher noise emissions and results in a conservative assessment

5 Points of Reception

In accordance with NPC-300, Project noise levels are evaluated at points of reception (PORs) located on noise sensitive land uses such as:

- a property of a person that accommodates a dwelling and includes a legal nonconforming residential use
- a property of a person that accommodates a building used for noise sensitive commercial purposes, such as hotels and motels
- a property of a person that accommodates a building used for noise sensitive institutional purposes, such as hospitals, schools and long-term cares

A POR can also be located on a property zoned to permit a noise sensitive land use, even if the property is currently vacant and no building permit has been issued. The property must also be accessible by road or water to qualify as a vacant lot POR. No vacant lot PORs have been identified for this assessment.

Further, NPC-300 indicates that a land use that would normally be considered noise sensitive, such as a dwelling, but is located within the property boundaries of the Project noise sources is not considered a receptor.

Eleven (11) representative PORs, including an on-site residence, have been identified for this assessment based on a review of local aerial imagery and zoning maps. Although NPC-300 indicates that the existing residence within the at 4454 Victoria Road South, within Project property boundary, would not be considered a receptor, this assessment includes R11/OR11 as discretionary PORs.

The identified PORs represent the plane of window of the highest storey and outdoor locations, where applicable, for the nearby dwellings. For a conservative approach, dwellings were assumed to have two-storeys where the number of storeys could not be verified through a review of aerial and street-level imagery.

The receptor locations considered for each POR are given below:

- Receptor location at 4.5 m above ground at Plane of Window PORs for the two-storey dwellings (i.e., highest window level).
- Receptor location at 1.5 m above ground at Plane of Window PORs for the single-storey dwellings and within 30 m of a facade of a dwelling for the Outdoor POR (OPOR) associated with the dwellings.

The PORs considered in this assessment are listed in Table 5-1 and shown in Figure 1.

Table 5-1 Points of Reception Summary

POR ID	POR Description	POR Height Above Ground (m)
R1	1.5 Storey Residence - 6 Dogwood Road	3.0 [a]
OR1	Residence Yard - 6 Dogwood Road	1.5
R2	1.5 Storey Residence - 22 Sumac Street	3.0 [a]
OR2	Residence Yard - 22 Sumac Street	1.5
R3	1 Storey Residence - 4458 Victoria Road South	1.5
OR3	Residence Yard - 4458 Victoria Road South	1.5
R4	1 Storey Residence - 4456 Victoria Road South	1.5
OR4	Residence Yard - 4456 Victoria Road South	1.5
R5	2 Storey Residence - 4442 Victoria Road South	4.5
OR5	Residence Yard - 4442 Victoria Road South	1.5
R6	2 Storey Residence - 4436 Victoria Road South	4.5
OR6	Residence Yard - 4436 Victoria Road South	1.5
R7	2 Storey Residence - 4414 Victoria Road South	4.5
OR7	Residence Yard - 4414 Victoria Road South	1.5
R8	2 Storey Residence - 82 Gilmour Road	4.5
OR8	Residence Yard - 82 Gilmour Road	1.5
R9	2 Storey Residence - 70 Gilmour Road	4.5
OR9	Residence Yard - 70 Gilmour Road	1.5
R10	2 Storey Residence - 46 Gilmour Road	4.5
OR10	Residence Yard - 46 Gilmour Road	1.5
R11	On-site 2-Storey Residence - 4454 Victoria Road South	4.5
OR11	On-site Residence Yard - 4454 Victoria Road South	1.5

Note:

a. The receptor height for one and a half storey dwellings is considered to be 3 m above ground.

6 Applicable Guidelines and Assessment Criteria

The MNR Publication entitled “Aggregate Resources of Ontario: Technical Reports and Information Standards” indicates the applicable noise guidelines and criteria for this assessment are the provincial guidelines provided in MECP Publication NPC-300.

NPC-300 establishes the applicable noise criteria in terms of the one-hour equivalent noise level ($L_{eq\text{-}1hr}$). The applicable noise level limits are set as higher of the background noise level and the exclusion limit specified in NPC-300. The exclusion limits apply at a POR based on the characteristics of its acoustic environment and the time of day (e.g., daytime, evening, or nighttime).

Based on a review of local aerial imagery, the local acoustic environment is classified as an MECP Class 2 Area. A Class 2 Area is described as an area where the background sound level is dominated by human activities during daytime (07:00 to 19:00) with lower background sound levels during the evening (19:00 to 23:00) and nighttime (23:00 to 07:00), and where the soundscape is otherwise influenced primarily by natural environment with infrequent human activity. This classification is supported by the presence of major roadways (e.g., Wellington Road 34, Brock Road), industrial activity associated with the Dufferin Aggregate Pit, community facilities, and residential subdivisions, all of which contribute to the existing background sound levels.

This assessment uses the MECP Class 2 exclusion limit of 50 dBA as the daytime noise limit to evaluate Project noise impacts at the PORs. Evening and nighttime noise limits are not considered in this study, as the Project will not operate during those periods (i.e., 19:00 to 07:00).

7 Impact Assessment

7.1 Methods

The assessment uses the commercially available software package Cadna/A (Datakustik GmbH 2024) to predict operational noise levels at the PORs. The Cadna/A noise model implements ISO 9613-2 noise propagation algorithms (ISO 1996) and accounts for noise attenuation factors such as:

- Geometrical divergence (noise attenuation due to distance)
- Barrier effects (noise shielding) of the intervening structures/buildings and topography
- Atmospheric absorption
- Ground absorption
- Local topography

Local topography outside of the extraction area was modelled based on Light Detection and Ranging (LIDAR) data obtained from GeoOptics Inc. while the topography within the extraction area was modelled based on ground elevation contours from the Project's hydrogeology models.

The model conservatively considers a downwind condition, where the wind is directed always from each noise source location to each receptor. Further, noise attenuation due to foliage was not included in the model as an additional level of conservatism. A summary of key acoustic model parameters used in the model is provided in Table 7-1

Table 7-1 Key Acoustic Model Inputs

Parameter	Value	Rationale
Ground Absorption	0.3	Models acoustically reflective ground conditions (e.g. hard packed ground) within the extraction areas
	1	Accounts for acoustically absorptive ground conditions (e.g., grass covered areas) between the extraction areas and the modelled receptors
Temperature	10°C	Ontario standard conditions
Relative Humidity	70%	Ontario standard conditions
Max. Order of Reflection	2	Accounts for building/barrier reflections
Noise Source Height	3 m	The noise source height was set at 3 m above ground to model the engine exhaust noise from the Project equipment, as this is expected to be the dominant noise source.

7.2 Noise Modelling Assumptions and Scenarios

In accordance with NPC-300 guidelines, the noise assessment evaluates the predictable worst-case hour of Project operation. The noise modelling is based on the operations described in Section 3 with the following assumptions applied for both above and below water extraction phases during a worst-case hour:

- Excavation and loading equipment may operate anywhere within the extraction area.
- Excavation and loading equipment operate continuously for 60 minutes.
- Twelve (12) trucks arrive at and depart from the site.
- Two trucks simultaneously idling for 60 minutes at the site.
- Noise barriers are implemented as outlined in Table 7-2. These noise barriers may consist of noise walls, berms or a combination of both.

Project operations noise will vary at the PORs as the working areas advance through the above water and below water extraction phases. To capture this variation in operations noise, four separate scenarios were considered for both the above water and below water extraction phases. Each scenario models a distinct working area for each extraction phase.

The modelling scenarios for both the above water and below water extraction phases are summarized in Table 7-2, including associated equipment, working areas, and noise barriers. The modelled working areas and noise barriers modelled for the above water extraction scenarios are shown in Figure 2, while those for the below water extraction scenarios are shown in Figure 3.

Table 7-2 Modelled Scenarios for Above and Below Water Extraction Phases

	Above Water Extraction				Below Water Extraction			
Equipment	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**
Loader (Qty.)	1	1	1	1	1	1	1	1
Dragline [d] (Qty.)	-	-	-	-	1	1	1	1
Moving Trucks (Qty.)	12	12	12	12	12	12	12	12
Idling Trucks (Qty.)	2	2	2	2	2	2	2	2
Modelled Working Area ID [a]	A1	A2	A3	A4	B1	B2	B3	B4
Noise Barrier [b] ID and Height	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**
NB0 – 5 m [c]	X	X	X	X	X	X	X	X
NB1 – 3.5 m	X	X	X	X	X	X	X	X
NB2 – 3.5 m	X	X	X	X	X	X	X	X
NB3 – 4 m	X	-	-	-	-	-	-	X
NB4 – 3 m	-	-	-	-	-	-	X	X
NB5 – 3.5 m	-	-	-	-	-	-	X	X
NB6 – 4 m	-	-	-	-	X	X	X	X
NB7 – 3.5 m	-	-	-	-	X	X	-	-

Notes:

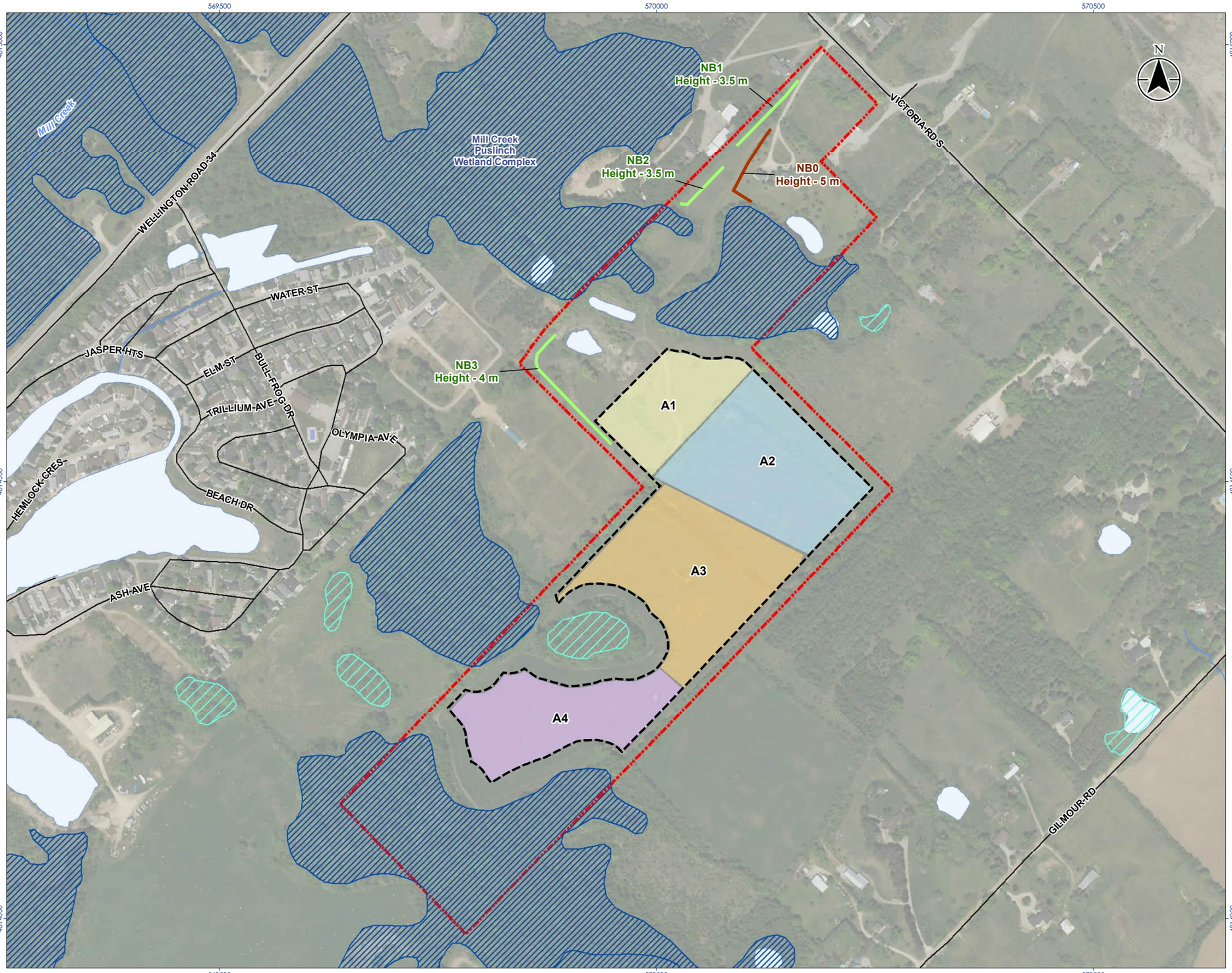
a. See Figure 2 for the modelled working area of the above water extraction scenarios and Figure 3 for the below water extraction scenarios.

b. Noise barrier (NB) refers to noise wall, berm, or a combination of both.

c. NB0 is a discretionary barrier for the on-site receptors R11/OR11.

d. Although an excavator may be alternatively used for below water extraction, only the dragline is considered as it generates higher noise emissions and results in a conservative assessment.

e. "-" indicates equipment/noise barrier is not considered for the identified modelling scenario. "X" indicates the noise barrier is considered for the identified modelling scenario.



Stantec

Legend

- Property Boundary
- Modelled Noise Barrier
- Modelled Discretionary Noise Barrier
- Road
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System

Modelled Equipment Working Areas – Above Water Extraction Phase

- A1
- A2
- A3
- A4

Extraction Footprints

- Above Water Extraction Footprint

0 100 200 metres

1:4,500 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
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Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2025-12-18
Technical Review by FA on 2025-12-19

Client/Project
CBM ANTHONY PIT
NOISE IMPACT ASSESSMENT REPORT
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
2

Title
Modelled Equipment Working Areas and Noise Barriers – Above Water Extraction Phase

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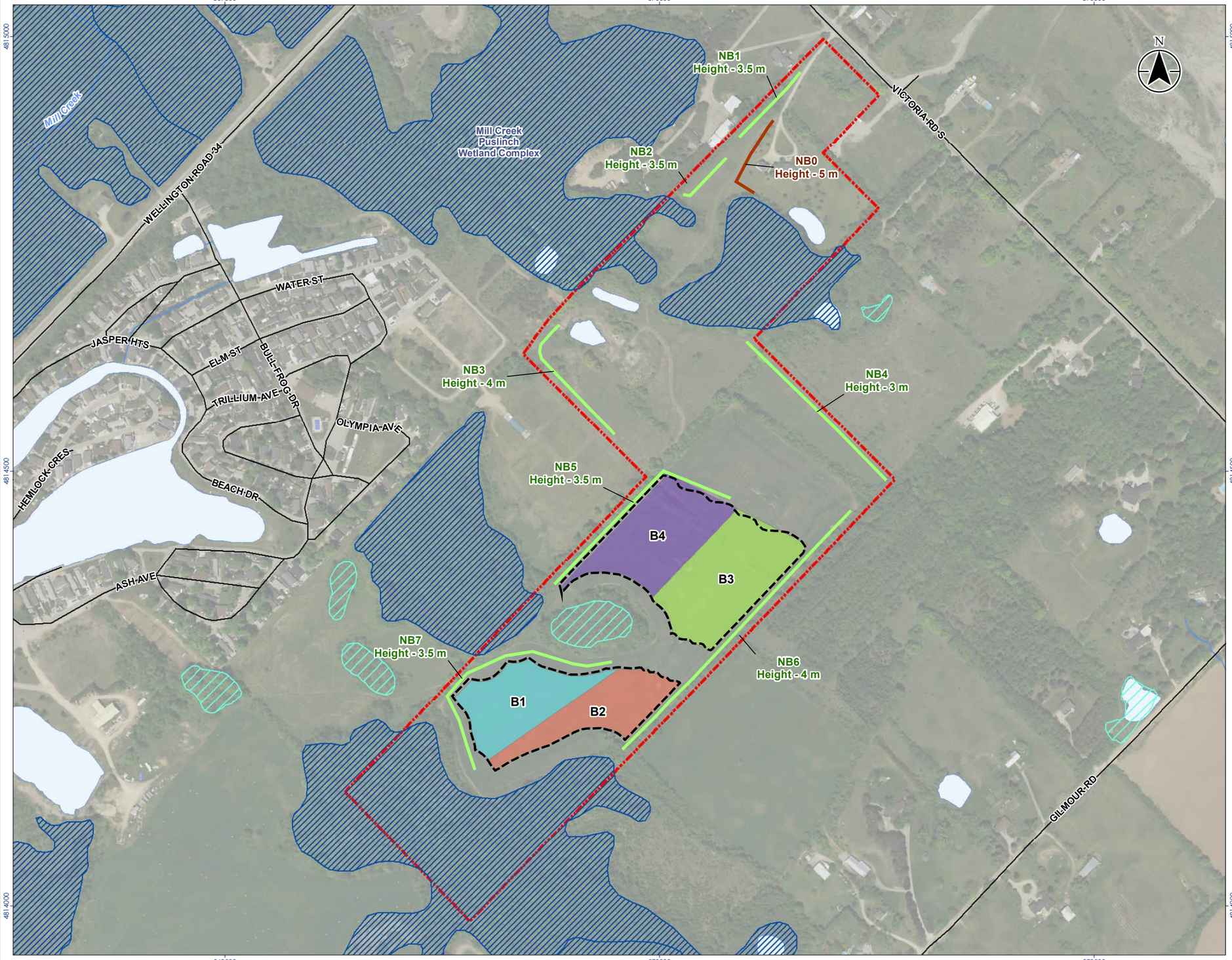

Stantec

Legend

- Property Boundary
- Modelled Noise Barrier
- Modelled Discretionary Noise Barrier
- Road
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System

Modelled Equipment Working Areas –

Below Water Extraction Phase

- B1
- B2
- B3
- B4

Extraction Footprints

- Below Water Table Extraction Footprint

0 100 200 metres

1:4,500 (At original document size of 11x17)

Notes

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Client/Project
CBM ANTHONY PIT
NOISE IMPACT ASSESSMENT REPORT
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
3

Title
Modelled Equipment Working Areas and Noise Barriers – Below Water Extraction Phase

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7.3 Noise Modelling Results

A noise assessment summary for the modelled above water extraction phase scenarios is provided in Table 7-3. The results show that the maximum predicted noise levels at the modelled PORs are within the 50 dBA noise level limit with the operating conditions and noise barriers identified in Section 7.2. Sample noise model calculations for Above Water Extraction – Scenario 1 are provided in Appendix D.

Table 7-3 Noise Assessment Summary – Above Water Extraction Phase

POR ID	Predicted Noise Levels, $L_{eq\text{-}1hr}$ (dBA)				Maximum Predicted Noise Level, $L_{eq\text{-}1hr}$ (dBA)	Noise Level Limit, $L_{eq\text{-}1hr}$ (dBA)	Maximum Predicted Noise Level Meets Noise Level Limit (Y/N)
	Scenario 1	Scenario 2	Scenario 3	Scenario 4			
R1	41	42	43	47	47	50	Y
OR1	40	40	42	46	46	50	Y
R2	48	48	47	47	48	50	Y
OR2	46	47	46	46	47	50	Y
R3	46	45	44	44	46	50	Y
OR3	49	48	48	48	49	50	Y
R4	46	46	46	46	46	50	Y
OR4	49	49	48	48	49	50	Y
R5	47	48	47	46	48	50	Y
OR5	46	47	45	45	47	50	Y
R6	47	49	46	45	49	50	Y
OR6	47	49	45	44	49	50	Y
R7	41	44	43	41	44	50	Y
OR7	40	43	41	39	43	50	Y
R8	38	41	40	39	41	50	Y
OR8	36	39	39	37	39	50	Y
R9	42	43	46	45	46	50	Y
OR9	41	41	45	43	45	50	Y
R10	37	37	39	43	43	50	Y
OR10	35	35	37	42	42	50	Y
R11	50	49	49	48	50	50	Y
OR11	48	49	47	47	49	50	Y

A noise assessment summary for the modelled below water extraction phase scenarios is provided in Table 7-4. The results show that the maximum predicted noise level at each POR meet the 50 dBA noise level limit with the operating conditions and noise barriers identified in Section 7.2. Sample noise model calculations for Below Water Extraction – Scenario 4 are provided in Appendix D.

Table 7-4 Noise Assessment Summary – Below Water Extraction Phase

POR ID	Predicted Noise Levels, $L_{eq\text{-}1hr}$ (dBA)				Maximum Predicted Noise Level, $L_{eq\text{-}1hr}$ (dBA)	Noise Level Limit, $L_{eq\text{-}1hr}$ (dBA)	Maximum Predicted Noise Level Meets Noise Level Limit (Y/N)
	Scenario 1	Scenario 2	Scenario 3	Scenario 4			
R1	50	48	46	46	50	50	Y
OR1	50	48	45	46	50	50	Y
R2	48	48	50	50	50	50	Y
OR2	47	47	49	48	49	50	Y
R3	45	45	47	45	47	50	Y
OR3	48	49	50	50	50	50	Y
R4	46	46	47	46	47	50	Y
OR4	49	49	49	49	49	50	Y
R5	47	47	48	48	48	50	Y
OR5	45	46	47	47	47	50	Y
R6	46	47	49	48	49	50	Y
OR6	45	46	48	47	48	50	Y
R7	43	42	49	45	49	50	Y
OR7	41	41	49	45	49	50	Y
R8	43	42	45	44	45	50	Y
OR8	42	41	44	44	44	50	Y
R9	49	49	46	50	50	50	Y
OR9	49	49	46	46	49	50	Y
R10	47	49	41	45	49	50	Y
OR10	48	49	40	44	49	50	Y
R11	48	49	50	50	50	50	Y
OR11	47	47	48	48	48	50	Y

8 Noise Controls

Based on the noise assessment results presented in this report, the following noise control measures are to be implemented for the Project operations to meet applicable NPC-300 noise criteria:

- Sound power levels for the Project equipment must be at or below the values identified in Table 4-1. If other equipment is used for the Project, their sound levels must be confirmed through measurements or manufacturer data to meet the levels provided in Table 4-1. Otherwise, additional noise controls may be required.
- The quantity of equipment, including truck volumes, must not exceed those modelled in this assessment. Otherwise, additional noise controls may be required.
- Noise barrier NB0 is a discretionary noise barrier for the on-site dwelling (R11/OR11), which is exempted per NPC-300. It should be implemented as shown in Figure 2 before any extraction phases begin.
- Noise barriers NB1 and NB2 are to be implemented as shown in Figure 2 before any extraction phases begin.
- Noise barrier NB3 is to be implemented as shown in Figure 2 before any extraction phases begin in working area A1 or B4.
- Noise barriers NB4, NB5, and NB6 are to be implemented as shown in Figure 3 before below water extraction occurs in working area B3 or B4
- Noise barriers NB6 and NB7 are to be implemented as shown in Figure 3 before below water extraction occurs in working area B1 or B2.
- Noise barriers NB0 through NB7 are to meet the minimum heights and extents shown in Figure 2 and Figure 3.
- Noise barriers NB0 through NB7 are to be of solid construction with no gaps and have a surface density of at least 20 kg/m^2. The noise barriers can be a single or combination of barrier system such as noise wall, earth berm, acoustical fence or shipment containers provided they meet the overall height and extents shown in Figure 2 and Figure 3.
- Noise barriers NB3, NB5, NB6, and NB7 are to be acoustically absorptive on the surface facing the extraction area. These noise barrier surfaces are to meet a minimum noise reduction coefficient (NRC) value of 0.7. Earth berms would be expected to satisfy this NRC requirement.
- Activities used to prepare the site for excavation, such as the stripping of topsoil, construction of the berm, or activities related to the remediation of the site after the extraction is completed as considered to be construction activities and are only permitted to occur during the daytime (i.e. 07:00 to 19:00) Monday to Friday except statutory holidays.

9 Conclusion

Stantec was retained by CBM to conduct a noise impact assessment for the CBM Anthony Pit.

This noise impact assessment has been conducted in accordance with applicable MECP guidelines and evaluates compliance of Project noise levels with the NPC-300 daytime noise limit of 50 dBA. The gravel pit will operate during daytime hours only, from 07:00 to 19:00 Monday through Friday and from 08:00 to 16:00 on Saturdays.

Eleven (11) representative points of reception (PORs) were identified for this assessment based on a review of local aerial imagery and zoning maps. These PORs represent the plane of window of the highest storey and outdoor locations where applicable, including a dwelling located within the Project property parcel.

This assessment modelled a predicable worst-case hour of operation, analyzing four separate scenarios for the above water and below water extraction phases. Based on the operating conditions and assumptions identified in this report, Project-related noise levels are predicted to comply with the applicable MECP noise criteria, subject to implementation of the noise control measures identified in Section 8.

10 References

BSI. 2008. "BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites-Part 1:Noise."

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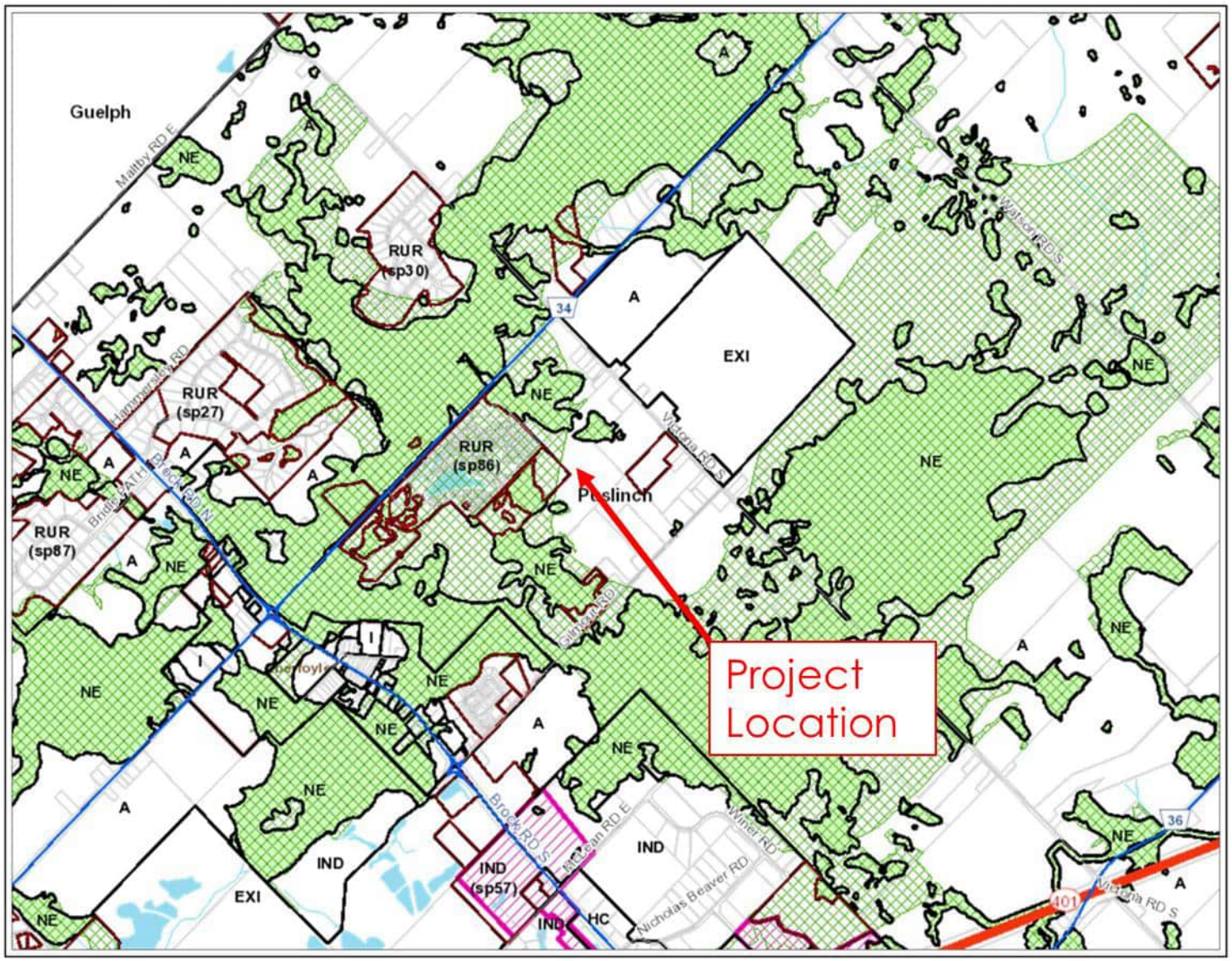
MOE. 1978. "Publication NPC-103 - Procedures."

MOE. 1978. "Publication NPC-104 - Sound Level Adjustments."

MOECC. 2013. "Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning (NPC-300)."

Appendices

Appendix A Zoning Map



Source. https://sgis.wellington.ca/Maps/index.html?viewer=WellingtonCountyExternal

Table 1 Zones and Zone Symbols – Township of Puslinch Comprehensive Zoning By-law No. 023-18

Zones	Zone Symbols
A	Agricultural
EXI	Extractive
FD2	Future Development Two Zone
HC	Highway Commercial
IND	Industrial
NE	Natural Environment Zone
OS	Open Space Zone
RUR	Rural Residential
UR	Urban Residential

Appendix B Instrumentation Calibration Certificates and Weather Data

Calibration Certificate

Certificate Number 2022000699

Customer:
Stantec Consulting

,

Model Number	CAL200	***Procedure Number***	D0001.8386
Serial Number	10294	***Technician***	Abraham Ortega
Test Results	**Pass**	***Calibration Date***	19 Jan 2022
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	19 Jan 2023
Description	Larson Davis CAL200 Acoustic Calibrator	***Temperature***	22 °C ± 0.3 °C
		Humidity	46 %RH ± 3 %RH
		Static Pressure	101.0 kPa ± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2017 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis Model 2900 Real Time Analyzer	04/01/2021	04/01/2022	001051
Agilent 34401A DMM	03/02/2021	03/02/2022	002588
Microphone Calibration System	02/24/2021	02/24/2022	005446
1/2" Preamplifier	08/26/2021	08/26/2022	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/09/2021	08/09/2022	006507
1/2 inch Microphone - RI - 200V	09/23/2021	09/23/2022	006511
Hart Scientific 2626-H Temperature Probe	02/04/2021	08/04/2022	006767
Pressure Transducer	06/28/2021	06/28/2022	007310

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Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

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Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	101.2	114.02	113.80	114.20	0.14	Pass
94	101.0	93.98	93.80	94.20	0.15	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
114	101.2	999.95	993.00	1,007.00	0.20	Pass
94	101.0	999.99	993.00	1,007.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
114	101.2	0.29	0.00	2.00	0.25 ‡	Pass
94	101.0	0.40	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 21 °C, 46 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
108.0	107.9	-0.03	-0.25	0.25	0.04 ‡	Pass
101.3	101.5	0.00	-0.25	0.25	0.04 ‡	Pass
92.0	92.0	0.04	-0.25	0.25	0.04 ‡	Pass
83.0	83.1	0.05	-0.25	0.25	0.04 ‡	Pass
74.0	73.9	0.03	-0.25	0.25	0.04 ‡	Pass
65.0	65.1	-0.06	-0.25	0.25	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 21 °C, 46 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	107.9	0.00	-7.00	7.00	0.20 ‡	Pass
101.3	101.5	0.00	-7.00	7.00	0.20 ‡	Pass
92.0	92.0	0.00	-7.00	7.00	0.20 ‡	Pass
83.0	83.1	0.00	-7.00	7.00	0.20 ‡	Pass
74.0	73.9	-0.01	-7.00	7.00	0.20 ‡	Pass
65.0	65.1	-0.02	-7.00	7.00	0.20 ‡	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 21 °C, 46 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	107.9	0.30	0.00	2.00	0.25 ‡	Pass
101.3	101.5	0.29	0.00	2.00	0.25 ‡	Pass
92.0	92.0	0.29	0.00	2.00	0.25 ‡	Pass
83.0	83.1	0.30	0.00	2.00	0.25 ‡	Pass
74.0	73.9	0.31	0.00	2.00	0.25 ‡	Pass
65.0	65.1	0.33	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Abraham Ortega*

LARSON DAVIS - A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB DIVISION

Hourly Data Report for October 24, 2022

If selected Local Standard Time (LST), add 1 hour to adjust for Daylight Saving Time where and when it is observed.

GUELPH TURFGRASS INSTITUTE
ONTARIO

Latitude:	43°32'30.741" N	**Longitude**:	80°13'19.492" W	**Elevation**:	334.50 m
Climate ID:	6143092	**WMO ID**:	73073	**TC ID**:	OGI

TIME LST	Temp °C	Dew Point °C	Rel Hum %	Precip. Amount mm	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	6.6	3.9	83	0.0	9	6		98.21			NA
01:00	6.9	4.3	84	0.0	7	5		98.21			NA
02:00	6.1	3.8	85	0.0	6	3		98.20			NA
03:00	5.4	3.5	88	0.0	31	3		98.24			NA
04:00	3.4	2.5	94	0.0		0		98.27			NA
05:00	2.8	1.8	94	0.0	8	4		98.27			NA
06:00	3.2	2.7	96	0.0	8	3		98.27			NA
07:00	2.3	1.7	96	0.0	7	3		98.27			NA
08:00	6.3	3.9	85	0.0		0		98.27			NA
09:00	11.8	7.3	74	0.0	10	5		98.26			NA
10:00	14.5	8.5	67	0.0	12	9		98.23			NA
11:00	16.5	8.5	59	0.0	16	8		98.22			NA
12:00	18.4	7.9	50	0.0	13	9		98.14			NA
13:00	19.6	6.9	43	0.0	13	12		98.04			NA
14:00	20.0	5.6	39	0.0	15	11		97.97			NA
15:00	19.9	5.8	40	0.0	15	11		97.97			NA
16:00	19.3	6.8	44	0.0	14	10		97.96			NA
17:00	17.4	7.9	54	0.0	12	7		97.95			NA
18:00	14.1	8.0	67	0.0	11	6		97.93			NA
19:00	11.8	8.4	80	0.0	10	8		97.92			NA
20:00	11.6	8.6	82	0.0	11	11		97.82			NA
21:00	11.5	8.4	81	0.0	10	11		97.82			NA
22:00	11.1	8.1	81	0.0	6	3		97.86			NA
23:00	10.5	7.4	81	0.0	5	4		97.81			NA

Legend

- E = Estimated
- M = Missing
- NA = Not Available*
- [empty] = Indicates an unobserved value

Calibration Certificate

Certificate Number 2022011045
Customer:
STANTEC CONSULTING LTD

,

Model Number	831	***Procedure Number***	D0001.8384		
Serial Number	0003334	***Technician***	Jacob Cannon		
Test Results	**Pass**	***Calibration Date***	22 Aug 2022		
Initial Condition	Inoperable	***Calibration Due***	22 Aug 2023		
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.403	***Temperature***	23.7	°C	± 0.25 °C
		Humidity	50.3	%RH	± 2.0 %RH
		Static Pressure	86.56	kPa	± 0.13 kPa

Evaluation Method ***Tested with:*** ***Data reported in dB re 20 µPa.***

Larson Davis CAL200, S/N 9079
Larson Davis PRM831, S/N 0211
Larson Davis CAL291, S/N 0108
PCB 377B02, S/N 319522

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev O, 2016-09-19

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to 1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with precedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	2021-09-10	2022-09-10	001250
Hart Scientific 2626-H Temperature Probe	2021-08-25	2023-02-25	006798
Larson Davis CAL200 Acoustic Calibrator	2022-07-21	2023-07-21	007027
Larson Davis Model 831	2022-02-21	2023-02-21	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2022-03-02	2023-03-02	007185
SRS DS360 Ultra Low Distortion Generator	2022-03-29	2023-03-29	007635
Larson Davis 1/2" Preamplifier for Model 831 Type 1	2021-09-28	2022-09-28	PCB0004783

Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
1000 Hz	114.01	113.80	114.20	0.14	Pass

Adjusted Level: 114.01
As Received Level: 114.16

-- End of measurement results--

Loaded Circuit Sensitivity

Measurement	Test Result [dB re 1 V / Pa]	Lower Limit [dB re 1 V / Pa]	Upper Limit [dB re 1 V / Pa]	Expanded Uncertainty [dB]	Result
1000 Hz	-26.66	-27.84	-24.74	0.14	Pass

-- End of measurement results--

Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.23	-0.20	-1.20	0.80	0.23	Pass
1000	0.17	0.00	-0.70	0.70	0.23	Pass
8000	-2.20	-3.00	-5.50	-1.50	0.32	Pass

-- End of measurement results--

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted, 20 dB gain	40.23

-- End of measurement results--

-- End of Report--

Signatory: Jacob Cannon

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Provo, UT 84601, United States
716-684-0001

Appendix C Sound Power Level Data

Table C.1 Sound Power Level Summary

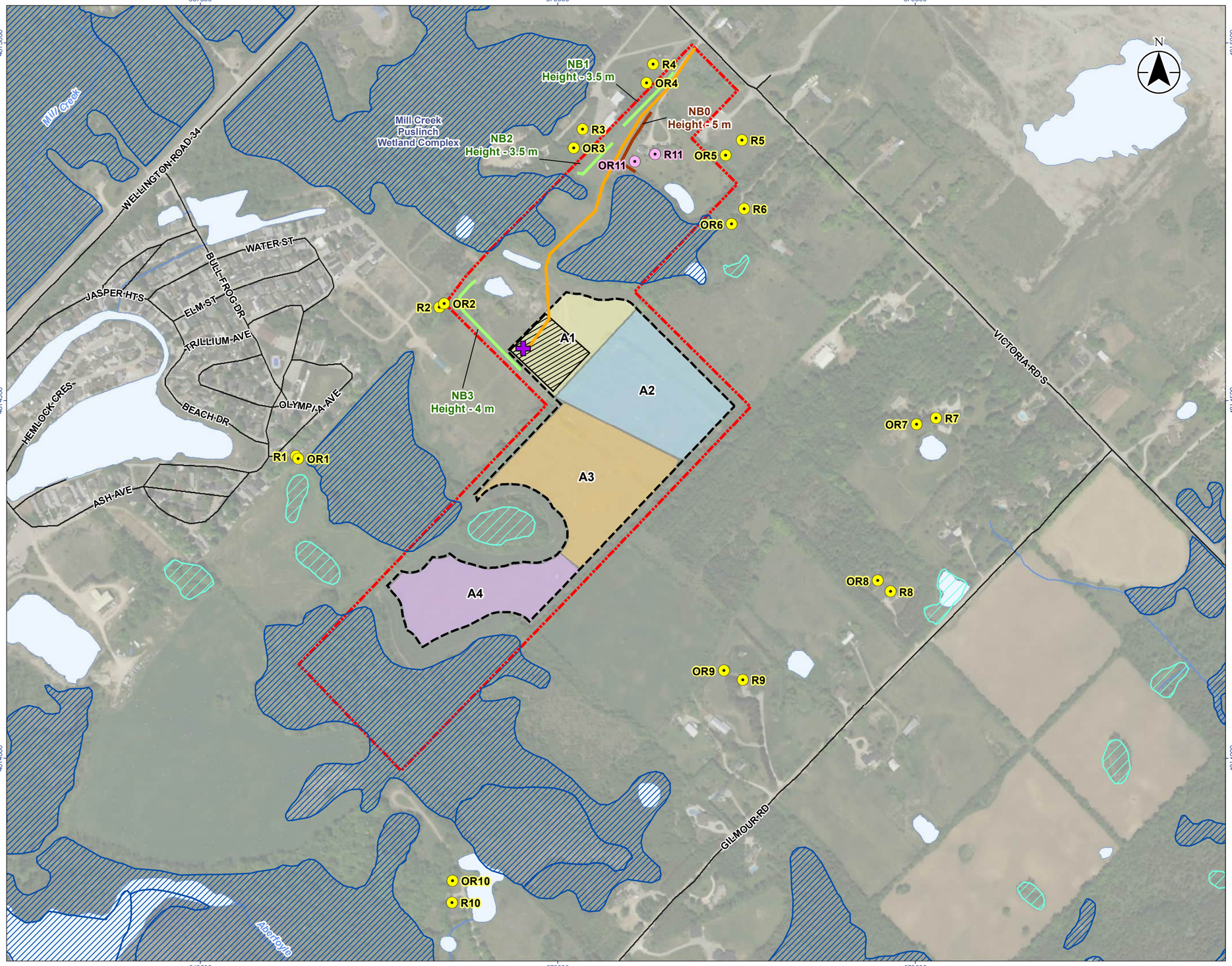
Source Name	ID	Distance [a] (m)	Partition Coefficient [b] (%)	Sound Power Level Octave Band Spectrum (dB)								Overall		Measurement Reference/Data Source
				63	125	250	500	1000	2000	4000	8000	dBA	dB	
Moving Truck	Lw1	25	50	105	107	109	103	100	96	89	79	106	113	1/1 and OA: Meas.004.s
Crane w/dragline	Lw2	50	50	117	124	109	107	108	107	100	93	114	125	1/1 and OA: Meas.010.s
Loader	Lw3	10	50	113	111	104	103	103	100	100	89	108	116	1/1 and OA: BSI 5228 2009
Truck Idling	Lw4	10	50	101	92	83	83	88	84	78	71	91	102	1/1 and OA: BSI 5228 2009

Notes:

a. Refers to the distance used to calculate the sound power level for the source

b. Refers to the partition coefficient used to calculate the sound power level for the source based on the observed/expected directivity of the source.

Appendix D Noise Model Sample Calculations



Stantec

Legend

- Property Boundary
- Points of Reception
- Discretionary Points of Reception
- Two Trucks Idling
- Loader
- Truck Route
- Modelled Noise Barrier
- Modelled Discretionary Noise Barrier
- Road
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System

Modelled Equipment Working Areas – Above Water Extraction Phase

- A1
- A2
- A3
- A4

Extraction Footprints

- Above Water Extraction Footprint

0 100 200 metres

1:5,500 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Orthoimagery ©

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2025-12-19
Technical Review by FA on 2025-12-19

Client/Project
CBM ANTHONY PIT
NOISE IMPACT ASSESSMENT REPORT
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
D.1

Title
Modelled Equipment and Noise Barriers for Scenario 1 – Above Water Extraction Phase

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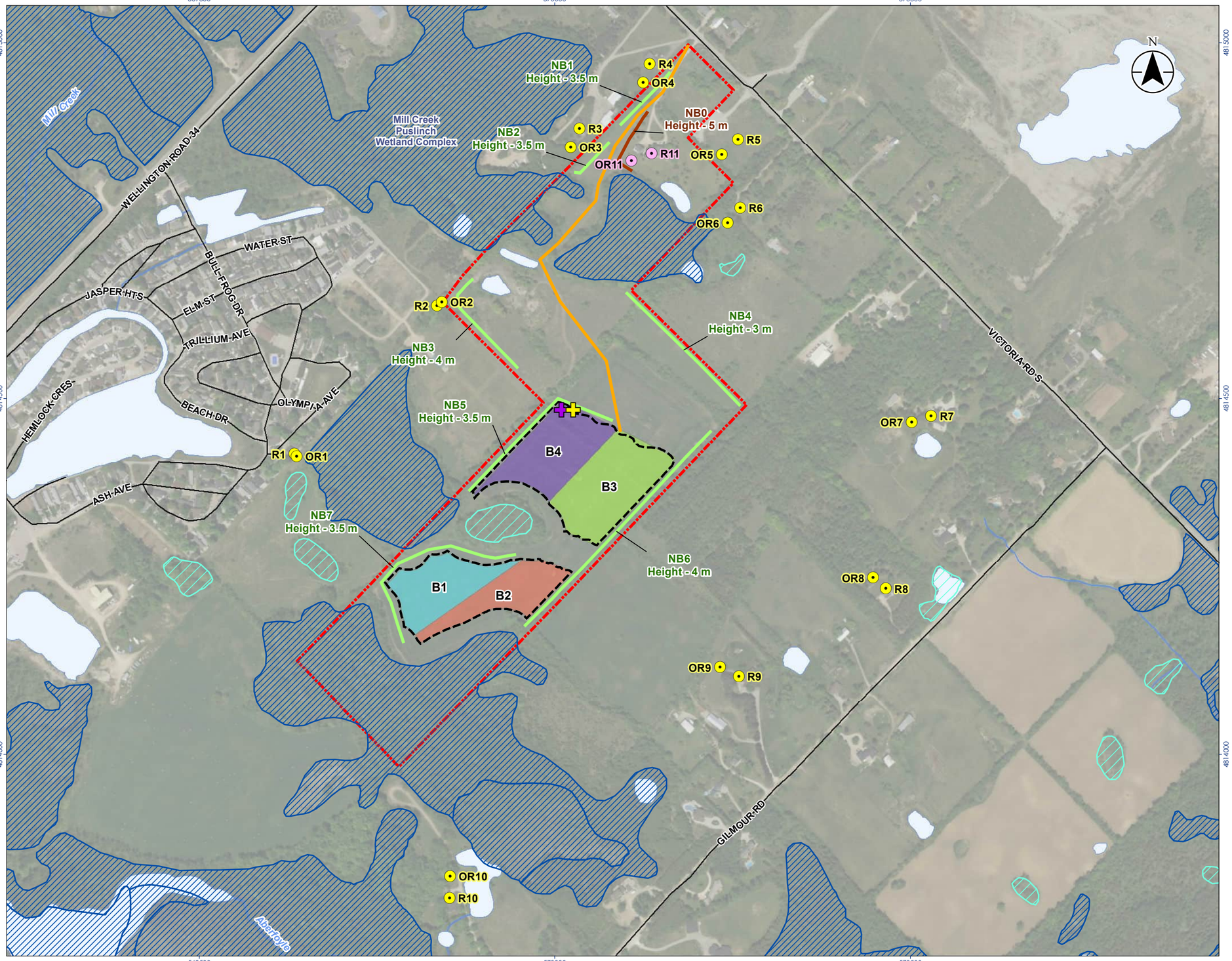
\\ca0004-sqfs01\01409\active\160961457\03_data\gis\mxds\Acoustic\Report_Figures\Noise_Impact_Assmnt_Fig01_Modelled_Equip_Scenario1_Above_Water_Table.mxd Revised: 2025-12-19 By: PMosier



Stantec

Legend

- Property Boundary
- Points of Reception
- Discretionary Points of Reception
- Two Trucks Idling
- Drag Line
- Truck Route
- Modelled Noise Barrier
- Modelled Discretionary Noise Barrier
- Road
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System

Modelled Equipment Working Areas – Below Water Extraction Phase

- B1
- B2
- B3
- B4

Extraction Footprints

- Below Water Table Extraction Footprint

0 100 200 metres

1:5,500 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Orthoimagery ©

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2025-12-19
Technical Review by FA on 2025-12-19

Client/Project
CBM ANTHONY PIT
NOISE IMPACT ASSESSMENT REPORT
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
D.2

Title
Modelled Equipment and Noise Barriers for Scenario 4 – Below Water Extraction Phase

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C:\0004-plot\01\01\60961457\03 data\gis\mxds\Acoustic\report figures\Noise_Impact Assmnt_Rpt\160961457 Noise_Impact Assmnt_Fig0.2 Modelled Equip Scenario4_Below_Water Table.mxd Revised: 2025-12-19 By: PMosier

Appendix E Curriculum Vitae

Fabian Alvarado M.Eng., P.Eng.

Noise and Acoustics Engineer

Fabian is a Noise and Acoustics Engineer within Stantec's Acoustics, Noise and Vibration in Ontario. Fabian has experience conducting noise and vibration assessments for domestic and international clients and stakeholders from a variety of market areas such as: transportation, construction, industrial and power generation. These noise and vibration assessments typically include, but are not limited to: noise and vibration field instrumentation specification and measurements; noise and vibration measurement data reduction and analysis; predictive noise and vibration modelling; assessment of potential adverse noise and vibration impacts; and reporting of assessment results including applicable mitigation recommendations.

EDUCATION

Master of Engineering, Mechanical Engineering, University of Toronto, Toronto, Ontario, Canada, 2015

Bachelor of Science with Distinction, Mechanical Engineering , University of Alberta, Edmonton, Alberta, Canada, 2014

REGISTRATIONS

Professional Engineer # 100520247, Professional Engineers Ontario

PROJECT EXPERIENCE

CONSTRUCTION NOISE AND VIBRATION ASSESSMENTS

GO Expansion and Network Wide Structures Project-McNaughton Road Grade Separation* | Metrolinx | Toronto, ON, Canada

The scope of work documents a Noise and Vibration Assessment for construction activities associated with the McNaughton Road Grade Separation. Fabian performed the noise and vibration assessments of the associated construction activities, as well as an assessment of rail operations and local road traffic directly affected. The assessments involved using standardized noise and vibration analysis methods from the U.S. Federal Transit Administration and U.S. Federal Highway Administration. Recommendations for best practices and construction mitigation measures to minimize adverse noise and vibration impacts were also developed.

CN Milton Logistics Hub - Acoustic Follow-up Program | Canadian National Railway | Milton, ON

Stantec was retained by the Canadian National Railway (CN) to implement the acoustic environment follow-up program (FUP) in reference to the construction of the Milton Logistics Hub (the Project). The FUP was developed to meet the conditions of approval stipulated in the Minister of the Environment's Decision Statement issued on January 21, 2021 (Decision Statement). As per condition 4.10 of the Decision Statement, the FUP involves monitoring noise levels during each phase of construction to assess compliance with the criteria established in the Project Noise Effects Technical Data Report. Mr. Alvarado completed the field work, technical analysis, and reporting for Phase 1 construction of the Project.

CN Halton Subdivision Expansion, Environmental Evaluation Phase 2 – Construction Noise and Vibration Assessment | Canadian National Railway Company | Ontario, Canada

CN retained Stantec Consulting Ltd. (Stantec) to complete a construction noise and vibration assessment report to support the Phase 2 environmental evaluation for the planned expansion of the Halton subdivision (the Project). The Project involves upgrades and modifications to the existing mainline within the Halton subdivision within the existing CN Right-of-Way (ROW) for approximately 23 kilometres (km) between Bramalea (Mile 11.06) and Georgetown (Mile 24.10).. Mr. Alvarado lead and completed the field investigations, noise and vibration modelling and reporting for the Project.

ENVIRONMENTAL NOISE ASSESSMENT - INDUSTRIAL FACILITIES

Acoustic Assessment Report for Valbruna ASW Inc. | Valbruna ASW Inc. | Welland, ON

Stantec Consulting Ltd. (Stantec) was retained by Valbruna ASW Inc. (Valbruna) to prepare an Acoustic Assessment Report (AAR) for their facility located at 42 Centre Street in Welland, Ontario (the Facility) in support of an Environmental Compliance Approval (ECA) renewal application. The AAR reflected planned Facility upgrades and expanded operation schedule, as well as proposed noise control measures to demonstrate compliance with Ontario Ministry of the Environment, Conservation and Parks noise criteria. Mr. Alvarado was the author of the AAR.

** denotes projects completed with other firms*

Noise Technical Data Report for Enbridge Pipelines Inc. | Enbridge Pipelines Inc. | Hamilton, ON

Preparation of a Noise Technical Data report (TDR) in support of the Environmental and Socio-economic Assessment for the Westover Facility Project (the Project) for Canada Energy Regulator (CER) approval. In accordance CER Filing requirements, the TDR provided a noise impact assessment for Project operations and construction with respect to provincial and federal noise guidelines: The Ontario Ministry of the Environment, Conservation and Parks (MECP) NPC-300 – Environmental Noise Guideline and Health Canada (HC) Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise. The TDR noise impact assessment was based on field measurements and noise emission modelling using CadnaA, a noise modelling software which implements ISO-9613 series environmental sound propagation algorithms.

Barbados Light and Power Company Clean Energy Bridge Project-Trents Facility Noise Assessment and Monitoring Program* | Barbados Light and Power | St Lucy, Barbados

Fabian prepared the noise assessment report for the BLPC Trent's Facility located in St. Lucy, Barbados. The noise assessment included a detailed noise analysis and model (Cadna/A) which reflected noise emissions from conventional diesel and solar power generation and storage. Fabian also developed and prepared the Environmental Noise and Vibration Monitoring Program to meet the conditions of the Environmental Planning Permission document. This Program provided a detailed noise and vibration monitoring protocol to be followed in terms of: instrumentation, monitoring locations, and data collection and documentation.

Noise and Vibration Technical Data Report for the proposed Co-op Renewable Diesel Complex | Federated Co-operatives Limited | Regina, Saskatchewan

Federated Co-operatives Limited (FCL) is proposing to build the Co-op Renewable Diesel Complex (CRDC, the Project) in the City of Regina, Saskatchewan. The CRDC includes a 15,000 barrel per day Renewable Diesel Refinery comprised of a feedstock Pre-Treatment unit, Hydrogen production unit, a Carbon Capture unit, rail yard, and other ancillary processes. Stantec Consulting Ltd. (Stantec) was retained by FCL to conduct a noise and vibration impact assessment of the Project in support of the Project's Technical Proposal submission to the Environmental Assessment and Stewardship Branch (EASB). Mr. Alvarado worked as the technical lead for the noise assessment of Project operations.

Noise and Vibration Technical Data Report for the proposed FCL-AGT Joint Venture Canola Crush Facility | Federated Co-operatives Limited and AGT Food and Ingredients Inc. | Regina, Saskatchewan

Federated Co-operatives Limited (FCL) and Food and Ingredients Inc. (AGT) are proposing to build a 3,500 tonnes per day Canola Crush Facility (CCF) as a joint venture (JV) in the City of Regina, Saskatchewan (the Project). The Project will output approximately 1,500 tonnes per day of super degummed canola oil, and 2,000 tonnes per day of canola meal pellets. The Project will have the potential to increase capacity to 8,000 tonnes per day. Stantec Consulting Ltd. (Stantec) was retained by the JV to conduct a noise and vibration impact assessment of the proposed CCF, inclusive of seed receiving, seed preparation, oil extraction, meal handling and pelleting, oil degumming and associated rail loop. This assessment considers the CCF operating at a capacity of 4,000 tonnes per day to allow for organic growth of the Project. Mr. Alvarado worked as technical lead for the noise assessment of Project operations.

Acoustic Assessment Report for Carmeuse Beachville Operations | Ingersoll, Ontario

Stantec Consulting Ltd. (Stantec) was retained by Carmeuse Lime (Canada) Ltd. (Carmeuse) to prepare an Acoustic Assessment Report (AAR) in support of an application for an Environmental Compliance Approval (ECA) with Limited Operation Flexibility (LOF) for its lime manufacturing facility located in Beachville, Ontario (the Facility or Beachville Operations). The Facility is located on Lots 15 to 18, Concession 2 & 3, Zorra (North Oxford), 374681 Oxford County Road #6, Ingersoll, Ontario. The AAR included proposed noise control measures for the Facility to demonstrate compliance with Ontario Ministry of the Environment, Conservation and Parks noise criteria. Mr. Alvarado was the author of the AAR.

Mohammed Salim MBA, P.Eng.

Senior Acoustical Lead Engineer - Noise & Vibration

27 years of experience · Stoney Creek, Ontario

Mohammed is an Associate and Senior Acoustical Engineer within the Environmental Services Division at Stantec. In his 27 years of experience in the field of acoustics, noise and vibration consulting, Mohammed has a very good understanding of the municipal, provincial and federal noise and vibration regulations and brings extensive experience in dealing with acoustics, noise and vibration problems in transportation projects. He has worked on many road and rail projects and grade separation projects. He has completed many acoustic studies to support building design, land use planning, Environmental Compliance Approvals for industrial projects and Environmental Assessments for many transportation projects. He is a Professional Engineer with the Ontario Society of Professional Engineers and the Professional Engineers and Geoscientist in the Province of British Columbia. Mohammed is a certified acoustical specialist with the Ontario Ministry of Transportation and the Region of Waterloo.

EDUCATION

Bachelor of Mechanical Engineering, Mahatma Gandhi University, Kottayam, Kerala, 1992

Master of Business Administration, Questrom School of Business, Boston University, Boston, Massachusetts, USA, 2022

REGISTRATIONS

Professional Engineer #100114731, Ontario Society of Professional Engineers

Professional Engineer #57361, The Association of Professional Engineers and Geoscientists

PROJECT EXPERIENCE

Mining/Quarry

Canada Nickel Company (Canada Nickel), North of Timmins, Ontario

Canada Nickel proposes to develop, operate, and progressively reclaim the Crawford Nickel Project, a new open pit nickel mine and processing facility approximately 42 km north of Timmins, Ontario along Highway 655. The project is an open pit nickel, iron and cobalt mine north of Timmins Ontario. The Project is being currently assessed in accordance with the Impact Assessment Act, 2019, and the noise and vibration assessment is part of the EIA. Stantec is currently involved in preparing the environmental noise and vibration assessment for the Project and it also includes blasting impact assessment to structures and fish habitats. Wildlife noise impacts are also being assessed. Mohammed is the quality reviewer for the Project noise and vibration assessment.

Greenstone Gold Mine, Greenstone, Ontario

Prepared a Noise and Vibration Management and Monitoring Plan (NVMMP) to satisfy regulatory/permit requirements and commitments made during EA for the open pit mining project with a capacity of about 30,000 tpd. Noise and vibration technical lead and quality reviewer for the Project Acoustic Assessment Report to support Environmental Compliance Approval. The Project components included an open pit, waste rock storage areas, overburden storage areas, ore stockpile, ore crushing and mill feed ore storage activities, process plant, water management facilities, tailings management facility, power plant, liquefied natural gas plant, and explosives facility.

Marathon Palladium Mining Project, Town of Marathon, Ontario

The Project, a platinum group metals (PGM), copper (Cu) and possibly iron (Fe) open pit mine with the processing operations was being assessed in accordance with the Canadian Environmental Assessment Act (CEA Act, 2012) and Ontario's Environmental Assessment Act (EA Act) through a Joint Review Panel. Acted as a quality reviewer for the Project updated noise and vibration assessment report as part of the Environmental Impact Statement (EIS Addendum) to support the Joint Review Panel process. Completed quality review of the acoustic assessment for the Project acoustic assessment to support the Environmental Compliance Approval. Steady noise associated with the mining activities was conducted using Cadna/A noise modelling software, and the Project haul route noise impact was assessed using US FWHA Traffic Noise Model (v 2.5).

Rockridge Aggregate Pit Blasting Noise and Vibration Report Peer Review, Peterborough, Ontario

A third-party peer review on the Project blasting noise and vibration was completed on behalf of the County of Peterborough for their approval of the proposed aggregate pit. The review looked at the receptors, assessment methodology, criteria, assessment and recommendations. The review included discussion of requirements of Ministry of the Environment, Conservation and Parks applicable to the Project.

Goldcorp Borden Gold Project*, Chapleau, Ontario

The Borden Gold Project is an underground gold mine with a capacity of 4,000 tpd ore capacity. Noise emission from the Project site have the potential to disturb residential and campers in the area. Provincial regulatory criteria will be met at surrounding noise sensitive receptors. Assessed data collected during project exploration as part of auditing. Modelled stationary steady noise associated with the underground mine using Cadna/A noise modelling software, and prepared acoustic assessment reports for EA and complete a separate acoustic assessment to support an ECA for an offsite coreshack.

Cote Gold Mine Project*, Chester and Neville Townships, Ontario

Worked as a technical reviewer for the Noise and Vibration Technical Study for the Cote Gold Mine project. Completed QA/QC of the operation and construction noise models and reviewed noise impact assessment report for EA. Modelled ground-borne vibration and overpressure (concussion) levels from open pit blasting operations at the closest receptor locations for EA. The assessment included impact from tailings and open pit operations at the closest receptors.

Pampa de Pongo Mine*, Peru

Completed a detailed peer review of the noise and vibration impact assessment. Included detailed review of compliance criteria, baseline and operational impact methodologies for both noise and vibration.

Rainy River Project*, Chapple, Ontario

Rainy River Project a gold mine project with 25,000 TPD ore capacity. Worked as the technical lead for preparing noise and vibration assessment from project blasting operations as well as noise impact from Project construction and operation in support of the EA and ECA for the Rainy River Project. Blasting noise and vibration assessment was completed in accordance with the MECP NPC-117. Modelled stationary noise from open pit and underground mine using Cadna/A noise modelling software. Assessed data collected during project exploration and provided technical support to MNRF and New Gold. Conducted yearly noise monitoring at Whip-poor-will Habitat Receptors as required by the MNRF Endangered Species Act (ESA) Permit for the Rainy River mining project. Sound level monitoring of the Whip-poor-will habitat receptor area near the site were conducted every year during the first week of May and June. The purpose of the noise monitoring was to confirm that the construction sound levels are at or below the criteria limit of 50 dBA, as provided in the permit.

** denotes projects completed with other firms*

Black Fox Gold Mine*, Matheson, Ontario
Modelled stationary steady noise emanating from the open pit and underground mining operations using Cadna/A software and provided acoustical assessment report to support ECA application. Updated the site-wide noise model and assessment report for the exploration activities at the site as part of the mine expansion.

Transportation Projects

Oshawa-Bowmanville GO Rail Corridor Extension| Metrolinx, Bowmanville, Ontario
Stantec was awarded the contract to provide technical advisory, design, and construction support services for Metrolinx's Bowmanville Rail Expansion project. This commuter rail expansion project will provide infrastructure improvements to accommodate a 20 km extension of Metrolinx's GO Transit service along their Lakeshore East rail corridor, from Oshawa to Bowmanville. The assessment includes, baseline noise and vibration assessment, rail noise and vibration impact assessment, station noise impact assessment, construction noise and vibration impact assessment, and identifying area for noise and vibration mitigation and monitoring. Mohammed worked as the Technical Lead and Quality Reviewer for Project Noise and Vibration impact assessment.

Stouffville Corridor Grade Separation, Toronto and Markham ON
Metrolinx has undertaken an expansion of the GO Transit system to transform GO Rail into a comprehensive regional rapid transit network to provide faster and more frequent two-way all-day service to core parts of the rail network. As part of the infrastructure modifications, Stouffville corridor grade separation is to support the introduction of additional trains on the Stouffville Rail Corridor, including reducing the number of at-grade rail crossings which will enhance on-time performance and operational flexibility/reliability. The Project included grade separation of seven road-rail crossings along the Stouffville Rail Corridor: Denison Street and Kennedy Road in the City of Markham and Passmore Avenue, McNicoll Avenue, Huntingwood Drive, Havendale Road and Progress Avenue in the City of Toronto. Mohammed acted as the Lead Noise and Vibration Engineer and completed quality assurance for the project. A baseline noise and vibration study and construction noise and vibration impact assessment were completed as part of the Project. The assessment included noise and vibration impacts from detours, construction noise impacts from construction activities, and vibration impacts from construction equipment. Mohammed worked as the Technical Lead and Quality Reviewer for Project Noise and Vibration.

Scarborough Junction Rail/Rail Grade Separation, Toronto, ON
Scarborough Junction grade separation project was completed under Metrolinx's expansion of the GO Transit rail service as defined by the Regional Express Rail (RER) plan. RER proposed increased train frequency on all lines including the Lakeshore East and Stouffville Lines. The Stouffville Line, which operates on the Uxbridge Subdivision, and the Lakeshore East Line, which operates on the Kingston Subdivision merge at Scarborough Junction near the intersection of St. Clair Avenue and Midland Avenue. Stantec was retained by Metrolinx to look at the feasibility of rail-to-rail grade separation solutions at the Scarborough Junction and move forward with the Detailed Design, Environmental Assessment and Technical Advisory Services following selection of the preferred alternative. Stantec successfully completed the TPAP for this project in February 2021. The assessment included noise and vibration impacts from detours, construction noise impacts from construction activities, and vibration impacts from construction equipment. The potential construction noise and vibration impacts were evaluated by establishing zones of influence. Recommendations for construction operational changes, mitigation and monitoring were provided in the report. Mohammed worked as the Lead Engineer for Project Noise and Vibration assessment.

West Side Collector Road Class Environmental Assessment, Town of Kingsville, Essex Region, Ontario

** denotes projects completed with other firms*

Stantec Consulting Ltd. (Stantec) was retained by the Town of Kingsville (the Town) to conduct a noise impact assessment in support of a Municipal Class Environmental Assessment for the for the construction of West Side Collector Road, an extension of Heritage Road to Road 2 West in the Town of Kingsville, Essex Region in Ontario. The existing Heritage ends at the south of Main Street West. The purpose of the noise impact assessment was to evaluate the Project's noise impact on surrounding noise sensitive areas in accordance with applicable regional and provincial noise guidance documents for road projects. The most current version of the United States Federal Highway Administration (FHWA) Traffic Noise Model (TNM v3.1), as recommended by the province, was used for the noise impact assessment. Mohammed worked as technical lead for the Project noise impact assessment.

Bass Pro Mills Drive Extension Class Environmental Assessment, City of Vaughan, Ontario

Stantec was retained by the City of Vaughan to conduct a noise impact assessment in support of a MCEA for the Bass Pro Mills Drive Extension located in the City of Vaughan, Ontario. The Project involves extending the existing Bass Pro Mills Drive from Highway 400 to Weston Road making it an internal road to service the area. The existing Bass Pro Mills Drive ends at the west of Highway 400, in the City of Vaughan. The Vaughan Mills Center Secondary Plan recommended the extension of Bass Pro Mills Drive westerly to Weston Road. The purpose of the noise impact assessment was to evaluate the Project's noise impact on surrounding noise sensitive areas in accordance with applicable regional and provincial noise guidance documents for road projects. Mohammed provided technical direction and acted as Quality Reviewer for noise.

Weston Road Detailed Design, York Region, City of Vaughan, Ontario

Stantec completed a noise impact assessment for the Weston Road Widening project for the Regional Municipality of York as part of the Detail Design. Weston Road would be a 6-lane roadway after completion of the Project. The assessment also validated the noise study completed as part of Individual Environmental Assessment for Western Vaughan in 2011. Mohammed provided technical direction and acted as Quality Reviewer for noise assessment.

Lincolnville GO Station, Whitchurch-Stouffville, Ontario

Through ongoing planning for the Lincolnville Layover and GO Station Improvements and continued detailed design work, it was determined that a new GO station was required to accommodate projected passenger growth and allow for full build-out of the layover improvements and relocation of Lincolnville GO station. The development of a relocated GO station on a new 5.5 hectares site was proposed. A noise and vibration impact assessment report was completed to support the EA and the Project design. The assessment was completed as per the Ministry of the Environment, Conservation and Parks (MECP)/GO Transit Draft Protocol for Noise and Vibration Assessment, and MECP guideline NPC-300 "Environmental Noise Guideline. An acoustic assessment report was completed for the new Lincolnville station, as part of the Environmental Compliance Approval (ECA) process, and noise barrier was recommended as noise mitigation for bus idling at the station.

Highway 401 Commercial Vehicle Inspection Station Relocation, Milton & Halton Hills, Ontario

A noise impact assessment report to support the preliminary design and Class EA for the Project on behalf of the Ministry of Transportation (MTO) was completed. The assessment was completed as per the Ministry of Environment, Conservation and Parks (MECP) and MTO noise guidelines. Both operation and construction noise were assessed.

** denotes projects completed with other firms*

Frank Babic P.Eng. INCE

Technical Lead Noise, Vibration and Acoustics - Environmental Services

27 years of experience · Mississauga, Ontario

Frank has over 27 years of engineering consulting experience in the areas of acoustics, noise and vibration engineering from notable consulting firms in our industry, and currently leads the Technical team for Stantec. His areas of technical expertise include engineering consulting in Environmental Noise, Transportation Noise, Building Acoustics, Vibration and Monitoring (Noise and Vibration). He has a breadth of project experience in key markets including Buildings, Construction, Environmental Services, Land Development, Oil & Gas, Transportation and Water/Wastewater. He is also fully experienced in the environmental assessment, construction administration and compliance requirements for these projects for both noise and vibration. Frank has led the growth of acoustics teams while being a key technical resource and support for multi-disciplinary, multi-million-dollar projects in Canada and the US.

EDUCATION

Bachelor of Applied Science, Civil Engineer; Option in Management Science, University of Waterloo, ON, Canada, 1996

REGISTRATIONS

Professional Engineer #90475229, Professional Engineers Ontario, 2001-present

Registered Member, Institute of Noise Control Engineering of the USA

MEMBERSHIPS

Member, Institute of Noise Control Engineering of the USA

Member, Canadian Acoustical Association

AWARDS

2012 SMART (Technology) Award for Remote Monitoring of Noise and Vibration on the Southeast Collector Project

PROJECT EXPERIENCE

GGM Environmental Assessment, Monitoring and Management Plan | Greenstone, Ontario | 2018 | Technical Lead for Noise & Vibration Management

Stantec completed the environmental noise and vibration assessment for the Greenstone Gold Mines Hardrock Project. This involved noise and vibration analysis and mitigation for operations and construction. Mr. Babic was technical lead for the Noise and Vibration Management and Monitoring Plan that was also prepared for the project.

Joint Panel Review: Marathon Palladium Project | Generation PGM Inc. | Marathon, Ontario, Canada | 2020-present | Technical Lead, Acoustics, Noise and Vibration

Providing technical advice for the environmental assessment for the Joint Review Panel (JRP) Federal-Provincial Environmental Assessment (EA) for the proposed Marathon Palladium Project, an open pit platinum group metal and copper mine located north of Marathon Ontario.

Canadian Nickel Mine | Canada Nickel Company | Timmins, ON | CAD 100k | Noise & Vibration Technical Lead

Frank is involved as the noise and vibration technical lead for the Canadian Nickel Mine. The project is an open pit nickel, iron and cobalt mine north of Timmins Ontario. Stantec is involved in preparing the environmental noise and vibration assessment for the construction, operation and decommissioning of the mine. This includes assessment of construction and operational noise and vibration impacts to federal (Health Canada) noise guidelines. This also includes blasting impact assessment to structures and fish habitats. Wildlife noise impacts are also provided. Frank is involved in the independent technical review of the noise and vibration work associated with the project.

IAMGOLD Cote Gold Mine Environmental Assessment* | 2013-2015 | Senior Lead

Senior lead in the preparation of the Noise and Vibration Technical Study for the Cote Gold Mine project. Included an assessment of construction and operational noise to Ministry of Environment noise guidelines NPC-300 and blasting noise and vibration to NPC-117. Assessment included impact from tailings and open pit operations.

** denotes projects completed with other firms*

Deloro Mine Phase 3 Cleanup Monitoring* | 2013-2016 | Senior Lead

Senior lead in preparing the Construction Noise Monitoring and Control Plan for the Deloro Phase 3 Cleanup project. Senior lead overseeing the installation and on-going noise monitoring of construction noise at the site. Technical challenges included low-temperature installation, power considerations and extreme winter considerations for real-time monitoring. Senior lead overseeing preparation of blast noise and vibration monitoring.

PUBLICATIONS & WHITEPAPERS

F. Babic; Transmission Loss of Ultra Lightweight Concrete Block. *Canadian Acoustics Journal*, 2006.

F. Babic; An Approach to Noise Impact Assessment for Long-Term Construction. *The Journal of the Acoustical Society of America, vol. 127, issue 3, p. 1829*, 2010.

F. Babic, AC Transmission Line Corona Noise. *AWMA Ontario Section Air Quality and Environment Acoustic Modeling Conference*, 2013.

F. Babic et. al.; “NFPA 130 Standard for Fixed Guideway Transit and Passenger Rail Systems & NFPA 502 Standard for Road Tunnels, Bridges, and Other Limited Access Highways”, Technical Contributor. *National Fire Protection Association*, 2014.

F. Babic, M. Salim. A. Rodrigues; Rooftop Noise Impact Investigation to the Community. *Canadian Acoustical Association, Acoustics Week in Canada 2014*, 2014.

F. Babic, Rumble Strip Noise. *CAA Conference 2015*, 2015.

F. Babic, Discussion on Noise And Its Impact on Birds. *CAA Conference 2017*, 2018.

PRESENTATIONS

https://prezi.com/-rx7swftdtvb/rumble-strip-design-characteristics-on-wayside-noise/. *Canadian Acoustics Conference*, 2016.

Transmission Line Corona Noise Presentation. *AWMA Ontario Section Air Quality and Environmental Acoustic Modelling Conference*, 2014.

** denotes projects completed with other firms*

Best Management Plan for Fugitive Dust: Anthony Pit Project

Final Report

January 22, 2026

Prepared for:
CBM Aggregates
55 Industrial Street
Toronto, ON M4G 3W9

Prepared by:
Stantec Consulting Ltd.

Project Number:
160961457

Stantec

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
A	Draft Report	Stantec	Dec 20, 2024	KI	Dec 20, 2024	GC	Dec 20, 2024
B	Final Report Version 1.0	Stantec	Feb 3, 2025	KI	Feb 3, 2025	GC	Feb 3, 2025
C	Final Report Version 2.0	Stantec	Jan 16, 2026	KI	Jan 20, 2026	GC	Jan 22, 2026

Limitations and Sign-off

The conclusions in the Report titled Best Management Plan for Fugitive Dust: Anthony Pit Project are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from CBM Aggregates (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

Prepared by: _____
Signature

Emily Wu, B.A.Sc.
Air Quality Scientist
Printed Name and Title

Reviewed by: _____
Signature

Kimberly Ireland, P.Eng.
Senior Environmental Engineer,
Environmental Services
Printed Name and Title

Approved by: _____
Signature

Gregory Crooks, M.Eng., P.Eng.
Principal, Environmental Services
Printed Name and Title

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Appendix A Operational Plan
Appendix B Fugitive Dust Control Log Sheet Template
Appendix C Curriculum Vitae

1 Introduction

This Best Management Plan for Fugitive Dust (BMP) was prepared by Stantec Consulting Ltd. (Stantec) on behalf of CBM Aggregates (CBM), a division of St. Mary Cement Inc. (Canada). for the proposed Anthony Pit Site (Anthony Pit), or "the Site". The Anthony Pit will include extraction operations of sand and gravel materials from above and below the groundwater table.

This BMP was prepared in general accordance with the Ontario Ministry of the Environment, Conservation and Parks (MECP) requirements as specified in the Technical Bulletin titled, "*Management Approaches for Industrial Fugitive Dust Sources",* dated February 2017 (MECP, 2017) which at a minimum are:

- Identification of the sources of fugitive dust emissions
- Description of how fugitive dust will be controlled from each identified source
- Schedule by which the plan will be implemented
- Description of how the plan will be implemented, including training of facility personnel
- Description of inspection and maintenance procedures
- Description of record keeping and reporting compliance with the plan

2 Description of Site and Operations

The Site is approximately 18 hectares in size and located at 4454 Victoria Road South, Puslinch, Ontario. The legal description of the Site is Part Lot 22, Concession 8, Geographic Township of Puslinch, Wellington County. The total area to be extracted and rehabilitated is 8.7 hectares. The site entrance will be located at the northeastern corner of the Site via Victoria Road South. There is a residential area located to the west of the extraction area. Additionally, there are several rural residences located near the proposed site entrance.

Internal haul roads will be established to facilitate the movement of aggregate material around the Site. Extracted aggregate material will be transported offsite with haul trucks to CBM's Aberfoyle North Pit and other nearby CBM operations for subsequent processing. An area map showing the Site location, and the proposed extraction footprint is provided in Appendix A.

The equipment and general operations are anticipated to be the following:

- Up to twelve (12) tri-axle haul trucks running 12 hours/ day
  - 40 tonnes loads per truck
  - Loading time up to 4 minutes
  - Up to two (2) haul trucks on site at any one time for loading
- One (1) 980 loader for above water extraction of aggregate
- One (1) dragline or excavator and one (1) loader for below water extraction of aggregate

3 Source Identification

The primary sources of fugitive dust emissions are anticipated to be the following based on the proposed operations at the Anthony Pit:

- Aggregate extraction and material handling
- Movement of vehicles on-site
- Vehicle track-out onto Victoria Road South

The aggregate will be loaded into haul trucks and transported off-site with limited temporary stockpiling of below water material on-site and no processing of the aggregate on-site; therefore, these are not anticipated to be emission sources and have not been included in this BMP. If site operations change in the future, this BMP should be reviewed and updated as appropriate to include new dust emission sources.

4 Fugitive Dust Control Measures for Each Source

The following sections describe the fugitive dust control measures for material handling and on-site movement of vehicles.

4.1 Material Handling

Extraction of aggregate will be conducted using a loader for above water table extraction and a dragline or excavator and a loader for below water table extraction. The loader will transfer the aggregate to the tri-axle haul trucks. It is anticipated that there will be a total of twelve (12) haul trucks with two (2) anticipated to be on-site at any time to be loaded. To minimize fugitive dust from loading the haul trucks, the drop distance between the loader bucket and the bed of the haul truck or the top of the load should be minimized to the extent feasible (ideally less than 1.5 m).

It is proposed that noise barriers including soil berms and noise barrier walls will be constructed along portions of the boundary of area to be licensed for excavation including the above water and below water areas. The location of the proposed noise barriers are shown in the Operational Plan provided in Appendix A. The intent of the noise barriers is to reduce sound levels at residential receptors and the barriers may also provide a partial windbreak under certain meteorological conditions which may reduce the suspension of dust from excavation and loading operations.

4.2 On-Site Access and Haul Road

The haul trucks and other support vehicles will travel within the Site via the access and haul road. Assuming a haul truck can be loaded within 4 minutes (or 0.067 hour), and the twelve haul trucks will be operating for a maximum of 12 hours per day, the anticipated maximum number of loads per day is approximately 180 (12 hr/day divided by 0.067 hr/load). Fugitive dust maybe generated from the haul trucks driving on-site. The following fugitive dust control measures will be implemented:

- A maximum speed limit of 25 km/h will be enforced on all on-site unpaved roads. The speed limit will be posted and communicated as a part of any site-specific orientation.
- Any observed vehicle track-out onto Victoria Road South should be removed as soon as possible.
- On days without significant precipitation (> 1 mm rainfall), wet the entrance road and haul road on a pre-determined schedule or as required by visual observations or complaints.
- Watering may be supplemented with the use of MECP approved chemical dust suppressants if required. Dust suppressants should be applied in accordance with manufacturer/supplier specifications/guidance.
- Surface the roads with a material that has a low silt content.
- Remove spills/deposits on the roads as soon as possible.

- Noise barriers will be installed to reduce the sound levels at residences. The noise barriers may also provide a partial windbreak under certain meteorological conditions that may reduce the suspension of dust from on-site vehicular traffic. Berms should be seeded as soon as practical to limit dust generation from construction.
- Ensure haul trucks are not overloaded and are covered with a secure tarp for above water line aggregate extraction and water is not leaking from the truck box when leaving the site for below ground water level extraction.

5 Implementation Schedule

CBM shall implement the relevant fugitive dust control measures outlined in this BMP upon the start of aggregate extraction.

6 Implementation and Training

A current version of the BMP will be maintained at the appropriate site office. CBM's Environment Manager, Health & Safety Specialist (H&S Specialist) or appropriate delegate will be responsible for the implementation of the BMP and ensuring on-site personnel and haul truck drivers are adequately trained. Formal training will be conducted for all relevant new staff and refresher training will be conducted if the BMP is updated and on a periodic basis.

The appropriate delegate will maintain overall responsibility for ensuring that the requirements of the BMP are followed. The delegate may assign responsibilities to the appropriate CBM staff (Site Manager or site operators) as required. The delegate will conduct an annual review of the BMP and update the requirements on an as needed basis.

7 Inspection and Maintenance Procedures

The following inspection and maintenance procedures will be conducted at the site:

- Regular (minimum daily) visual inspection of the access and haul road.
- Regular inspection of Victoria Road South at the entrance to the Site.

8 Monitoring, Record Keeping and Reporting

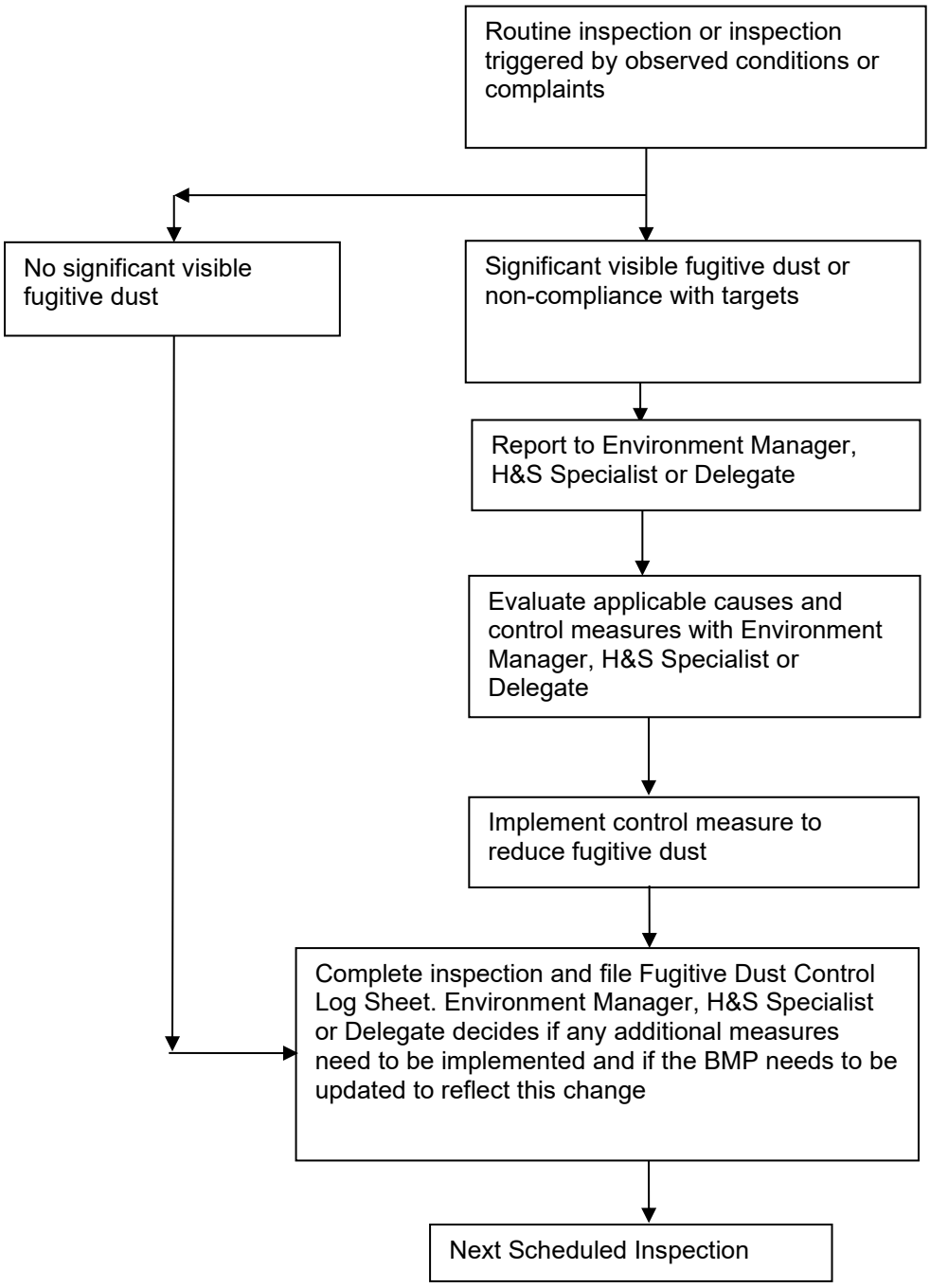
8.1 Monitoring

Formal daily inspections of the access and haul roads, the Site entrance and the active excavation area will be conducted by the Site Supervisor or Area Manager. Inspection findings are to be documented in a Fugitive Dust Control Log Sheet (template provided in Appendix B). The established targets related to fugitive dust are:

- No significant visible fugitive dust from the identified fugitive dust sources during worst-case conditions. For the purpose of this BMP, “significant visible fugitive dust” is visible dust that is observed to move, or is likely to move, off property.
- No public complaints related to fugitive dust.
- No complaints from CBM personnel related to fugitive dust.

If significant visible fugitive dust is observed during an inspection or complaints (from public and/or CBM personnel) are received related to fugitive dust, corrective action will be implemented as outlined in Figure 8-1.

Figure 8-1 Inspection and Complaint Corrective Action



8.2 Recording Keeping and Reporting

The following records will be maintained and kept at the site office:

- A current version of this BMP
- Daily visual inspection record
- Water/dust suppressant application record
- Record of cleaning up any significant spills on the access / haul roads or near the Site entrance
- Fugitive dust control logsheet
- Complaint record (including date/time, description of complaint, weather conditions at the time of the complaint, site operations, corrective actions taken and the notifications)
- Personnel training records

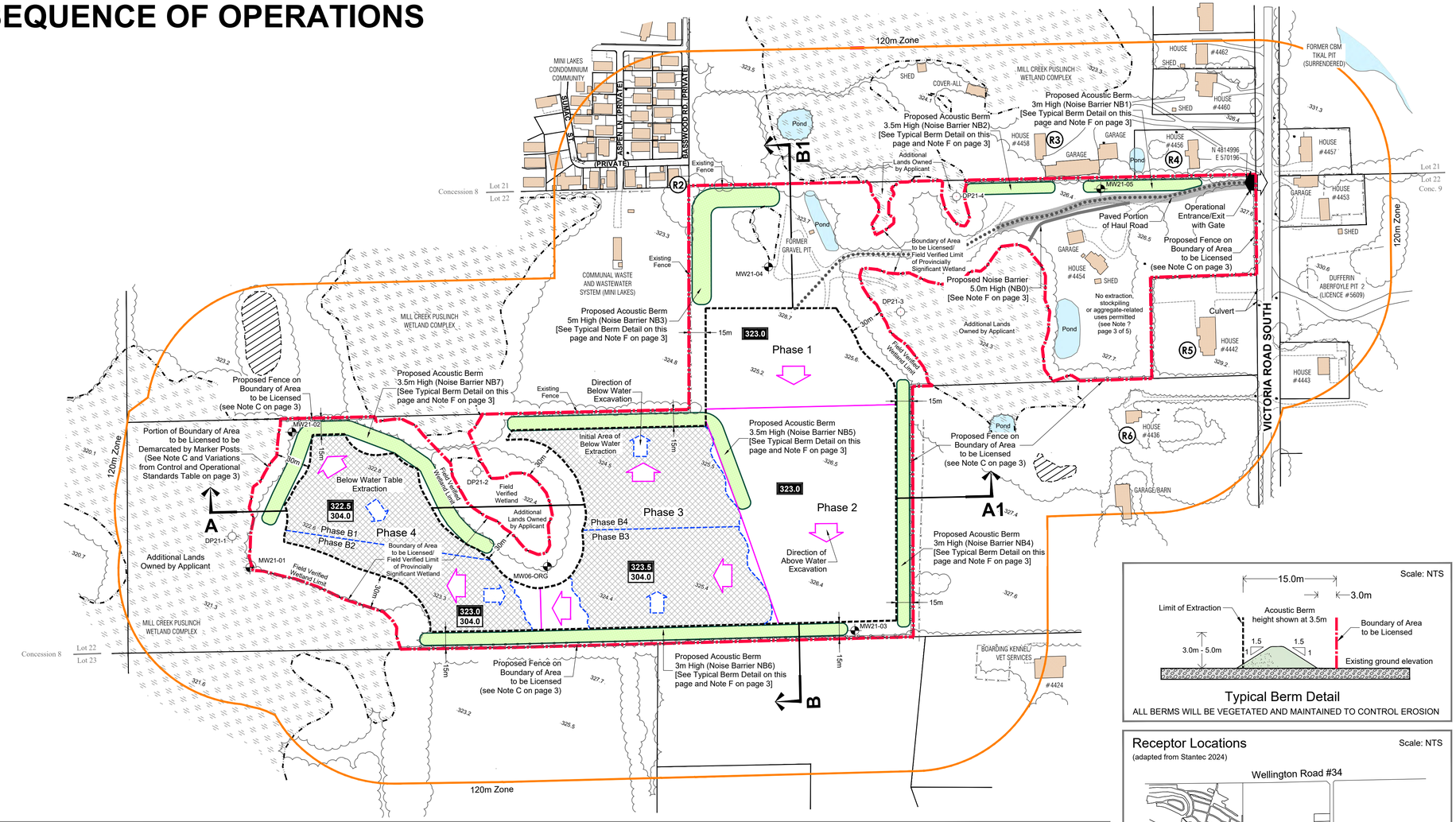
9 References

Ontario Ministry of the Environment, Conservation and Parks (MECP), Management Approaches for Industrial Fugitive Dust Sources, February 2017.

Appendices

Appendix A Operational Plan

SEQUENCE OF OPERATIONS



Phase Notes:

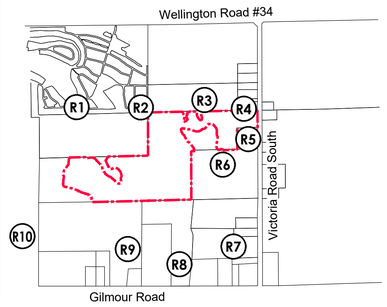
Typical Berm Detail

ALL BERMS WILL BE VEGETATED AND MAINTAINED TO CONTROL EROSION

Receptor Locations

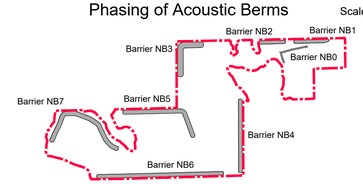
Scale: NTS

(adapted from Stantec 2024)



Phasing of Acoustic Berms

Scale: NTS



Barriers NB0, NB1 and NB2 - Prior to commencement of extraction phases.
Barrier NB3 - Prior to commencement of extraction phases 1/B1.
Barriers NB4, NB5 and NB6 - Prior to commencement of extraction phases B1/B2.
Barriers NB6 and NB7 - Prior to commencement of extraction phases B3/B4.

Source: "CBM Anthony Pit - Noise Impact Report" October 2025
(Source: Stantec Consulting Ltd.)

Legal Description

PART OF LOT 22
CONCESSION 8
(Geographic Township of Puslinch)
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON

Legend

- Boundary of Area to be Licensed
- Additional Lands Owned by Applicant
- Existing Spot Height Elevation — METRES ABOVE SEA LEVEL
- Existing Fence — POST & WIRE FENCE UNLESS OTHERWISE NOTED
- Building/Structure — LOCATION AND USE FOR BUILDINGS ON-SITE AND WITHIN 120m ARE SHOWN ON THIS PAGE
- Existing Vegetation
- Drainage Feature — AS INDICATED
- Provincially Significant Wetland — STANTEC 2024/ ONTARIO GEOHUB
- Wetland — STANTEC 2024
- Unevaluated Wetland — ONTARIO GEOHUB
- Groundwater Monitor Drive-point Piezometer — STANTEC 2024
- Cross Sections — SEE PAGE 5 OF 5 FOR EXISTING AND REHABILITATED CROSS SECTIONS
- Limit of Excavation — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Operational Entrance/Exit — MAINTAINED BY A GATE WHICH WILL BE CLOSED WHEN PIT IS NOT IN OPERATION
- Direction of Above Water Excavation — SEE NOTES ON THIS PAGE/PAGE 3 OF 5
- Direction of Below Water Excavation — SEE NOTES ON THIS PAGE/PAGE 3 OF 5
- Area of Below Water Excavation
- Elevation — ABOVE WATER DEPTH OF EXTRACTION / MAXIMUM DEPTH OF BELOW WATER EXTRACTION/PIT FLOOR
- Internal Haul Road — INITIAL TYPICAL LOCATION. LOCATION TO VARY AS OPERATIONS PROGRESS
- Proposed Fence — 1.2m HIGH POST & WIRE FENCE UNLESS OTHERWISE NOTED
- Acoustic Berm — SEE "TYPICAL BERM DETAIL" ON THIS PAGE AND NOTES ON PAGE 3 OF 5
- Receptor Locations

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR, KITCHENER, ON, N2B 3X9 | P: 519.576.3650 | WWW.MHBCPLAN.COM

MNR Approval Stamp

Stamp

DRAFT

north

Applicant

VOTORANTIM cimentos cbm
55 Industrial St. 4th Floor Toronto, Ontario M4G 3W9
Telephone: (416) 696-4411

Applicant's Signature

DRAFT

Andreanne Simard
Director of Lands, Resources and Environment
Votorantim Cimentos North America (VCNA)

Project

Anthony Pit

MNR Licence Reference No.

Pre-approval review:

For Client Review - November 2025

Plan Scale **1:2,000 (Arch D)**

SCALE
0 25 50 100
METRES

Plot Scale 1:2 [1mm = 2 units] MODEL

Drawn By D.G.S.

Checked By N.D.

File No.

File Name

OPERATIONAL PLAN

Drawing No.

2 OF 5

K:\Y321AU-CBM-Anthony Pit\A\CBM Anthony Pit Operplan2of5 November2025.dwg

Appendix B Fugitive Dust Control Log Sheet Template

Fugitive Dust Control Logsheet

CBM Anthony Pit

Name:	**Date:**	**Time:**
Weather Conditions:		
Temperature:	**Wind Speed and Direction:**	

Section 1: Description of Dust Conditions

1. Site Access and Victoria Road South

Significant visible fugitive dust observed?* [ ] Yes [ ] No

Comments:

2. On-site Haul Roads

Significant visible fugitive dust observed?* [ ] Yes [ ] No

Comments:

3. Active Aggregate Extraction and Haul Truck Loading Area

Significant visible fugitive dust observed?* [ ] Yes [ ] No

Comments:

4. Other

Significant visible fugitive dust observed?* [ ] Yes [ ] No

Comments:

* For the purpose of this form, *"significant visible fugitive dust"* is visible dust that is observed to move, or is likely to move, off property.

Section 2: Description of Applied Dust Control Measure(s)

1. Water applied? [ ] Yes [ ] No

Description (where applied, frequency, duration, quantity applied):

2. Dust suppressant product applied? [ ] Yes [ ] No

Description (product applied, where applied, quantity applied):

3. Other Dust Control Measure(s)

Description:

Section 3: Description of Corrective Action(s) and Follow-up (if required):

Appendix C Curriculum Vitae

Greg Crooks M.Eng., P.Eng.

Principal - Environmental Services / Atmospheric Environment

36 years of experience · Toronto, Ontario

Gregory Crooks has over 29-years' experience in air quality modelling and monitoring. Mr. Crooks has carried out ambient air and source monitoring studies for industrial clients that have included site selection, QA/QC of data, remote data acquisition, and software and hardware design and development. He has performed numerous projects involving dense gas dispersion modelling, physical and numerical modelling of dispersion in urban environments and complex terrain, noise monitoring, emission inventory development, and software development. He has been involved in the development of a state-of-the-art dense gas dispersion model that accounts for terrain and obstacle effects. His Master's thesis examined concentration fluctuations in plumes dispersing in complex terrain.

Greg has international air quality experience, having conducted projects in Thailand, United Arab Emirates, Saudi Arabia, Trinidad and Tobago, USA, and Canada. Greg has also served as an expert witness on quantitative risk assessment before the Alberta Energy Utilities Board. Greg has managed and been the lead technical resource on projects with Environment Canada, Health Canada, the Ontario Ministry of Environment and the Canadian Council of Ministers of the Environment regarding air policy issues for several industrial sectors (including pulp and paper, iron and steel, petroleum, lime manufacturing, etc).

Greg also holds a position as an Adjunct Lecturer with the University of Toronto.

EDUCATION

MEng Civil/Environmental Engineering, University of Western Ontario, London, Ontario, 1992

B.E.Sc. Civil Engineering, University of Western Ontario, London, Ontario, 1989

Atmospheric Chemistry, Canadian Institute for Research in Atmospheric Chemistry (CIRAC), Ontario, Ontario, 1997

CALPUFF Training Course, Ontario, Ontario, 1998

Strategic Leadership and Management Course, Markham, Ontario, 2000

MEMBERSHIPS

Member, Professional Engineers Ontario

PROJECT EXPERIENCE

AIR QUALITY

Pollution Control Department | Government of Thailand | Bangkok, Thailand

Sole instructor for a 5-day training course on air quality management (dispersion modelling and ambient monitoring) conducted for the Pollution Control Department.

Jacques Whitford Training Institute

AERMOD dispersion modelling course.

Ontario Power Generation

Instructed a two-day dispersion modelling course.

General Motors of Canada Limited

Instructed a one-day dispersion modelling training course.

Abu Dhabi Marine Operating Company | United Arab Emirates

Sole instructor for an either-day training course on air dispersion modelling and monitoring for the Abu Dhabi Marine Operating Company.

ATMOSPHERIC ENVIRONMENT - ACOUSTICS & LIGHTING

MRI and Angiogram Suite Vibration Testing | Southlake Regional Health Centre | Toronto, Ontario | Senior Reviewer

Senior Reviewer for a vibration assessment of proposed angiogram and MRI suites at the Southlake Regional Health Centre

Noise Assessment and Permitting | University Health Network (UHN) | Toronto, Ontario | Senior Reviewer

Senior reviewer for an acoustic assessment conducted for the Princess Margaret Hospital including noise source measurements, noise modelling, and acoustic impact report for submission in support of an environmental permit application.

Vibration Assessment of CN Railway | CN Rail | Senior Reviewer

Senior reviewer for an assessment of rail vibration for a proposed residential development in Kitchener, ON. The purpose of the assessment was to evacuate vibration impacts with respect to CN vibration criteria due to a neighbouring rail line to provide recommendation for vibration isolation designs to reduce vibration transfer into homes, and prepare a report for review by the CN Railway Company.

Floor Vibration Analysis for Walking Excitation | Kelowna General Hospital

Environmental Noise Assessment | University of Saskatchewan

Sunnybrook Hospital

Preparation of an acoustic assessment report and noise abatement action plan

Crew Change Noise Assessment | CN Rail

Carmeuse Lime

Preparation of an acoustic assessment report

Noise Control Feasibility Study | Humber College | Ontario

EMISSIONS CONTROL

Ontario Hydro Pickering Nuclear Generation Station

Emission inventory and dispersion modelling of redioactive tritium deposition and aerosol formation due to emissions from the Ontario Hydro Pickering Nuclear Generation Station.

Abu Dhabi Water and Electricity Authority

Emission inventory development and dispersion modelling of Abu Dhabi Water and Electricity Authority (ADWEA) member company power plants (including Al Mirfa and Al Taweelah) using the US EPA ISC-PRIME model.

North Atlantic Refining Limited

Emission inventory of heater emissions of SO2, NOx, PM, and VOC's, and VOC emissions from fixed and floating roof storage at the North Atlantic Refining Limited, Come-by-Chance, Newfoundland Oil Refinery. Dispersion modelling of these emissions was performed using the CALMET/CALPUFF meteorological processor and dispersion model.

Iron Ore Company of Canada

Dispersion modelling of point and fugitive particulate emissions for the Iron Ore Company of Canada. Emissions inventories of point and fugitive emissions of PM, PM10 and PM2.5 from the IOCC ore processing facilities/pelletizing plants in Labrador City and Sept-Iles were developed for this project.

General Motors of Canada Ltd.

Dispersion modelling of over 30 contaminants from over 260 stacks on the General Motors of Canada Ltd. Oshawa Facility using REG346, ISCT3, and AERMOD.

GMCL Emission Inventory

A QA/QC review of the GMCL emission inventory was conducted.

Dofasco Steel Facilities | Hamilton, Ontario

Odour modelling of emissions from a wastewater treatment plant located in the Dofasco Steel Facilities in Hamilton using the CALPUFF dispersion model.

Ontario Hydro Generating Station | Thunder Bay, Ontario

Modelling of particulate transport and deposition due to emissions from the Ontario Hydro Generating Station in Thunder Bay.

Ontario Hydro Fossil Fuel Generating Stations

Emission inventory and dispersion modelling and environmental assessment of the impacts of increasing emissions from six Ontario Hydro Fossil Fuel Generating Stations.

TransAlta Energy Corporation | Sarnia, Ontario

Preparation of a Certificate of Approval for a 500 MW cogeneration facility.

Lakeview New Generation Project

Dispersion modelling of the Lakeview New Generation Project, a 550 MW combined cycle power plant operated by ATCO Power.

Newfoundland Trans-shipment Terminal | Come By Chance, Newfoundland

Air quality modelling of NOx and VOC emissions from the Newfoundland Trans-shipment Terminal.

Environmental Assessment of the Hibernia Offshore Oil Platform | Grand Banks Region, Atlantic Ocean

Studied modelled emissions from several sources on the platform and their impact on: helicopter operations and health and safety of workers; and the operation and maintenance of machinery on the platform.

Novacor Polyethylene Plant | Sarnia, Ontario

Physical modelling of the emissions from process bins located in a complex setting at the Novacor Polyethylene Plant, in order to determine equivalent source characteristics for use in regulatory air pollution models.

Brunswick Mining and Smelting Facility | Belledune, New Brunswick

Dispersion modelling of SO2 emissions from the Brunswick Mining and Smelting Facility.

ENVIRONMENTAL ASSESSMENTS

Études environnementales de référence et études d'impact sur l'environnement du projet aurifère Troilus | Troilus Gold Corp | Chibougamau (Québec) | 23-06/- | Ingénieur, Spécialiste - Environnement atmosphérique et acoustique

Joint Panel Review: Marathon Palladium Project | Generation PGM Inc. | Marathon, Ontario, Canada | 2020-present | Technical Lead, Air Quality

Providing technical advice for the environmental assessment for the Joint Review Panel (JRP) Federal-Provincial Environmental Assessment (EA) for the proposed Marathon Palladium Project, an open pit platinum group metal and copper mine located north of Marathon Ontario.

Air Quality Assessment of a Proposed Municipal Solid Waste Incinerator | Regions of Durham-York | Ontario | Project Manager,Technical Lead

Greg was the Technical Lead and Project Manager for the Air Quality Assessment portion of the EA that included as emission inventory, dispersion modelling of the proposed EFW emissions, and dispersion modelling of vehicle traffic on highways and primary/secondary roads in the study area using the CAL3QHCR model. Greg was also responsible for liaison with the Ministry of Environment on air quality issues and presenting assessment results in public information sessions.

Air Quality/Odour Assessment | Proposed Hanover/Walkerton Landfill Expansion EA | Ontario | Technical Lead

Greg was the technical lead on the air quality assessment for the landfill expansion EA, which included; estimating landfill emissions using the LandGem emissions model, dispersion modelling of landfill emissions using the AERMOD dispersion model, assessing the potential for odour impacts, assessing and recommending mitigation measures for litter control and evaluating GHG emissions.

Air Quality Assessment of a Proposed Refinery | Shell Canada Products | Sarnia, Ontario | Technical Lead

As part of the Environmental Assessment for a proposed new refinery in Sarnia Ontario, Greg directed the air quality study and was the lead technical resource. The scope of the assessment included dispersion modelling, emissions inventory, liaison with the government review team and attendance at public information sessions.

Air Quality Assessment | Proposed Jane Street LRT | Toronto, Ontario | Technical Lead

Technical Lead for this study which involved estimating emissions and assessing air quality due to current traffic levels along the proposed LRT route and then evaluating the incremental changes in air quality due to the Project for two future scenarios (build and no-build options). Greg was the technical lead on the project and senior reviewed all submissions to ensure their technical excellence.

Air Quality Assessment | Proposed Weber Street Widening | Kitchener, Ontario | Technical Lead, Senior Reviewer

This study included assessment of current ambient (background) levels of contaminants and changes in the emissions of the contaminants of concern in the study area. The emissions generated from current traffic in conjunction with current ambient air quality conditions were used as incremental change in air quality due to the Project, future emissions were also considered.

ODOUR ASSESSMENT MANAGEMENT

Odour and VOC Dispersion Modelling | Marafiq Waste Water Treatment Plant | Jubail Industrial City, Saudi Arabia

Odour Modelling and Stack Height Optimization | Dofasco Steel Waste Water Treatment Plant | Hamilton, Ontario

Odour and VOC stack testing, odour modelling | Raywall Kitchens | Thornhill, Ontario

Development of a technology benchmarking report for odour mitigation

Odour and VOC stack testing, odour modelling, and odour mitigation evaluation | National Research Council of Canada | Ottawa, Ontario

QUANTITATIVE RISK ASSESSMENT

National Research of Canada*

Quantitative risk assessment of carbon monoxide and hydrogen storage facilities.

Environmental Management Authority* | Port of Spain, Trinidad

Instructor for an introductory course on Quantitative Risk Assessment.

National Gas Company* | Trinidad

Quantitative risk assessment of a proposed liquids pipeline for the National Gas Company.

Compton Petroleum*

Quantitative risk assessment and expert witness testimony (in front of the Alberta Energy Utilities Board) for Compton Petroleum for a sour gas well development near the City of Calgary.

Environmental Management Authority | Trinidad and Tobago

Developmenmt of guidelines to define the scope of a QRA for an environmental assessment.

Abu Dhabi National Oil Company

Quantitative risk assessment of sour gas well project.

Shell Canada

Dense gas modelling of ground level H2S concentrations due to a hydro-cracker quench line failure and reactor depressurization for Shell Canada, Scotford Refinery.

** denotes projects completed with other firms*

Ontario Power Generation

Risk assessment of gas turbine hydrogen leaks for Ontario Power Generation.

Environmental Management Authority | Trinidad and Tobago

Over 20 peer reviews of QRA reports on behalf of the Environmental Management Authority.

** denotes projects completed with other firms*

PUBLICATIONS & WHITEPAPERS

Modelling Emissions from Elevated Cylindrical Bins. *Journal of Air and Waste Management*, 1999.

Overview of the Results of a Source Sampling Study of 20 Pulp And Paper Mills Across Canada and the Challenges Associated with Complex Source Measurement Programs. *Presented at Exfor*, 2004.

Computerised System to Measure and Predict Air Quality for Emission Control. *Presented at the Air & Waste Management Associations 90th Annual Meeting*, 1997.

A Wind Tunnel Study of Mean and Fluctuating Concentrations in a Plume Dispersing over a Two-Dimensional Hill. *Boundary-Layer Meteorology 66*, 1993.

** denotes projects completed with other firms*

Kimberly Ireland B.Sc.(Eng.), P.Eng.

Senior Associate, Senior Environmental Engineer, Atmospheric Sciences

28 years of experience · Stoney Creek, Ontario

Kim has over 25 years of experience in environmental consulting focusing on air quality monitoring and environmental approvals. Kim routinely attends the Ontario Air Practitioners' meetings and workshops convened by the Ministry of the Environment, Conservation and Parks and the Air and Waste Management Association to remain up-to-date with regulatory changes and current practices. Kim has been an Environmental Engineer and/or Project Manager for several ambient air monitoring programs including continuous and non-continuous sampling regimes for short and long-term monitoring periods. She has completed many applications for Environmental Compliance Approvals (Air) as well as Air Emissions Environmental Activity and Sector Registries. She has worked with numerous types of industrial facilities, mining, manufacturing, municipalities, institutions, and agencies. Kim is a Senior Associate with signing authority as well as an Independent and Quality Reviewer for air quality projects. She successfully manages approximately ten projects per year with budgets ranging from $20,000 to $500,000.

EDUCATION

Environmental Engineering Applications (Post Diploma Program), Conestoga College, Kitchener, Ontario, 1998

Baccalaureate in Science in Engineering (Environmental), University of Guelph, Guelph, Ontario, 1997

CERTIFICATIONS & TRAINING

Greenhouse Gas Verification Using ISO 14064 (Cert. # 0000370056), Canadian Standards Association, Stoney Creek, Ontario, 2011

Standard First Aid Level C CPR/AED (Cert. #1167322315), St. John Ambulance, Burlington, Ontario, Canada, 2024

Working at Heights: Principals of Fall Protection, Occupational Safety Group Inc., Hamilton, Ontario, 2018

REGISTRATIONS

Professional Engineer #90530726, Professional Engineers Ontario

MEMBERSHIPS

Member of the Ontario Chapter, Air and Waste Management Association, 1996 - present

PROJECT EXPERIENCE

AIR MONITORING

Ambient Air Quality Monitoring Program for the Port Credit West Village Partners Remediation Project | Kilmer Brownfield Management Limited | Port Credit, Ontario | 2018-2020 | Environmental Engineer and Task Manager

Task Manager for an ambient air quality monitoring program for due diligence purposes during soil excavation during remediation of a benzene and petroleum impacted soil. Monitoring included continuous monitoring of particulate matter with and electronic sampler and meteorological conditions for the duration of site activities (~2 years). Additionally, non-continuous monitoring of Volatile Organic Compounds (VOC) using SUMMA canisters and sampling of benzene using 14-day diffusion tubes. Automated email and phone messages were sent to assigned people to provide notification of equipment issues or when concentrations exceeded preset action levels. Site activities were modified real-time in response air monitoring. Bi-weekly reports were prepared tracking monitoring data and trends.

Ambient Air Quality Monitoring for Carmeuse Lime in Dundas | Carmeuse Lime | Hamilton, Ontario, Canada | Project Manager and Environmental Engineer

Ambient air quality monitoring to support an application for Site Specific Standards for a lime manufacturing facility. Monitoring included Total Suspended Particulate Matter and Calcium Oxide (lime) using a high-volume sampler. A meteorological monitoring station was also used to track weather conditions including wind speed and direction. Results of the monitoring program were used to validate air dispersion modelling.

Baseline Ambient Air Quality Monitoring for the Port Credit West Village Partners Remediation Project | Kilmer Brownfield Management Limited | Mississauga, Ontario, Canada | 2017-2018 | Task Manager and Environmental Engineer

Study to determine baseline air quality prior to remediation activities for a large brownfield redevelopment project. Monitoring included continuous monitoring of particulate matter with and electronic sampler and meteorological conditions. Additionally, non-continuous monitoring of Volatile Organic Compounds (VOC) using SUMMA canisters was completed. A baseline report was prepared summarizing the data and providing recommendations.

** denotes projects completed with other firms*

Ambient Air Monitoring Program for Carmeuse Beachville Operations | Carmeuse Lime | Beachville, Ontario | Project Manager

Multi-year ambient air monitoring program to continuously monitor suspended particulate matter and other parameters such as temperature, humidity, barometric pressure, wind speed and wind direction at three monitoring stations. Three stations were installed on residential and municipal properties to monitor the air quality surrounding the Carmeuse Lime facility.

Ambient Air Quality Monitoring Program for the Durham York Energy Centre | Regional Municipalities of Durham and York | Courtice, Ontario | Environmental Engineer

Project coordination and review of reports for a 3-year ambient air quality monitoring program for combustion contaminants, metals, polycyclic aromatic hydrocarbons and volatile organic compounds and dioxins and furans. Program includes both continuous and non-continuous sampling with multiple instruments.

Port Weller Noise/Dust Baseline Monitoring | St. Lawrence Seaway Management Corporation | St. Catharines, ON | 2018-2019 | Project Manager

Project Manager for ambient air monitoring program to aid in characterizing baseline ambient dust and noise levels in the context of increasing industrial/commercial activities on St. Lawrence Seaway Management Corporation-leased lands.

North Maple Regional Park | City of Vaughan | Vaughan, ON | 2020 - 2024 | Air Quality Engineer

Quality Review of an Ambient Air Monitoring Plan and Dust Management Plan for the construction related activities at the North Maple Regional Park. Review of ambient air monitoring data and recommendations to monitor, mitigate, and manage dust emissions.

Atmospheric Compliance Monitoring for Agnico Eagle (formerly TMAC Resources) Hope Bay Project | Agnico Eagle Mines Ltd | Nunavut, Canada | 2017-Present | Project Manager

Project Manager for ongoing annual compliance reporting regarding ambient air quality and meteorology.

Ambient Air Quality Monitoring Program for Greenstone Gold Mine | 2022-Present | Reviewer

Review of Ambient Air Quality Monitoring Plan. Review of Ambient Air Quality Monitoring Reports. Review of Dust Suppressant Studies.

AIR QUALITY PERMITTING

Environmental Activity and Sector Registry for a Bulk Fuel Terminal | Valero Energy Inc. | Whitby, Ontario | 2018-2019 | Task Manager and Air Quality Engineer

Provided Valero with advice and recommendations to navigate the air and noise approval process for a new facility in Ontario. Preliminary assessment of anticipated emissions to atmosphere for a planned bulk petroleum transfer facility. Air emissions estimates, inventory, air dispersion modelling and preparation of an Emission Summary and Dispersion Modelling Report. Conducting pre-application consultation with regulatory agencies.

Environmental Compliance Approval (Air/Noise) with Limited Operational Flexibility for North West Rubber | Brantford, Ontario, Canada | 2012-Present | Project Manager and Environmental Engineer

Prepared initial application for an Environmental Compliance Approval (Air/Noise) with Limited Operational Flexibility for a facility which manufacturers rubber mats from rubber crumb. Prepared subsequent annual updates, Annual Written Summaries and applications to amend the approval. Approval package included an Emission Summary and Dispersion Modelling Report and an Acoustic Assessment Report.

Environmental Compliance Approvals for Evolve Recycling | Evolve Recycling | Brantford, ON | 2019-Present | Project Manager and Environmental Engineer

Managed a team of specialists to prepare applications for Environmental Compliance Approvals for Waste, Industrial Sewage Works, as well as Air and Noise for a tire recycling facility. Guided communication with the Ministry of the Environment, Conservation and Parks. Routine progress meetings and communication with agencies.

Environmental Compliance Approval (Air/Noise) for National Steel Car | National Steel Car | Hamilton, ON | 2014-Present | Project Manager and Environmental Engineer

Preparation of an application for Environmental Compliance Approval (Air/Noise) for a rail car manufacturing facility including preparation of an Emission Summary and Dispersion Modelling (ESDM) Report and Acoustic Assessment Report. Guided communication with the Ministry of the Environment, Conservation and Parks (Ministry). Prepared a focused ESDM Report along with development of an Action Plan to reduce off-site contaminant concentrations. On-going environmental consultation and negotiation with the Ministry.

Environmental Activity and Sector Registry for SUEZ | SUEZ Water Technologies & Solutions | Ancaster, ON | 2016-2019 | Project Manager and Environmental Engineer

Prepared an Air Emissions Environmental Activity and Sector Registry for SUEZ which manufacturers ozone water treatment systems. The package included and Emission Summary and Dispersion Modelling (ESDM) Report for welding and ozone emissions. Also prepared subsequent updates to the ESDM Report and updates to the registry.

Amended Environmental Compliance Approval (Air/Noise) with Limited Operational Flexibility for Asbury Wilkinson | Asbury Wilkinson Inc. | Burlington, ON | 2018-2019 | Project Manager and Environmental Engineer

Prepared an application for an amended Environmental Compliance Approval (Air/Noise) with Limited Operational Flexibility for a facility which recycles and repackages shot used in shot-blasting.

Environmental Compliance Approval (Air/Noise) with Limited Operational Flexibility for BASF | BASF Canada Inc. | Brampton, ON | 2018-2020 | Project Manager and Environmental Engineer

Prepared an application for Environmental Compliance Approval (Air/Noise) with Limited Operational Flexibility for a facility which produces concrete admixtures.

Environmental Activity and Sector Registry for Komatsu/Joy Global - Magill and Fielding Facilities | Komatsu Mining Corp. Group | Sudbury, ON | 2019 - 2025 | Project Manager and Environmental Engineer

Updated the Emission Summary and Dispersion Modelling Reports for two facilities which produce equipment used in the mining industry. Updated other supporting information and guided client through the registry process. On-going updates to the Emission Summary and Dispersion Modelling Report on an as needed basis.

Application for Certificate of Approval (Air), Tech Coat Inc.* | Guelph, Ontario | 2005-2006 | Project Manager and Air Quality Engineer

Preparation of an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a new dip and spin painting facility.

Application for Consolidated Certificate of Approval (Air) * | ACSYS Technologies | Oshawa, Ontario | 2002 | Air Quality Engineer

Assisted in the preparation of an application for Consolidated Certificate of Approval (Air) and Emission Summary and Dispersion Modelling Report for a large plastic automotive parts manufacturing and painting plant.

Application for Consolidated Certificate of Approval (Air)* | Fabricated Plastics Limited | Vaughan, Ontario | 2002-2004 | Project Manager and Air Quality Engineer

Prepared an application for addendum to a Certificate of Approval (Air) and Emission Summary and Dispersion Modelling Report for a facility that manufactures specialized fiberglass products. Negotiated with the Ministry of the Environment regarding terms and conditions of the certificate.

Application for Certificate of Approval (Air) for Skyway WWTP* | Regional Municipality of Halton | Burlington, Ontario | 2003 | Air Quality Engineer

Preparation of an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for ventilation and process upgrades to the Skyway WWTP.

Assistance for STAC Reporting* | Court Galvanizing Limited | Guelph, Ontario | 2003 | Project Manager and Air Quality Engineer

Assisted in the development of emission factors and completed Reg. 346 dispersion modelling for Court's existing hot-dip galvanizing facility in Guelph as required by the Ministry of the Environment's STAC program.

Application for Certificate of Approval (Air), Court Galvanizing Limited* | Court Galvanizing Limited | Cambridge, Ontario | 2003-2006 | Project Manager and Air Quality Engineer

Preparation of an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a new hot-dip galvanizing facility to be constructed in Cambridge. Preparation of an application for amendment to the approval for minor facility modifications.

Environmental Compliance Audit and Application for Certificate of Approval (Air)* | Gates Canada Inc. | Brantford, Ontario | 2004 | Project Engineer

Prepared Environmental Compliance Audit report based on inspectors' field notes. Prepared an application for Certificate of Approval (Air) for natural gas fired equipment.

Application for Certificate of Approval (Air), Timber Preservatives* | Timber Preservatives | Campbellville, Ontario | 2003-2004 | Air Quality Engineer

Prepared an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a wood preservatives manufacturing facility.

Application for Certificate of Approval (Air) for the Barrie Water Pollution Control Plant* | City of Barrie | Barrie, Ontario | 2003-2006 | Air Quality Engineer

Preparation of a facility-wide application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for the Barrie Water Pollution Control Plant. Coordination and review of an acoustic audit report. Preparation of several addenda related to subsequent facility upgrades and modifications.

Application for Certificate of Approval (Air), Courtice Water Pollution Control Centre* | Courtice, Ontario | 2004-2005 | Air Quality Engineer

Prepared an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a planned new wastewater treatment facility.

Application for Consolidated Certificate of Approval (Air)* | H.L. Blachford Limited | Mississauga, Ontario | 2002-2005 | Project Manager and Air Quality Engineer

Preparation of an application for Certificate of Approval (Air) and Emission Summary and Dispersion Modelling Report for a facility that manufactures liquid and powder industrial lubricants. Negotiation with the Ministry of the Environment regarding terms and conditions of the certificate. Also completed a basic noise assessment of this facility to assess compliance with provincial noise guidelines. Follow-up work including coordinating an acoustic audit and source testing to meet the terms and conditions of the certificate.

** denotes projects completed with other firms*

Application for Certificate of Approval (Air), Richardson Foods* | Richardson Foods | St. Marys, Ontario | 2003-2006 | Air Quality Engineer

Preparation of an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a manufacturer of sauces, salad dressings, syrups, and other food products. Preparation of addenda regarding process modifications. Coordination of an acoustic audit and assistance with Operation and Maintenance Manuals to meet the terms and conditions of the certificate.

Permitting Assistance* | INVISTA Canada Ltd. | Maitland and Kingston, Ontario | 2005-2006 | Air Quality Engineer

Review of applications amendments to Certificates of Approval (Air) prepared by INVISTA personnel. Preparation of presentation outlining regulatory requirements regarding air and noise. Provide advice regarding air related issues on an as needed basis.

Application for Certificate of Approval (Air), Shelburne Wood Processing Ltd.* | Shelburne Wood Processing Ltd. | Shelburne, Ontario | 2005-2006 | Air Quality Engineer

Preparation of an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a chemical wood treating facility.

Application for Certificate of Approval (Air), I.K. World Trading Company Ltd.* | I.K. World Trading Company Ltd. | Shelburne, Ontario | 2005-2006 | Air Quality Engineer

Preparation of an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a wood processing facility.

Environmental Assistance; Stelpipe Ltd.* | Welland, Ontario | 2005 | Air Quality Engineer

Review of facility operations, environmental manuals, permits, and approvals to identify opportunities for improvement. Prepared National Pollutant Release Inventory (NPRI) and O.Reg. 127 (ON AIR) reports.

Application for Certificate of Approval (Air), Bramcal Production Inc.* | Barrie, Ontario | 2005-2006 | Air Quality Engineer

Preparation of an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a new polyethylene extrusion and printing process.

Application for Certificate of Approval (Air), Strongco Limited Partnership | Strongco Limited Partnership | Mississauga and Burlington, Ontario | 2008-2009 | Project Manager and Technical Advisor

Preparation of an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for two heavy equipment servicing facilities.

Application for Certificate of Approval (Air), FarmTech | Oshawa, Ontario | 2008-2010 | Project Manager and Technical Advisor

Preparation of an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a proposed ethanol fuel production facility.

Master Builders Solutions Canada, Inc. | Master Builder Solutions Canada, Inc. | Brampton, Ontario | 2021 | Project Manager

Preparation of an application to amend the Environmental Compliance Approval (Air/Noise) with Limited Operational Flexibility including an updated Emission Summary and Dispersion Modelling Report.

Application for Certificate of Approval (Air), St. John's Rehabilitation Hospital | North York, Ontario | 2008-2009 | Project Manager and Technical Advisor

Preparation of an application for Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for boilers, emergency generator and cooling tower at a hospital with numerous air intakes and other sensitive receptors.

Application for a Basic Comprehensive Certificate of Approval (Air) | Chemtrade Logistics Inc | Niagara Falls, Ontario | 2010-2012 | Project Manager and Technical Advisor

Preparation of a Basic Comprehensive Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a chemical transfer facility. Preparation of applications for amendment on an as needed basis.

Application for Certificate of Approval (Air) | Suncor Energy Products Inc. | Sarnia, Ontario | 2008-2009 | Project Manager

Preparation of an application for a new Certificate of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for a new benzene loading system.

Application for Amended Certificates of Approval (Air), Suncor Energy Products | Sarnia, Ontario | 2008-2009 | Project Manager

Preparation of an application for amended Certificates of Approval (Air) and associated Emission Summary and Dispersion Modelling Report for two flares.

Air Quality and Acoustic Assessment for a Proposed Sugar Factory Rebuild | Andrews Sugar Factory | Barbados | 2013-2015 | Task Manager and Engineer

Prepared an air quality assessment report including a cumulative effects assessment for a proposed sugar manufacturing facility located in Barbados. Report submitted to regulatory agency for review and approval of development. Report updated in 2016 based on revised facility design.

** denotes projects completed with other firms*

Application for an Environmental Compliance Approval (Air/Noise) for a Methane Venting System | Toronto District School Board | Toronto, Ontario | Project Manager and Environmental Engineer

Preparation of an application for a new Environmental Compliance Approval including an Emission Summary and Dispersion Modelling Report for subsurface methane gas venting system. Also prepared supporting documents required by the approval such as operation and maintenance plan and procedure to respond to public complaints.

Environmental Compliance Approval for Alternative Low-Carbon Fuels Demonstration Project | Carmeuse Lime (Canada) Limited | Beachville, ON | 2017-2018 | Project Manager and Environmental Engineer

Stantec and Carmeuse prepared the first application in Ontario for approval for an Alternative Low-Carbon Fuel demonstration project under a new regulation, specifically, Ontario Regulation 79/15 - Alternative Low-Carbon Fuels. The application included an Emission Summary and Dispersion Modelling Report and a Carbon Intensity Report.

Environmental Compliance Approval for Full-Scale Use of Alternative Low-Carbon Fuels | Carmeuse Lime (Canada) Ltd. | Dundas, ON | 2021-2023 | Project Manager, Environmental Engineer

Preparation of an application for the full-scale use of Alternative Low-Carbon Fuels (ALCF) under Ontario Regulation 79/15 - Alternative Low-Carbon Fuels for Carmeuse's Dundas Operations. Application included an Emission Summary and Dispersion Modelling Report, Acoustic Assessment Report, Carbon Intensity Report, and public consultation. The public consultation process included a website with project related information, two virtual public meetings and responding to public comments.

Application for Site-Specific Standards | National Steel Car | Hamilton, Ontario | 2023- 2025 | Project Manager, Quality Reviewer

Application for Site-Specific Standards including a Ventilation Study, Refined Emission Summary and Dispersion Modelling Report, Technology Benchmarking Report, Action Plan, and Public Consultation Report. Pre-application consultation with the Ministry of the Environment, Conservation and Parks. Engaged outside consultant to complete Computational Fluid Dynamics Modelling to refine the fugitive emissions through building doors and openings. Coordinated and led the public consultation process including distribution of meeting notice, responding to public comments in-person during public meeting and via email.

INDUSTRIAL AND MUNICIPAL WASTE LANDFILLS

Landfill Gas Collection and Flaring Phasing* | Canadian Waste Services | Burlington, Ontario | 2000 | Project Engineer

Prepared a conceptual design report for the phasing of a landfill gas collection and flaring or utilization system for the proposed Adam’s Mine Landfill near Kirkland Lake.

Emission Summary and Disposal Modelling Report Preparation* | City of Brockville | Brockville, Ontario | 2000-2001 | Project Engineer

Aided in the preparation of an emission summary and dispersion modelling report, and the design of a temporary landfill gas odour control system. Additionally, supervised system construction, and was responsible for system operation, maintenance, and monitoring.

Landfill Gas Collection and Flaring System* | City of Cornwall | Cornwall, Ontario | 1998-2001 | Field Technician

Monitored the permanent landfill gas collection and flaring system at the Cornwall Landfill and balanced the well field as required.

Cornwall Landfill Hydrogeological Study and Operations Report* | City of Cornwall | Cornwall, Ontario | Field Technician and Project Engineer

Conducted GPS and level surveying, collected groundwater samples, and measured groundwater levels as part of a hydrogeological study. Also analyzed the data and prepared an annual operations and monitoring report for the Cornwall Landfill.

Annual Monitoring and Reporting* | Neelon Castings | Sudbury, Ontario | 1999-2001 | Project Engineer

Collected groundwater and surface water samples, analyzed the data, and prepared an Annual Monitoring Report for a waste disposal site.

Landfill Gas Collection and Flaring System Expansion* | City of Cornwall | Cornwall, Ontario | 2001 | Project Engineer

Prepared a conceptual design report for the phasing of a landfill gas collection and flaring system along with associated capital, operation, and maintenance costs. Also assisted in the preparation of detailed design drawings and specifications for the expansion.

Landfill Gas Pumping Test and Conceptual Design* | City of Guelph | Guelph, Ontario | 2001 | Project Engineer

Analyzed test data, modelled landfill gas production, and prepared a conceptual design and budget for a full-scale landfill collection and flaring system at the Eastview Road Landfill.

Landfill Status Report and Financial Assurance Update* | Atlas Specialty Steels | Welland, Ontario | 2002-2003 | Project Engineer

Preparation of a Bi-Annual Status Report for the River Road Landfill, and determination of the necessary financial assurance as required by the Ontario Ministry of the Environment.

Methane Gas Assessment of Bulk Material Landfill | Atomic Energy of Canada Limited | Deep River, Ontario | 2010 | Project Manager

Estimation landfill gas generation over the landfill’s life span and modeling explosive gas concentrations at ground level.

** denotes projects completed with other firms*

Operation and Maintenance Report* | City of Barrie | Barrie, Ontario | 2003-2006 | Project Engineer

Assisted in preparation an operation and maintenance report for the Sandy Hollow Landfill to be submitted to the Ministry of the Environment as part of planned landfill rehabilitation/reclamation project. Report included proposed odour control system and odour monitoring plan.

Landfill Gas Collection and Flaring Test Program* | Canadian Waste Services | Napanee, Ontario | 1998-1999 | Field Technician

Construction, operation, monitoring, and analysis of a temporary landfill gas collection and flaring system test program at the Richmond Landfill near Napanee.

Landfill Gas Extraction System* | Canadian Waste Services | Carp, Ontario | 1998-1999 | Field Technician

Installation and operation of a temporary landfill gas extraction system at the West Carleton Landfill. Responsible for monitoring and maintaining the system as well as compiling and analyzing the test results.

Air Injection System Installation and Monitoring* | Canadian Waste Services | Carp, Ontario | 1998-2000 | Field Supervisor and Project Engineer

Site supervision, installation, operation, and monitoring of an air injection system to prevent landfill gas migration at the West Carleton Landfill. Reviewed data and prepared analysis of system performance.

Conceptual Landfill Gas Extraction and Flaring Systems* | Canadian Waste Services | Ontario | 1999-2000 | Project Engineer

Assisted in the design and report preparation for conceptual landfill gas extraction and flaring systems in Napanee and Carp. Worked on Emission Summaries and Dispersion Modelling reports for Certificates of Approval (Air).

GHG EMISSIONS INVENTORIES / CARBON FOOTPRINTS

Greenhouse Gas Reduction (Energy Management) Plan | Cambridge, Ontario | Project Manager and Air Quality Engineer

Collaboratively worked with the City of Cambridge staff to set GHG reduction targets and develop a reduction action plan. Annual monitoring and reporting progress by updating the corporate GHG Inventory. Received recognition of completion of Federation of Canadian Municipalities (FCM) Partners for Climate Protection (PCP) Milestones 1 to 4.

Region of Waterloo Community-Scale Greenhouse Gas Inventory and Forecast | Region of Waterloo, Ontario | Project Manager and Air Quality Engineer

Developed a community-scale inventory of the Greenhouse Gas emissions for the Region of Waterloo and emissions forecast

GHG Offset Estimation from Combustion of Landfill Gas, Canadian Waste Services* | Various Locations, Ontario

Calculated the potential GHG offset credits available from the combustion of Landfill Gas in flares and engines generating electricity.

Corporate Greenhouse Gas Inventory, Forecast, Reduction Planning and Monitoring Progress | City of Cambridge | Cambridge, Ontario | 2010-Present | Project Manager and Air Quality Engineer

Developed a corporate inventory of the Greenhouse Gas emissions for the Corporation of the City of Cambridge and emissions forecast. Assisted with setting GHG reduction targets and developed a reduction action plan to reduce corporate GHG emissions and energy use. Completed Milestones 1 to 4 under the Federation of Canadian Municipalities, Partners for Climate Protection Program and also reporting energy use under the Ontario Green Energy Act. Annually updated the GHG inventory to track progress towards meeting the reduction goals. Coordinated and held workshops and presented results to City's Greenhouse Gas Task Force. Presented the inventory, reduction plan, and progress updates to the City's Management Committee and City Council.

Region of Waterloo Water Supply and Distribution Operations Master Plan | Region of Waterloo | Kitchener, Ontario, Canada | 2010 | Task Manager and Air Quality Engineer

Developed an inventory of the Greenhouse Gas emissions associated with the operation of the Region’s Water Services Division including Scopes 1, 2, and 3.

GHG VALIDATION VERIFICATION

Verification of Greenhouse Gas Emission Report for 2010 to 2015, Carmeuse Lime | Beachville, Ontario | Project Manager

Completed a verification of the GHG emission report for the Beachville facility in accordance with O.Reg. 452/09 and ISO 14064. Sources included lime kilns, heaters, dryers, coal storage, and other combustion equipment.

Verification of Greenhouse Gas Emission Report for 2011, Cardinal Power | Cardinal, Ontario | Project Manager

Completed a verification of the GHG emission report for a natural gas fired cogeneration facility in accordance with O.Reg. 452/09 and ISO 14064.

Verification of Greenhouse Gas Emission Report for 2011 and 2014, Canadian Gypsum Company | Hagersville, Ontario | Verifier

Completed site visit and internal working paper for verification of the GHG emission report for a gypsum plaster and wallboard manufacturer in accordance with O.Reg. 452/09 and ISO 14064. GHG emissions were from general stationary combustion sources.

** denotes projects completed with other firms*

Verification of Greenhouse Gas Emission Report for 2011 and 2014, Hanson Brick | Burlington, Ontario | Verifier

Completed site visit and internal working paper for verification of the GHG emission report for a brick manufacturing facility in accordance with O.Reg. 452/09 and ISO 14064. GHG emissions source categories were carbonate use and general stationary combustion.

Verification of Greenhouse Gas Emission Report for 2015, Forterra Brick | Burlington, Ontario | Verifier

Completed site visit and internal working paper for verification of the GHG emission report for a brick manufacturing facility in accordance with O.Reg. 452/09 and ISO 14064. GHG emissions source categories were carbonate use and general stationary combustion.

Verification of Greenhouse Gas Emission Report for 2015, McMaster University | Hamilton, Ontario | Verifier

Completed site visit and internal working paper for verification of the GHG emission report for general stationary combustion sources at a university campus and supporting facilities.

AIR QUALITY ASSESSMENT / MANAGEMENT

Air and Noise Regulations Presentation* | General Motors of Canada Limited | Oshawa, Ontario | 2005 | Presenter

Gave presentation to environmental coordinators providing an overview of O.Reg. 346 and O.Reg. 419, and its potential impacts to General Motors' facilities.

Screening Level Air Quality Assessment for an Ethanol Facility | FarmTech | Oshawa, Ontario | 2007 | Project Engineer

Preparation of a screening level assessment of air emissions from a proposed ethanol fuel production facility. Assessment included an inventory of emission sources, assessment of significance, estimation of emission rates, air dispersion modelling using AERMOD and preparing a summary report.

Annual Environmental Reporting | General Kinetics | Brampton, Ontario | Environmental Engineer

Preparation of NPRI, Ontario Regulation 127 and Ontario Regulation 452 (Greenhouse Gas Emission) reports, as required for metal working facility

Annual Environmental Reporting, Dare Foods, Five Facilities | Dare Foods | Environmental Engineer

Preparation of NPRI, Ontario Regulation 127 and Ontario Regulation 452 (Greenhouse Gas Emission Report) reports, as required for five food processing facilities in Ontario and Quebec.

Third Party Review of an Environmental Impact Assessment for Value Creation Inc. Advanced TriStar Facility | Alberta Environment and Sustainable Resource Development | Alberta | Environmental Engineer

Reviewed and provided comment on the emission estimation, air quality assessment and dispersion modelling for a proposed bitumen extraction system compared to project's Terms of Reference.

Third Party Review of an Environmental Impact Assessment for Cenovus Christina Lake Thermal Project | Alberta Environment and Sustainable Resource Development | Alberta | Environmental Engineer

Reviewed and provided comment on the emission estimation, air quality assessment and dispersion modelling for a proposed expansion to the Christina Lake Steam Assisted Gravity Drain bitumen extraction facility compared to project's Terms of Reference.

Overview of Considerations for Greenhouse Gases Provisions from Lime Manufacturing | Environment Canada | Project Manager and Environmental Engineer

Prepared report overviewing research and analysis of the sources of greenhouse gas emissions from the lime sector, potential emission reductions from abatement methods and an analysis of existing regulatory and policy provisions in order to support the development of GHG performance standards applicable to existing and new facilities in the Canadian lime manufacturing sector.

Site-Specific Air Quality Standards | Carmeuse Lime | Dundas, Ontario | 2014-Present | Project Manager and Environmental Engineer

Prepared a refined Emission Summary and Dispersion Modelling Report, a Technology Benchmarking Report, and an Action Plan as part of an application for Site-Specific Standards for particulate matter and calcium oxide from a lime manufacturing facility. Project included preparation of newspaper notice, public notification letters and convening a public open house to present and discuss the reports. Coordinated subsequent annual public open houses to review the implementation of the Action Plan.

Screening-Level Air Quality Assessment for a Proposed Diesel Generating Station | Glossy Bay Marina, St. Vincent and the Grenadines | Task Manager and Environmental Engineer

Prepared a screening-level air quality assessment report as part of an Environmental Impact Assessment for a proposed diesel-fired electricity generating station to provide electricity to a marina and local community.

Evaluation of Benzo(a)Pyrene Emissions | Brantco Asphalt and Material Ltd. | Cambridge, Ontario | Project Manager and Environmental Engineer

Air dispersion modelling to evaluate the Point of Impingement Concentration of B(a)P from an asphalt facility compared to the an updated air quality Standard.

Screening-Level Assessment for Diesel Generators | Nunavut Nukkiksautiit Corp. | Iqaluit, NU, Canada | Project Manager

Air and Noise Emissions Summary for the Weavers Way Sanitary Pumping Station | Houchaimi Holdings Inc. | Town of Mississippi Mills | 2024 | Quality Reviewer

Screening level assessment of air emissions and noise emissions for a proposed emergency generator at a pumping station in a new community development.

** denotes projects completed with other firms*

Air Emissions Assessment for the Dorchester and Thorndale Elevated Storage Tanks | Municipality of Thames Centre | Thames Centre | 2020 | Senior Environmental Engineer

Air and Noise Emission Summary for the Outdoor Generator at the McGillivray Pumping Station | Lake Huron Primary Water Supply System Joint Board of Management | Municipality of North Middlesex | 2023 | Quality Reviewer

Air Emissions and Dispersion Modelling Assessment – Conservation Drive and Beaver Creek Sewage Pumping Stations | City of Waterloo | Waterloo, Ontario | 2024 | Quality Reviewer

Air and Noise Screening Level Assessment of the PJ Cecile Pumping Station | Town of Tecumseh | Tecumseh | 2024 | Quality Reviewer

Hope Bay Mine 2025 Operational Update - Air Quality Modelling Study | Agnico Eagle Mines | Hope Bay, Nunavut | 2024-Present | Project Manager and Reviewer

Update to the Air Quality Modelling (CALPUFF) to include planned operational updates for the Hope Bay Mine Site.

BIOSOLIDS ASSESSMENT, MANAGEMENT, AND FACILITIES

Biosolids Land Application Program Audit* | City of Hamilton | Hamilton, Ontario | 2002-2006 | Project Manager and Lead Auditor

Lead Auditor for a program to confirm land application contractor applied sewage biosolids in accordance with regulatory requirements. Information was used to assist in the development of an Environmental Management Program and Standard Operating Procedures.

MINING

Deloro Mine Rehabilitation* | Ministry of the Environment | Kingston, Ontario | 2003-2004 | Project Engineer

Task Manager for four work plans involving installation of groundwater wells, sediment coring and sampling, groundwater sampling, test pitting, and surveying. Coordinated field and office staff as well as laboratories and contractors. Combined value of work plans was $150,000.

COMMUNITY INVOLVEMENT

Leader, Girl Guides of Canada, Hamilton, Ontario, Canada 2012 - Present

Ski Instructor for Disabled Children, Waterloo Region Track 3 Ski Schools, Kitchener, Ontario, Canada 2000 - 2006 and 2022 - Present

EMPLOYMENT HISTORY

CH2M HILL Canada Limited
Environmental Engineer
2002 - 2007 · 5 years

Project Manager and Task Manager for small to medium sized environmental consulting projects. Responsible for written and oral communication with clients, the public, regulatory agencies and government offices. Preparation of project reports and presentations. Tasks included: applications for environmental approvals, environmental sampling, data interpretation, development of alternatives for remediation of contaminated sites, auditing the land application of municipal sewage biosolids on agricultural land.

GRS Comcor Environmental Limited
Environmental Engineer in Training
1998 - 2002 · 4.5 years

Environmental sampling and monitoring of soil, groundwater, surface water and gas at landfill sites, contaminated sites, and industrial sites. Preparation of project reports and client correspondence. Design, construction and monitoring of temporary and permanent landfill gas extraction and control systems. Conducted and prepared reports for Phase I and Phase II Environmental Site Assessments. Preparation of annual operations and monitoring reports for industrial and municipal landfills. Design, construction and testing of a pilot air stripper for removal of trichloroethylene from groundwater followed by design of a full-scale system.

Environment Canada
Laboratory and Field Technician
1996 - 1996 · 0.25 years

Summer student responsibilities included: - Researched the reproductive effects of pulp mill effluent on fish through field and laboratory work - Developed, constructed and tested a flow-through bioassay system used to establish a laboratory protocol for the pulp and paper industry - Responsible for care of fish stick cultures and lab maintenance

Environmental Youth Corps
Environmental Project Worker
1995 - 1995 · 0.25 years

Summer student responsibilities included: - Assessed drinking water quality and septic system operation - Researched and conducted stream assessments with physical measurements and monitoring of watercourses _ Assisted in the completion of a waste audit and flora inventory

Canadian Department of Fisheries and Oceans
Laboratory Technician
1994 - 1994 · 0.25 years

Summer student responsibilities: - Conducted bioassays to determine the acute and chronic toxicity of sediment from contaminated harbours in Lake Ontario - Collected water, sediment, and phytoplankton samples from research vessel and prepared specimens in onboard laboratory - Interpreted laboratory data, developed database, and presented results in reports

** denotes projects completed with other firms*

Jieyu (Emily) Wu B.A.Sc.

Air Quality Scientist

6 years of experience · Markham, Ontario

Emily has been an Air Quality Engineer-in-Training (EIT) at Stantec since January 2024. She holds a Bachelor's degree in Chemical Engineering. In her role at Stantec, Emily conducts air dispersion modeling, ambient air quality monitoring fieldwork, and environmental assessments, and performs data analysis and prepares technical reports for projects related to transportation, railways, and industrial developments. She has strong technical expertise in air monitoring fieldwork, ventilation system design, air contaminant emission estimation, and greenhouse gas quantification. In addition, Emily brings international experience from the United States and China, where she contributed to mining facility ventilation process design and smelter off-gas handling systems.

EDUCATION

Bachelor of Applied Science in Chemical Engineering, University of Toronto, Toronto, Ontario, Canada, 2017

Master of Education, University of Toronto, Toronto, Ontario, Canada, 2021

CERTIFICATIONS & TRAINING

Standard First Aid - CPR A - AED, St. John Ambulance Saint-Jean, Toronto, Ontario, Canada, 2024

eRailSafe Certificate, CN, Toronto, Ontario, Canada, 2024

Working at Heights, Workers Health & Safety Centre, Markham, Ontario, Canada, 2024

Personal Track Safety (PTS), PNR RailWorks Inc., Markham, Ontario, Canada, 2024

Book 7 Training, Ontario Traffic Council, Toronto, Ontario, 2024

Online AERMOD, Lakes Environmental Consultants Inc., Markham, Ontario, 2024

PROJECT EXPERIENCE

AIR MONITORING

Metrolinx Ambient Air Quality Monitoring Program | Metrolinx | Toronto, Ontario, Canada | 2024-2025 | Air Quality Scientist

Conducted ambient air quality monitoring and data analysis during the early and advanced works phases of new subway station construction projects, including continuous monitoring of PM_{10} and $PM_{2.5}$ and non-continuous sampling of TVOCs, PAHs, and silica. Performed weekly fieldwork for routine site inspections, equipment calibration, and sample collection, and compiled monitoring results into weekly summary reports.

CN Milton Logistics Hub - Environmental Assessment | Canadian National Railway | Milton, Ontario, Canada | 2025-present | Air Quality Specialist

Ambient air monitoring sampling and annual reporting.

AIR QUALITY COMPLIANCE

National Pollutants Release Inventory Assessment for Laurysen Kitchens | Laurysen Kitchens | Ottawa, Ontario, Canada | 2024 | Air Quality Scientist

Prepared an annual report for the National Pollutant Release Inventory for their cabinet manufacturing plant in Ottawa, Ontario for the 2022 compliance year. Assessed facility wide air emissions and chemical products used for reporting to the NPRI.

National Pollutants Release Inventory Assessment for a Lamination Board Manufacturing Facility* | Arauco Canada Ltd. | New Brunswick, Canada | 2023 | Air Quality Specialist

Assessed facility wide air emission and chemical products and prepared an annual National Pollutant Release Inventory report for a particle and lamination board manufacturing facility for the 2022 compliance year.

Axens Canada Specialty Aluminas Inc. | Brockville, Ontario, Canada | 2024-present | Air Quality Specialist

** denotes projects completed with other firms*

AIR QUALITY ASSESSMENT / MANAGEMENT

Due Diligence Air Quality Assessment for an Emergency Diesel Generator Set | City of Windsor | Windsor, Ontario, Canada | 2024 | Air Quality Scientist

Due diligence air quality assessment for a US EPA Tier-2 (1391 kW) emergency diesel generator set of a pumping station, located in Windsor, Ontario. Responsibilities included estimation of emission rates for primary combustion contaminants (NOx, CO and PMs), prediction of the contaminant concentrations using the AERMOD air dispersion model and preparation of technical memo.

GHG EMISSIONS QUANTIFICATION AND VERIFICATION

Greenhouse Gas Quantification and Reporting for Landfill Site* | City of Lloydminster | Saskatchewan, Canada | 2023 | Air Quality Specialist

Quantified the Greenhouse Gas emissions for the landfill site of the City of Lloydminster for the 2022 compliance year. Calculated facility wide GHG emissions for reporting under Saskatchewan GHG Reporting Regulations and to Environment and Climate Change Canada. GHG emissions were assessed from the landfill gas emissions and the combustion of gasoline, diesel and propane fuels.

Greenhouse Gas Quantification and Reporting for Renewable Energy Generation Facilities * | Pinnacle Renewable Energy | British Columbia, Canada | 2023 | Air Quality Specialist

Quantified the Greenhouse Gas emissions for eight facilities of Pinnacle Renewable Energy Inc. located in British Columbia and Alberta for the 2022 compliance year. Calculated facility wide GHG emissions for reporting under BC GHG Reporting Regulations and the Environment and Climate Change Canada. GHG emissions were assessed from the combustion of natural gas, biomass fuel, diesel fuel and propane fuel.

Greenhouse Gas Quantification and Reporting for Clearwater County Landfill Site* | Clearwater Regional Landfill | Alberta, Canada | 2023 | Air Quality Specialist

Quantified the Greenhouse Gas emissions for the landfill site of Clearwater County in Alberta for the 2022 compliance year. Calculated facility wide GHG emissions for reporting under Alberta GHG Reporting Regulations and the Environment and Climate Change Canada. GHG emissions were assessed from the landfill gas emissions, as well as on-site transportation and generator emissions.

EMPLOYMENT HISTORY

Stantec Consulting Ltd.
Air Quality Scientist
Since 2024 · 1 year(s)

AECOM Canada
Air Quality Engineer-In-Training
2021 - 2022 · 1 year(s)

Hatch Ltd.
Off-gas Engineer-In-Training
2017 - 2019 · 2 years

Ontario Ministry of the Environment, Conservation and Parks
Air & Noise ECA Review Engineer Assistant
2015 - 2016 · 1 year(s)

Assisted review engineer on evaluating Air & Noise ECA applications.

** denotes projects completed with other firms*

CULTURAL HERITAGE REPORT: EXISTING CONDITIONS AND PRELIMINARY IMPACT ASSESSMENT – ANTHONY PIT

FINAL REPORT

September 22, 2025

Prepared for:
CBM Aggregates
55 Industrial Street
Toronto, Ontario M4G 3W9

Prepared by:
Stantec Consulting Ltd.
300W-675 Cochrane Drive
Markham, Ontario L3R 0B8

Project Number:
160961457

Limitations and Sign-off

The conclusions in the Report entitled Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment – Anthony Pit are Stantec Consulting Ltd.'s professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec Consulting Ltd. (Stantec) was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from CBM Aggregates (the Client) and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

Prepared by: _____
Signature

Laura Walter, MA, CAHP
Printed Name

Reviewed by: _____ Approved by: _____
Signature Signature

Lashia Jones, MA, CAHP Parker Dickson, MA
Printed Name Printed Name

Executive Summary

CBM Aggregates (CBM) a division of St. Marys Cement Inc. retained Stantec Consulting Ltd. (Stantec) to complete a Cultural Heritage Report: Preliminary Impact Assessment and Existing Conditions (CHR) for the CBM Anthony Pit (the Project). The Project Location is the municipal property boundary of 4454 Victoria Road South, in the Township of Puslinch, in Wellington County, Ontario. The CHR is included alongside other multi-discipline studies, as part of a submission to the Ministry of Natural Resources and Forestry (MNRF) to comply with the requirements of the *Aggregate Resources Act*.

Under the *Aggregate Resources of Ontario: Technical Reports and Information* a Cultural Heritage Report is required as a technical report for an aggregate licence. The Cultural Heritage Report must be consistent with provincial requirements under the *Ontario Heritage Act* and the Provincial Policy Statement (Government of Ontario 2020).

In order to identify the presence of built heritage resources and cultural heritage landscapes within or adjacent to the Project, understand the potential impacts of the Project on these resources, and prepare mitigation strategies to minimize these impacts, a CHR has been prepared. The CHR Study Area includes a 50-metre boundary around the Project Location.

Where a potential heritage resource was identified within the CHR Study Area, an evaluation of the potential cultural heritage value or interest of the property, or properties, was undertaken. Where cultural heritage value or interest was identified, the property was determined to contain a built heritage resource or cultural heritage landscape. Historical research, municipal and agency data requests, and field investigations conducted for this report identified one potential built heritage resource, 4436 Victoria Road South (BHR-1).

Based on the location of BHR 1 more than 150 metres away from planned construction activities, separated by another property parcel and Provincially Significant Wetland, no direct or indirect impacts are anticipated to BHR-1, and no mitigation measures are required.

The executive summary highlights key points from the report only; for complete information and findings the reader should examine the complete report.

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APPENDIX B HERITAGE PROJECT PERSONNEL CVS

Project Personnel

Project Manager:	Debbie Giesbrecht, M.Sc.
Heritage Consultant:	Lashia Jones, MA, CAHP
Report Writer:	Laura Walter, MA, CAHP
GIS Specialist:	Paul Moser, BES
Administrative Assistant:	Priscilla Kwan
Quality Reviewer:	Lashia Jones, MA, CAHP
Independent Reviewer:	Parker Dickson, MA

Acronyms / Abbreviations

ARA	*Aggregate Resources Act*
BHR	Built Heritage Resource
CAHP	Canadian Association of Heritage Professionals
CBM	CBM Aggregates
CHER	Cultural Heritage Evaluation Report
CHL	Cultural Heritage Landscape
CHR	Cultural Heritage Report
CHVI	Cultural Heritage Value or Interest
HIA	Heritage Impact Assessment
MA	Master of Arts
MCM	Ministry of Citizenship and Multiculturalism
MNRF	Ministry of Natural Resources and Forestry
MTCS	Ministry of Tourism, Culture and Sport
O. Reg.	Ontario Regulation
OHA	*Ontario Heritage Act*
OHT	Ontario Heritage Trust
PPS	Provincial Planning Statement
PPV	Peak Particle Velocity

1 Introduction

1.1 Study Purpose and Objectives

CBM Aggregates (CBM), a division of St. Marys Cement Inc., retained Stantec Consulting Ltd. (Stantec) to complete a Cultural Heritage Report (CHR): Existing Conditions and Preliminary Impact Assessment – for the CBM Anthony Pit (the Project). The Project Location is the municipal property boundary of 4454 Victoria Road South, in the Township of Puslinch, in Wellington County, Ontario (Figure 1, Figure 2). The CHR is included alongside other multi-discipline studies, as part of a submission to the Ministry of Natural Resources and Forestry (MNRF) to comply with the requirements of the *Aggregate Resources Act*.

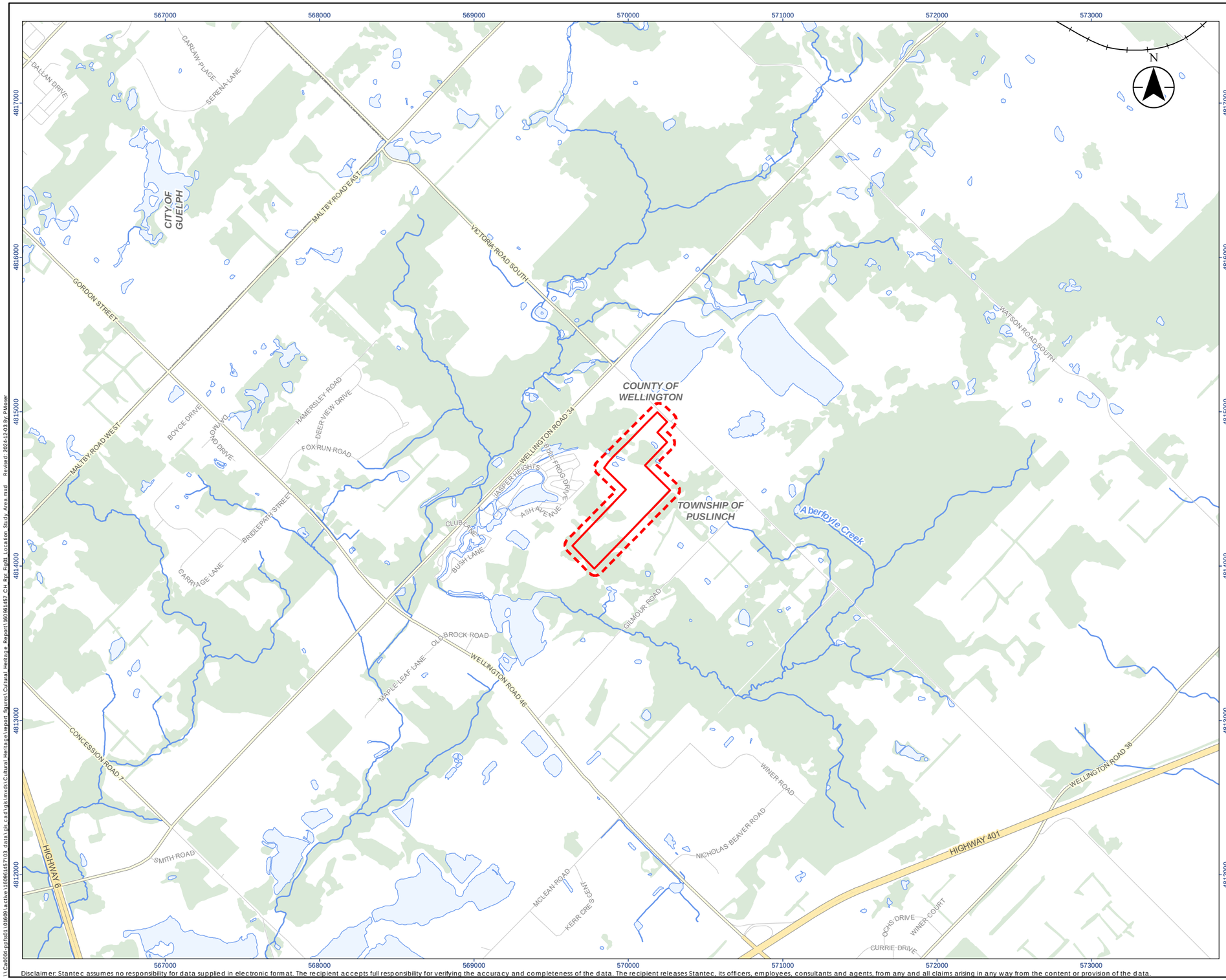
Under the *Aggregate Resources of Ontario: Technical Reports and Information* (Government of Ontario 2020) a CHR is required as a technical report for an aggregate licence. The CHR must be consistent with provincial requirements under the *Ontario Heritage Act* (OHA) (Government of Ontario 1990a) and the Provincial Planning Statement (PPS) (Government of Ontario 2024). See Section 2 for an overview of the applicable methodology for the CHR.

A CHR has been prepared to identify the presence of built heritage resources (BHR) and cultural heritage landscapes (CHL) within the Study Area for the Project, to understand the potential impacts of the Project on these resources, and to prepare mitigation strategies to reduce these impacts. The Study Area includes a 50-metre boundary around the Project Location. The 50-metre Study Area boundary is used as a buffer zone for potential vibration effects resulting from the Project. Although specific structures on a property may be situated outside the 50-metre buffer, the property boundary may be within the 50-metre buffer, and therefore, a BHR or CHL on a property is required to be examined as it is within the Study Area.

As part of the CHR, known and potential BHRs and CHLs were identified, inventoried, and evaluated according to *Ontario Regulation* (O. Reg.) *9/06*, the criteria for determining cultural heritage value or interest (CHVI) (Government of Ontario 2023). A land use history was completed to provide a cultural context for the Study Area and historical background upon which to base evaluations. Where CHVI was identified, the resource was mapped, and recommendations were made for further study. To meet these objectives, the following report:

- Summarizes the historical context of the area surrounding the Project
- Identifies properties protected under the OHA through information requests to the local heritage planners and regulatory bodies
- Identifies and describes known or potential BHRs or CHLs situated on properties within the Study Area based on a windshield survey
- Evaluates the potential CHVI of known or potential BHRs or CHLs in the Study Area according to O. Reg. 9/06 (Government of Ontario 2023)
- Identifies areas of potential impacts according to the Ministry of Citizenship and Multiculturalism (MCM) *InfoSheet #5 in Heritage Resources in the Land Use Planning Process, Cultural Heritage*

and Archaeology Policies of the Ontario Provincial Policy Statement, 2005 (Government of Ontario. 2006).



Stantec

Legend

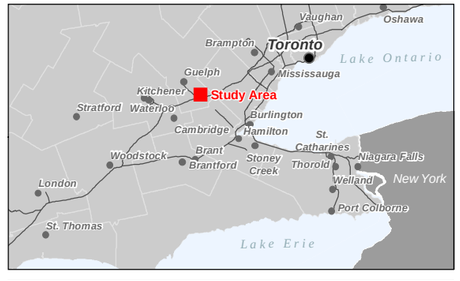
- Project Location
- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Wooded Area
- Municipal Boundary - Lower Tier
- Study Area

0 250 500 metres

1:25,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Orthoimagery © First Base Solutions, 2021.



Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2024-12-03
Technical Review by LW on 2024-12-03

Client/Project

CULTURAL HERITAGE REPORT: EXISTING CONDITIONS AND PRELIMINARY IMPACT ASSESSMENT PROPOSED ANTHONY PIT

Figure No.

1

Title

Location of Study Area

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

\\Ca0004-pgfs01\03\609\active\160961457\03 data\gis\cad\gis\mxds\Cultural Heritage\report figures\Cultural Heritage Report\160961457 CH_Rpt_Fig05_Location Study Area.mxd Revised: 2024-12-03 By: PMoser

Stantec

Legend

- Project Location
- Road
- Watercourse
- Study Area

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
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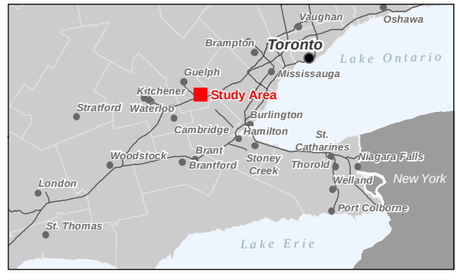

Project Location
Township of Puslinch

160961457 REVA
Prepared by PRM on 2024-12-03
Technical Review by LW on 2024-12-03

Client/Project
CULTURAL HERITAGE REPORT: EXISTING CONDITIONS AND PRELIMINARY IMPACT ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
2

Title
Study Area

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\\Ca0004-prpfs01\01609\active\160961457\09_data\gis_cad\gis\mxds\Cultural Heritage\report figures\Cultural Heritage Report\160961457 CH Rpt_Fig02 Study Area.mxd Revised: 2024-12-03 By: PMoser

2 Methodology

2.1 Regulatory Requirements

The MNRF regulates and issues aggregate licences, permits, and changes to existing approvals. The Project is regulated under the *Aggregate Resources Act* (ARA) (Government of Ontario 1990b). The ARA regulation requires that site plans and technical reports accompany an application according to provincial standards (Government of Ontario 2022). The *Aggregate Resources of Ontario: Technical Reports and Information Standards* (Government of Ontario 2020), includes the preparation of a CHR. The CHR must be consistent with provincial requirements under the OHA and the PPS.

Section 4.6 of the PPS addresses cultural heritage in the land use planning process and was considered. The applicable provisions include:

> *4.6.1 Protected heritage property, which may contain built heritage resources or cultural heritage landscapes, shall be conserved.*
>
> *4.6.4 Planning authorities are encouraged to develop and implement proactive strategies for conserving significant built heritage resources and cultural heritage landscapes*
>
> (Government of Ontario 2024)

2.2 Background History

To familiarize the study team with the Study Area, local historical resources were consulted, archival documents were reviewed, and a summary of the historical background of the local area was prepared. Specifically, historical and topographical mapping from 1861, 1877, 1906, 1916, 1967, and 1972, and aerial photography from 1954 were reviewed to identify the presence of structures, settlements, and other potential built heritage resources and cultural heritage landscapes in advance of the field program.

2.3 Municipal and Agency Information Requests

Listings of provincially and locally designated properties, districts, and easements for the municipality were collected from the Ontario Heritage Trust (OHT), the MCM, and the Township of Puslinch. Consultation with these agencies and municipalities within which the Project is proposed was undertaken to determine the presence of designated, listed, or registered heritage properties within the Study Area.

2.4 Thematic Review: Desktop and Data Sources

A desktop review of historical information (i.e., local histories, archival material, government documents, and primary sources) and topographic mapping was conducted to provide information on the historical context of the Study Area and its surroundings. This included identifying the general nature of the area

and its characteristics (e.g., commercial, residential, rural, industrial, natural landscape, etc.), determining when buildings or structures in the area were constructed, and identifying developments or changes to the area over time. The intent of this review was to determine the thematic development of the municipality within the Study Area and inform the fieldwork approach to determine the presence of previously known or potential BHRs or CHLs. The desktop review determined whether portions of the Study Area and/or individual properties contributed to the identified thematic frameworks (see Section 3.2). The presence of potential heritage resources that contribute to the identified thematic development of the Study Area and surroundings was confirmed by the field survey and subsequent screening-level evaluations of potential heritage properties.

2.5 Field Program

Vehicular windshield surveys were conducted by Kimberly Beech, Landscape Architect Intern, on September 23, 2022, and November 11, 2022, from publicly accessible roadways, unless specified otherwise. During the survey, the Study Area was surveyed for previously identified or potential BHRs or CHLs. Where identified, these were photographed, their characteristics noted while in the field, and their locations digitally recorded.

In general, buildings and structures of more than 40 years of age were screened during the survey for their potential to satisfy O. Reg. 9/06 criteria and the MCM's *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* (MCM 2016) (Appendix A). Only properties containing buildings or structures determined to have potential to satisfy O. Reg. 9/06 were inventoried. The use of the 40-year threshold is generally accepted by both the federal and provincial authorities as a preliminary screening measure for CHVI. This practice does not imply that all buildings and structures more than 40 years of age are inherently of CHVI, nor does it exclude exceptional examples constructed within the past 40 years of being of CHVI.

2.6 Evaluation of Cultural Heritage Value or Interest

The criteria for determining CHVI is defined by O. Reg. 9/06 (Government of Ontario 2023). Each potential heritage resource was considered both as an individual structure and as cultural landscape. Where CHVI was identified, a structure or landscape was assigned a BHR or CHL number and the property was determined to contain a heritage resource.

2.6.1 Ontario Regulation 9/06

1. *The property has design value or physical value because it is a rare, unique, representative or early example of a style, type, expression, material or construction method.*
2. *The property has design value or physical value because it displays a high degree of craftsmanship or artistic merit.*
3. *The property has design value or physical value because it demonstrates a high degree of technical or scientific achievement.*

4. *The property has historical value or associative value because it has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community.*
5. *The property has historical value or associative value because it yields, or has the potential to yield, information that contributes to an understanding of a community or culture.*
6. *The property has historical value or associative value because it demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.*
7. *The property has contextual value because it is important in defining, maintaining or supporting the character of an area.*
8. *The property has contextual value because it is physically, functionally, visually or historically linked to its surroundings.*
9. *The property has contextual value because it is a landmark.*

(Government of Ontario 2023)

2.7 Assessment of Impacts

Where a component of a previously identified or potential BHR or CHL was situated within the Study Area, the impacts of the proposed undertaking were evaluated. The impacts, both direct and indirect, were evaluated according to InfoSheet #5.

Seven potential negative effects have been identified (Government of Ontario 2006), including:

1. **Destruction** of any, or part of any, significant heritage attributes or features
2. **Alteration** that is not sympathetic, or is incompatible, with the historic fabric and appearance
3. **Shadows** created that alter the appearance of a heritage attribute or change the viability of a natural feature or plantings, such as a garden
4. **Isolation** of a heritage attribute from its surrounding environment, context, or a significant relationship
5. **Direct or indirect obstruction** of significant views or vistas within, from, or of built and natural features
6. **A change in land use** such as rezoning a battlefield from open space to residential use, allowing new development or site alteration to fill in the formerly open spaces
7. **Land disturbances** such as a change in grade that alters soils and drainage patterns that adversely affect an archaeological resource

In addition to direct effects related to destruction, the potential for indirect effects resulting from vibration due to construction and operation activities and the transportation of Project components and vehicular traffic were also evaluated. The operation of heavy construction equipment, including pile drivers and pavement breakers, can create seismic waves that radiate along the earth's surface and can be felt as ground vibration. As vibrations travel from a source, they excite the particles of rock and soil and cause the particles to move back and forth. This vibration level dissipates as it travels away from its source (Wilson, Ihrig & Associates et al. 2012:1-2). Although the existing effect of traffic and construction vibrations on historical period structures is not fully known, negative effects have been demonstrated on buildings with a setback of less than 40 metres from the curbside (Crispino and D'Apuzzo 2001; Ellis 1987; Rainer 1982; Wiss 1981). The proximity of Project components to BHRs and CHLs was considered in this assessment, particularly those within 50 metres of the Project, in order to encompass a wide enough buffer zone to account for built resources less than 40 metres from curbside or potential Project activities. Therefore, this area has been used to delineate the Study Area for the CHR.

The severity of soil movements depends primarily on the type and compactness/consistency of the surrounding soils, particularly between the source, receiver, and groundwater levels. The source character, duration, frequency of vibration occurrences, and the foundation-footing interaction also contribute to the stress induced on structures. Regarding built structures, vibration can also have a variable impact depending on the building's mass, the stiffness of the building's main structural elements, and building materials. Wood and steel are more elastic than masonry (i.e., brick and stone). Interior finishes that are more susceptible to damage are those such as lath and plaster (Wilson, Ihrig & Associates et al. 2012:2).

In the absence of in-situ soil data and considering the typical vibration levels induced by anticipated construction equipment associated with the proposed pit expansion, a 50 metre buffer surrounding all pit expansion activities was established to identify a preliminary zone of influence for these activities. It is not anticipated that vibration monitoring will be required for all BHRs or CHLs identified within this potential zone of influence. Rather, it is anticipated that properties within the potential zone of influence will be reviewed as part of the pre-construction vibration assessment as recommended to determine the appropriate distance from pit expansion and potential distribution activities. As further discussed within Section 5, this assessment should take place following the determination of a detailed construction approach, including the identification of machinery to be used.

Indirect impacts resulting from land disturbances apply to archaeological resources, which are beyond the scope of this assessment. An Archaeological Assessment is being prepared under separate cover which addresses the archaeological potential of the Study Area and includes recommendations for further work. No further consideration to archaeological potential or archaeological resources is provided in this report.

3 Existing Conditions

3.1 Background and Historical Research

3.1.1 Introduction

The Study Area is located in southwestern Ontario within the Township of Puslinch, County of Wellington. The Study Area spans the following historical lots and concessions in the Township of Puslinch:

- Part of Lots 21 to 23, Concession 8
- Part of Lots 21 to 22, Concession 9

3.1.2 Physiography

The Study Area is situated within the Horseshoe Moraines physiographic region of southern Ontario. The physiographic region is characterized by a series of broad, horseshoe-shaped glacial moraines which flank the uplands that lie to the west of the Niagara Escarpment. Specifically, the Study Area is located just south of the Paris and Galt moraines that are part of an extensive moraine network in southern Ontario. The Paris Moraine was formed approximately 12,000 to 13,000 years ago by the Ontario ice-lobe as it retreated into the Lake Ontario basin. The Galt Moraine was deposited during a re-advance and stagnation of the Ontario ice lobe (Blackport Hydrogeology Inc. 2009:56).

The Paris Moraine runs from Acton to Cambridge and is a high boulder ridge. Within the Township of Puslinch, the Paris Moraine extends from Arkell, in the east, to Puslinch Lake, in the west. At the community of Arkell, the moraine is steep at an elevation of 388.62 metres, the highest point in the township, and is also the broadest with a width of approximately five kilometres. The moraine slopes to the southwest where it splits into two ridges (Head 1963:11-12). The Galt Moraine runs south and parallel to the Paris Moraine. The Galt Moraine has a height of 335.28 metres in the east and slopes to 304.8 metres in the west. Both moraines are composed mostly of Wentworth Till that is brown to reddish silty sand or sandy silt till (Blackport Hydrogeology Inc. 2009:56). Associated with the moraines is a system of old spillways with broad gravel and sand terraces and swampy floors. The Study Area is composed of a central spillway with peat and muck to the north and till moraines to the south.

Within the Township of Puslinch, the area is very hilly, with steep irregular slopes and small basins or kettle lakes that collect water in the spring and early summer. The soil is coarse stony till composed largely of dolostone with traces of red shale (Chapman and Putnam 1984:128). The Eramosa Branch of the Speed River runs through the northern portion of the Township of Puslinch, draining the area along the City of Guelph border. There are numerous springs and creeks located throughout the township. The moraines provide the relief for the headwaters of many streams. Kettle lakes, including Puslinch Lake and associated wetlands, are common in this region (Blackport Hydrogeology Inc. 2009:24).

3.1.3 Post-Contact Indigenous Overview

"Contact" is typically used as a chronological benchmark when discussing Indigenous archaeology in Canada and describes the contact between Indigenous and European cultures. The precise moment of *contact* is a constant matter of discussion. Contact in what is now the province of Ontario is broadly assigned to the 16th century (Loewen and Chapdelaine 2016).

The post-contact Indigenous occupation of southern Ontario was heavily influenced by the dispersal of various Iroquoian-speaking communities by the New York State Iroquois and the subsequent arrival of Algonkian-speaking groups from northern Ontario at the end of the 17th century and beginning of the 18th century (Konrad 1981; Rogers 1978; Schmalz 1991). This is also the period in which the Mississaugas are known to have moved into southern Ontario and the lower Great Lakes watersheds (Konrad 1981).

The nature of Indigenous settlement size, population distribution, and material culture shifted as European settlers encroached upon their territory. Despite this shift, however, "written accounts of material life and livelihood, the correlation of historically recorded villages to their archaeological manifestations, and the similarities of those sites to more ancient sites have revealed an antiquity to documented cultural expressions that confirms a deep historical continuity to … systems of ideology and thought" (Ferris 2009:114). As a result, Indigenous peoples have left behind archaeological resources throughout southern Ontario which show continuity with past peoples, even if they have not been recorded in historical Euro-Canadian documentation.

Since contact with European explorers and immigrants, and, later, with the establishment of provincial and federal governments (the Crown), the lands within Ontario have been included in various treaties, land claims, and land cessions. Though not an exhaustive list, Morris (1943) provides a general outline of some treaties within the Province of Ontario from 1783 to 1923. Based on Morris (1943), the Study Area is within part of Treaty Number 3, which details the surrender of land to the Crown by the Mississaugas. Treaty Number 3 was:

> *…made with the Mississa[ug]a Indians 7th December, 1792, though purchased as early as 1784. This purchase in 1784 was to procure for that part of the Six Nation Indians coming into Canada a permanent abode. The area included in this Treaty is, Lincoln County excepting Niagara Township; Saltfleet, Binbrook, Barton, Glanford and Ancaster Townships, in Wentworth County; Brantford, Onondaga, Tusc[a]r[o]ra, Oakland and Burford Townships in Brant County; East and West Oxford, North and South Norwich, and Dereham Townships in Oxford County; North Dorchester Township in Middlesex County; South Dorchester, Malahide and Bayham Township in Elgin County; all Norfolk and Haldimand Counties; Pelham, Wainfleet, Thorold, Cumberland and Humberstone Townships in Welland County.*
>
> (Morris 1943:17-18)

3.1.4 19th Century Development

The first survey of the Township of Puslinch was completed in 1791 by the Deputy Provincial Land Surveyor of the Nassau District, Augustus Jones. Jones surveyed a line from Burlington Bay to the Conestoga River at Arthur. This survey line was known as the "Purchase Line" or "Jones Base Line." From the Jones Base Line, the townships within the County of Wellington were laid out (Wellington County Branch OGS 2018).

The remainder of the Township of Puslinch was surveyed by Provincial Land Surveyor David Gibson between 1828 and 1831. The survey was initiated by John Galt, the founder of Guelph and a representative of the Canada Company. Galt, in wanting to make his new town site more accessible, instigated the development of a road from Guelph to Dundas through the Township of Puslinch. The "Dundas Road", or "Aboukir Road" (now Brock Road), ran between Concessions 7 and 8 of the township adjacent to the Study Area (Mack 1977). Gibson first surveyed Concessions 7 to 10 (old survey) for the development of the roadway, followed later by Concessions 1 to 6 (new survey). A Gore section at the southern portion of the township was originally excluded from the original survey as it was set aside as a clergy reserve.

Gibson surveyed the concessions with double front lots that were each approximately 100-acres (Plate 3.1). The old survey followed the Jones Base Line with lots on a north-easterly angle, while the new survey was laid out east to west. The conjunction of the two surveys later caused a "V" shaped arrangement of township roads (Puslinch Historical Committee 1950).

Plate 3.1: Double-Front Survey System (Source: Dean 1969)

Brock Road was originally named Aboukir Road in honour of the British victory at Abourkir Bay in the Battle of the Nile, in 1798. In 1828, Absalom Shade was awarded the contract to construct the roadway. The road was cleared and constructed through dense forests and cedar swamps. Following its completion, Shade was commissioned to complete a road between Guelph and Galt, known as the "Accommodation Road" or "Given Road," that would connect to Brock Road from Concession 4 (Hutchinson 1998:108).

Communities developed along the main Brock Road through the township. Aberfoyle, just south of the Study Area, was one of the first towns along Brock Road. John McFarlane immigrated from Aberfoyle, Perthshire, Scotland, to the township, and purchased Lot 17, Rear Concession 7 in 1841. McFarlane built a house and opened a store there in 1842. A mill was built at Aberfoyle in 1859 by George McLean (Mack 1977).

By 1840, the Township of Puslinch had a population of 1,617. The township was incorporated on January 1, 1850, and was named for the ancestral home of Lieutenant Governor Sir John Colborne's wife (Puslinch Historical Society 2000:8). The population of the township in 1851 had increased to 3,862 residents. Aberfoyle became the seat of administration in 1867, and a town hall was built in the village. By 1877, the population of the township was 4,514 people, and had an area of 60,990 acres (Walker and Miles 1877:4). The Credit Valley Railway was completed through the southern portion of the township in 1879 and a station was built at the Village of Puslinch. It became a main shipping point in the township, as the line ran between Toronto and St. Thomas, with branches to Orangeville and Elora (Puslinch Historical Society 2018). The line became part of the Canadian Pacific Railway in 1884.

The historical maps of the Township of Puslinch from 1861 and 1877 indicate that by the late 19th century most lots within the township had been purchased and settled (Figure 3).

3.1.5 20th Century Development

At the turn of the 20th century, the Township of Puslinch witnessed a change in settlement patterns, as retired farmers began to move into the villages. This coincided with a shift in the specialization of agriculture and industries. Brock Road continued to be the main thoroughfare through the township and was paved between 1921 and 1925, and later became part of the King's Highway 6 (Puslinch Historical Society 2000:27).

Development of Highway 401, south of the Study Area, began in the 1930s when the congestion of automobiles became a problem for towns and cities along Highway 2, which was the main thoroughfare through the province at the time. Construction of Highway 401 occurred during the Great Depression in Ontario and, as a result, the Department of Highways, Ontario was generating road construction projects to assist in providing unemployment relief. Construction of Highway 401 was put on hold at the end of the 1930s, due to the commencement of the Second World War. Following the war, the first portion of Highway 401 was completed in Scarborough in 1947; initially known as Highway 2A, it was changed to Highway 401 in 1952, when the 400-series highway numbering came into effect. Highway 401 was completed across the province in the 1950s and 1960s, with the final section between Gananoque and Brockville finished in 1968 (Bevers 2022).

Within the Township of Puslinch, land was purchased for the development of Highway 401 in the mid-1950s. The construction of the highway had an immediate effect on the township, including a loss of farmland, cutting off township concession roads, disruption of local traffic, and a decentralization of its economy (Puslinch Historical Society 2000:27). The close proximity of the Township of Puslinch to larger urban centres, including the Greater Toronto Area, Hamilton, Milton, Guelph, and Kitchener-Waterloo, has influenced the development of subdivisions for commuters, and industries. Industrial parks developed

off Brock Road, including Kerr Industrial Park in 1979, the Nicholas Beaver Industrial Subdivision in 1980, and the Aberfoyle Business Park in 1995 (Puslinch Historical Society 2000:90).

Since the early 1980s, the City of Guelph began plans for municipal expansion to the south. In 1982, the Joint Fringe Area Planning Program was established to discuss development proposals, boundary issues, and future land use planning for the City of Guelph and Township of Puslinch (Matheson and Anderson 2000:255). It was during this decade that subdivision development occurred off Brock Road just south of the City of Guelph's boundaries, including Maple Leaf Lane (Lot 7, Concession 22) in 1984, Rolling Hills Subdivision (Lots 11 to 13, Concession 8) in 1986, and Fox Run Estates (Lots 18 and 19, Concession 8) in 1989 (Puslinch Historical Society 2000:91). In 1990, the *Wellington County Study – Future Land Needs,* was adopted by the City of Guelph and Township of Puslinch and became the basis for the annexation of land in 1993. This annexation included the Study Area with the transfer of 1,488.5 hectares (3678.16 acres) from the township to the City of Guelph (Matheson and Anderson 2000:255). The township's population increased in the late 20th century and continues to do so in the early 21st century, influenced by industrial and residential development. The township's population increased from 3,592 in 1971, to 7,336 in 2016 (Statistics Canada 1971; Statistics Canada 2017).

3.1.6 Site History

3.1.6.1 East Half, Lot 21, Concession 8

The 1861 map of the County of Wellington (Leslie and Wheelock 1861) depicts Ebenezer Langdon on east half of the lot and no structures are depicted on Langdon's parcel (Figure 3). In the *Gazetteer and Directory of the County of Wellington 1867* (Irwin and Burnham 1867: 80-81), Ebenezer Landon is listed as a householder on Lot 21, Concession 8.

The 1877 Township of Puslinch map (Walker and Miles 1877) depicts Nelson on the east half (Figure 3). No structures are depicted on Lot 21, Concession 8. In *The County of Wellington Gazetteer and Directory for 1879-1880* (Armstrong & Delion 1879:86-87), Sand Nelson is listed as a freeholder on Lot 21, Concession 8.

The 1906 Township of Puslinch map (Historical Atlas Publishing Co. 1906) depicts the east half occupied by Thomas Warren with a structure fronting the roadway (Figure 4). On the 1916 topographic map of Galt (Department of Militia and Defence 1916), a structure is also depicted on the east portion of the lot fronting the present-day Victoria Road South, but outside of the Study Area (Figure 5). Similarly, a structure, along with two outbuildings, is depicted outside of the Study Area (Figure 5) on the 1976 topographic map of Aberfoyle (Department of Energy, Mines, and Resources 1976). No structures related to the topographic mapping remain within the Study Area.

3.1.6.2 Lot 22, Concession 8

The 1860 map of the County of Wellington (Leslie and Wheelock 1861) depicts a portion of the village of Aberfoyle on the far west end of Lot 22, Concession 8 (Figure 3). The map also depicts a store and sawmill on the property associated with the village of Aberfoyle. The majority of the west half of the lot depicts Patrick McMahan (Mahon) as the occupant. The east half of Lot 22 had been spilt into north and

south parcels, with D. Kane on the north half, and Mrs. Haggerty on the south half (Figure 3). No structures are depicted on the east half of the lot. In the *Gazetteer and Directory of the County of Wellington 1867* (Irwin and Burnham 1867:79), Daniel Kane and Andrew Haggarty are listed as householders on Lot 22, Concession 8.

The 1877 Township of Puslinch map (Walker and Miles 1877) depicts P. Mahon on the west half, D. Gain on the north quarter of the east half, and H. Haggarty on the south quarter of the east half (Figure 3). On the west half, a structure is depicted fronting the roadway in the village of Aberfoyle. A large pond is also depicted on the property associated with the mill in Aberfoyle. On the east half, a structure is depicted on the southwest corner of Haggarty's property.

The 1906 Township of Puslinch map (Historical Atlas Publishing Co. 1906) depicts the west half of the property associated with the development of the village of Aberfoyle along Brock Road, with the remainder of the west half of the lot under the Peter Mahon estate (Figure 4). The large pond is depicted centrally on the west half. Philip Crumliss is depicted on the east half of the lot with a structure off the present-day Victoria Road South. The 20th century development of the west half of Lot 22 remained associated with the village of Aberfoyle. On the 1916 topographic map of Galt (Department of Militia and Defence 1916), a brick or stone structure is depicted to the south of the Study Area on the east half of the lot fronting present-day Victoria Road South (Figure 5). On the 1976 topographic map of Aberfoyle (Department of Energy, Mines, and Resources 1976), this same structure is depicted to the south of the Study Area but three new outbuildings are depicted within the Study Area (Figure 5). The main structure may be the extant building at 4426 Victoria Road South.

3.1.7 Lot 23, Concession 8

The 1860 map of the County of Wellington (Leslie and Wheelock 1861) depicts the west half of Lot 23, Concession 8 as just outside of the village of Aberfoyle with a sawmill on the property. William Black is listed as the owner on west half of the lot. John McKauge is depicted on the east half of Lot 23 (Figure 3). No structures are depicted on the east half of the lot. In the *Gazetteer and Directory of the County of Wellington 1867* (Irwin and Burnham 1867:77), William Black is listed as a freeholder on Lot 23, Concession 8.

The 1877 Township of Puslinch map (Walker and Miles 1877) depicts William Black on the west half and J. M. McCagne on the east half (Figure 3). The map shows a saw or grist mill on the west half of Lot 23. A structure is also depicted on the west half, just east of the large pond. No structures are depicted on the east half of the lot.

The 1906 Township of Puslinch map (Historical Atlas Publishing Co. 1906) depicts the west half of the property as part of the village of Aberfoyle and a 78-acre section owned by Peter Black (Figure 4). George Hunt is depicted on the east half of the lot with a structure fronting the present-day Gilmour Road. The 20th century development of the west half of Lot 23 remained associated with the village of Aberfoyle. The same 19th century structure associated with Hunt is depicted on the 1916 topographic map of Galt (Department of Militia and Defence 1916) fronting the present-day Gilmour Road (Figure 5). The 1976 topographic map of Aberfoyle (Department of Energy, Mines, and Resources 1976) depicts additional structures on the east half of Lot 23, however these structures are outside of the Study Area.

3.1.8 West Half Lot 21, Concession 9

The 1860 map of the County of Wellington (Leslie and Wheelock 1861) depicts Duncan McKercher on the west half of Lot 21, Concession 9 (Figure 3). No structures are depicted on the map on the lot. In the *Gazetteer and Directory of the County of Wellington 1867* Irwin and Burnham 1867:77), Duncan McKerracher listed as a freeholder on Lot 21, Concession 9.

The 1877 Township of Puslinch map (Walker and Miles 1877) depicts B. McKercher on the west half of Lot 21, with a structure on the southwest portion of the property (Figure 3). McKercher is listed as a freeholder of the property in *The County of Wellington Gazetteer and Directory for 1879-1880* (Armstrong & Delion 1879:86).

The 1906 Township of Puslinch map (Historical Atlas Publishing Co. 1906) depicts Henry Kelleher on the west half of the property with a structure fronting present-day Wellington Road 34 (Figure 4). This structure is also depicted on the 1916 topographic map of Galt (Department of Militia and Defence 1916) (Figure 5). On the 1976 topographic map of Aberfoyle (Department of Energy, Mines, and Resources 1976) this structure had been removed, with one outbuilding remained to the southeast (Figure 5).

3.1.9 West Half Lot 22, Concession 9

The 1860 map of the County of Wellington (Leslie and Wheelock 1861) depicts the R.B. Morrison on the property (Figure 3). No structures are depicted on the lot. In the *Gazetteer and Directory of the County of Wellington 1867* (Irwin and Burnham 1867:81), Morrison is listed as a freeholder on Lot 22, Concession.

The 1877 Township of Puslinch map (Walker and Miles 1877) depicts D. McNeilty as the owner on the west half of Lot 22, with a structure in the southwest corner of the property, outside of the Study Area (Figure 3). The 1906 Township of Puslinch map (Historical Atlas Publishing Co. 1906) depicts Michael Hohenadale on the west half of the Lot 22, with a structure fronting present-day Victoria Road South outside of the Study Area (Figure 4). This structure is also depicted on the 1916 topographic map of Galt (Department of Militia and Defence 1916) and the 1976 topographic map of Aberfoyle (Department of Energy, Mines, and Resources 1976) (Figure 5). This structure still exists but is outside the Study Area.

3.2 Thematic History

The thematic development of the Study Area during the 19th and 20th centuries has been influenced by several factors which have also played a broader role in the development of the Township of Puslinch. These themes include geographic and historical factors. The following key themes were identified for the Study Area:

- Early Settlement and Development (1828-1871)
- Mechanization of Agriculture and Urban Migration (1872-1954)
- Industrial development and residential subdivisions (1955-present)

These themes and their implications on the development of the Study Area are discussed in the following sections.

3.2.1 Early Settlement and Development

The survey of the Township of Puslinch was completed between 1828 and 1831. By 1840, the Township of Puslinch had a population of 1,617 (Puslinch Historical Society 2000:8). Following the end of the Napoleonic Wars, the British government actively encouraged immigration to Upper Canada. As a result, a wave of British immigrants arrived in the Township of Puslinch and the population increased to 3,862, with 1,696 people of Great Britain descent (Census of Canada 1853). A large majority of early settlers to the township were Scottish Highlanders (Township of Puslinch 2022). By 1861, the population increased to 4,701 (Census of Canada 1861). The 1861 Township of Puslinch map (Leslie and Wheelock 1861) depicts the Study Area and surrounding township with several occupants (Figure 3). The township's population decreased into the late 19th century, with a population in 1871 of 4,514, and 1881 of 3,985 (Census of Canada 1873). This decrease was due to most of the land in the township having been settled by the mid-19th century as the frontier moved to the north.

3.2.2 Mechanization of Agriculture and Urban Migration

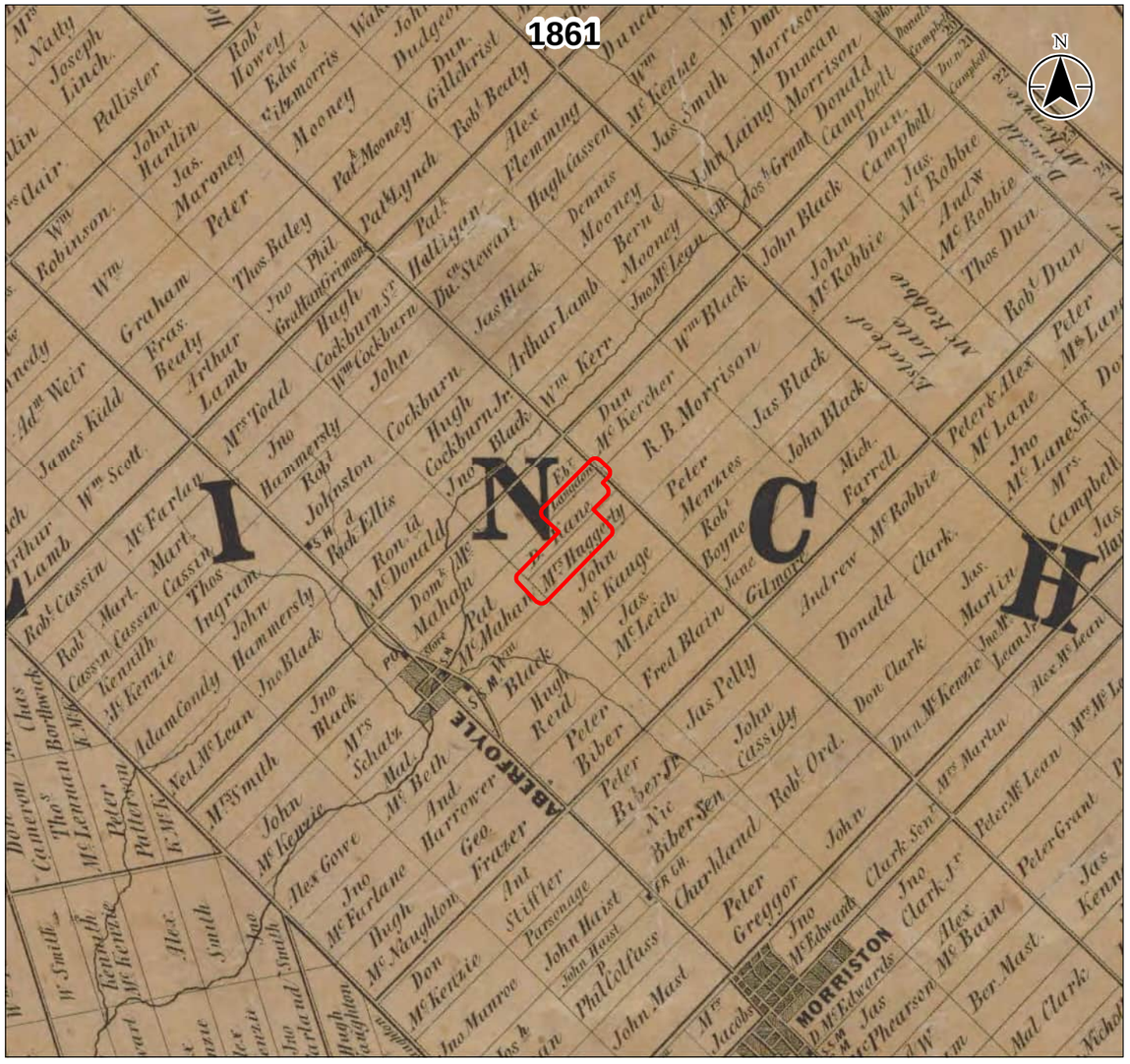
During the late 19th and early 20th century, most farms were owned by the family who worked them. In general, farms were inherited, and the average lifespan of Ontarians was increasing. Therefore, many children of farmers sought opportunity in the newly opened lands of western Canada or migrated to the burgeoning industrial cities of Ontario.

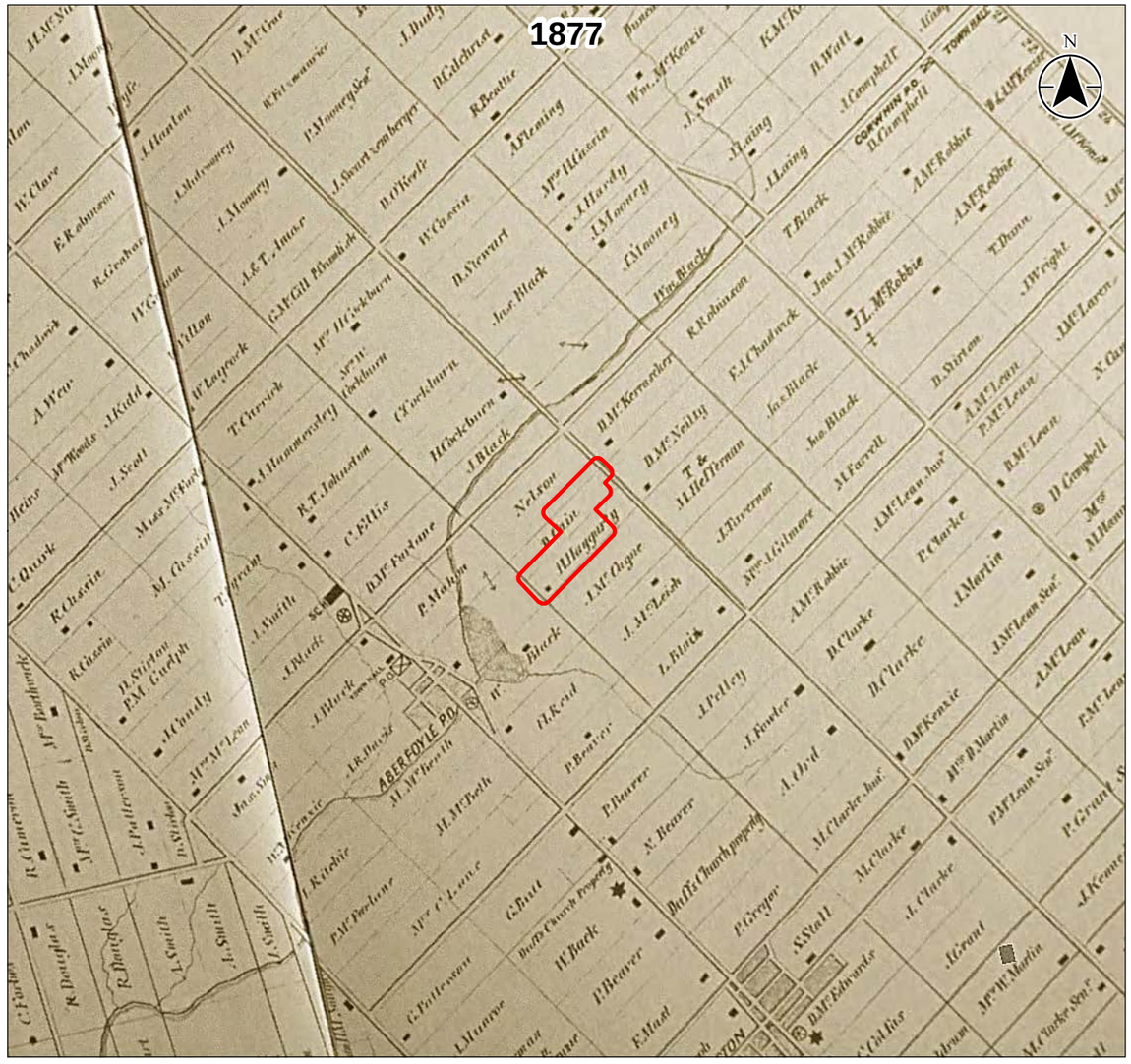
In 1871, the Township of Puslinch had 57,212 acres occupied, with 36,513 acres of improved land. Of the improved land, 27,587 acres was under crops, 8,104 acres was pasture, and 822 acres was orchards. The average farm size was 50 to 100 acres (Census of Canada 1875). In the late 19th century, agricultural numbers slightly increased such that in 1891, the township had 57,940 acres occupied, with 46,754 acres of improved land. Of the improved land, 35,425 acres was under crops, 10,500 acres was pasture, and 829 acres was gardens and orchards (Census of Canada 1893). While the population declined into the late 19th century, improvements in technology allowed farmers to cultivate more land with less labour (Sampson 2012; Drummond 1987:30). As a result, the amount of improved land in the township continued to rise into the early 20th century.

At the turn of the 20th century, the Township of Puslinch witnessed a change in settlement patterns, as retired farmers began to move into the villages and employment attracted people to the City of Guelph to the north. The township's population declined from 3,045 in 1901 to 2,462 in 1921, while the City of Guelph's population grew from 11,496 in 1901 to 18,128 in 1921 (Dominion of Bureau Statistics 1924). In the early 20th century, the average farm size remained 51 to 100 acres. In 1921, the township had 29,469 acres of field crops, with the largest crops being oats, hay, and mixed grains (Dominion Bureau of Statistics 1925). By 1941, the township's population declined to 2,312, while the City of Guelph's population increased to 23,273 (Dominion of Bureau of Statistics 1944). In 1941, the township had 57,777 acres of occupied farmland, with 441 farm operators. Of the occupied farmland, 24,633 acres was field crops (Dominion Bureau of Statistics 1941). Ten years later, in 1951, the number of farm operators decreased to 374 and the number of occupied farmlands decreased to 52,199 acres (Dominion Bureau of Statistics 1953).

3.2.3 Industrial Development and Residential Subdivisions

In the 1950s, land was purchased for the development of Highway 401, which resulted in a loss of farmland and a decentralization of the economy. The close proximity of the Township of Puslinch to larger urban centres, including the Greater Toronto Area, Hamilton, Milton, Guelph, and Kitchener-Waterloo, influenced the development of subdivisions for commuters and commercial industries. Industrial parks developed off Brock Road between 1979 and 1995 (Puslinch Historical Society 2000:90). Influenced by the growth of the City of Guelph, residential subdivision development occurred in the township beginning in the 1980s (Puslinch Historical Society 2000:91). Influenced by this industrial and residential development, the township's population increased into the late 20th century from 3,592 in 1971, to 5,397 in 1991 (Statistics Canada 1971; Statistics Canada 1991).





Notes

1. Leslie, Guy and Charles J. Wheelock. 1861. *Map of the County of Wellington, Canada West.* Orangeville: Guy Leslie and Charles J. Wheelock.
2. Walker and Miles. 1877. *Illustrated Historical Atlas of the County of Wellington, Ontario.* Toronto: Walker and Miles.

Legend

Study Area

Figure Not to Scale

Stantec

Project Location	160961457 REVA
Township of Puslinch	Prepared by PRM on 2024-12-03
	Technical Review by LW on 2024-12-03

Client/Project

CULTURAL HERITAGE REPORT: EXISTING CONDITIONS AND PRELIMINARY IMPACT ASSESSMENT PROPOSED ANTHONY PIT

Figure No.

3

Title

19th Century Historical Mapping

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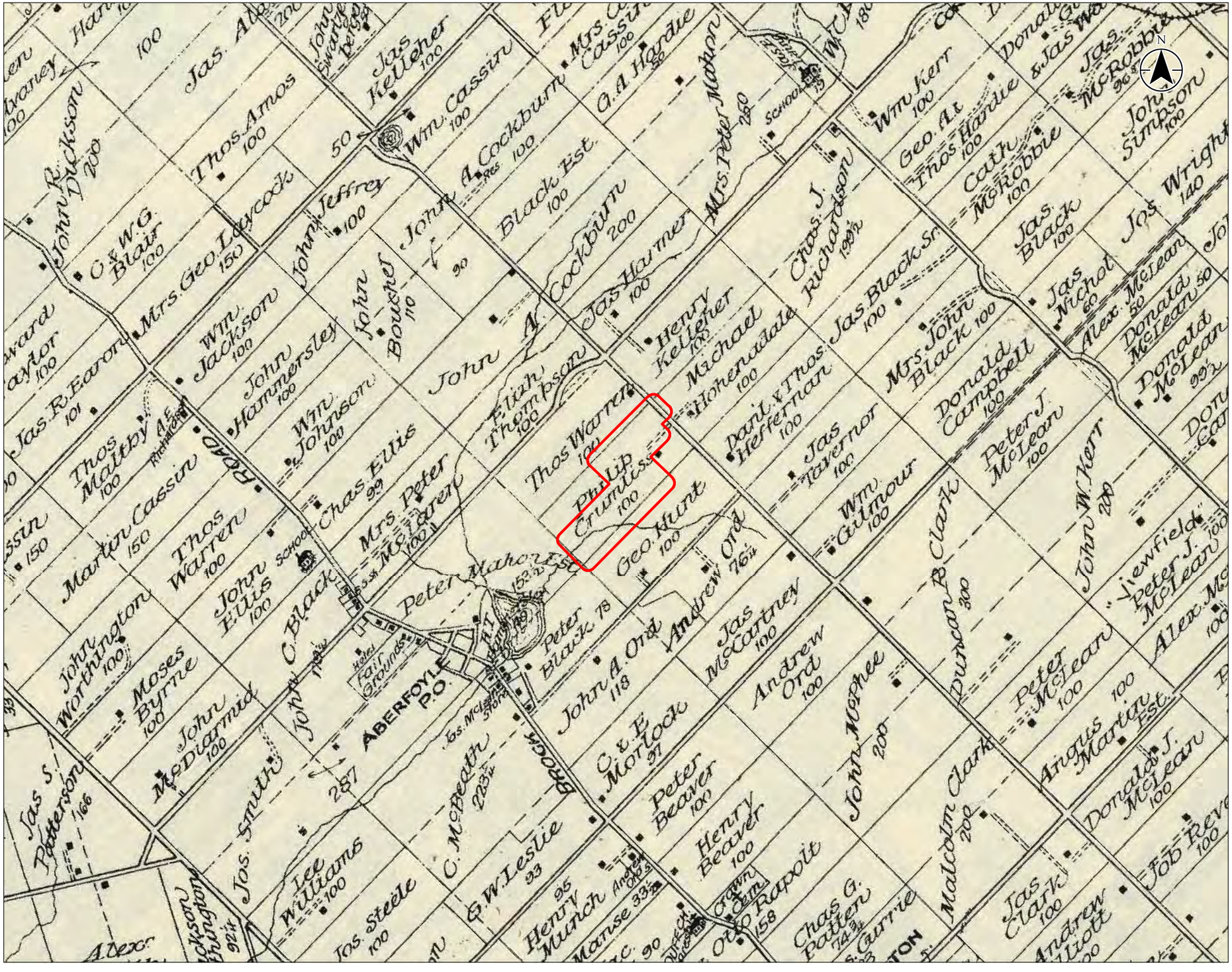

Stantec

Legend

Study Area

Figure Not to Scale

Notes

1. Historical Atlas Publishing Co. 1906. *Wellington County 1906.* Toronto: Historical Atlas Publishing Co.

Project Location
Township of Puslinch

160961457 REVA
Prepared by PRM on 2024-12-03
Technical Review by LW on 2024-12-03

Client/Project
CULTURAL HERITAGE REPORT: EXISTING CONDITIONS AND PRELIMINARY IMPACT ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
4

Title
1906 Township of Puslinch Map

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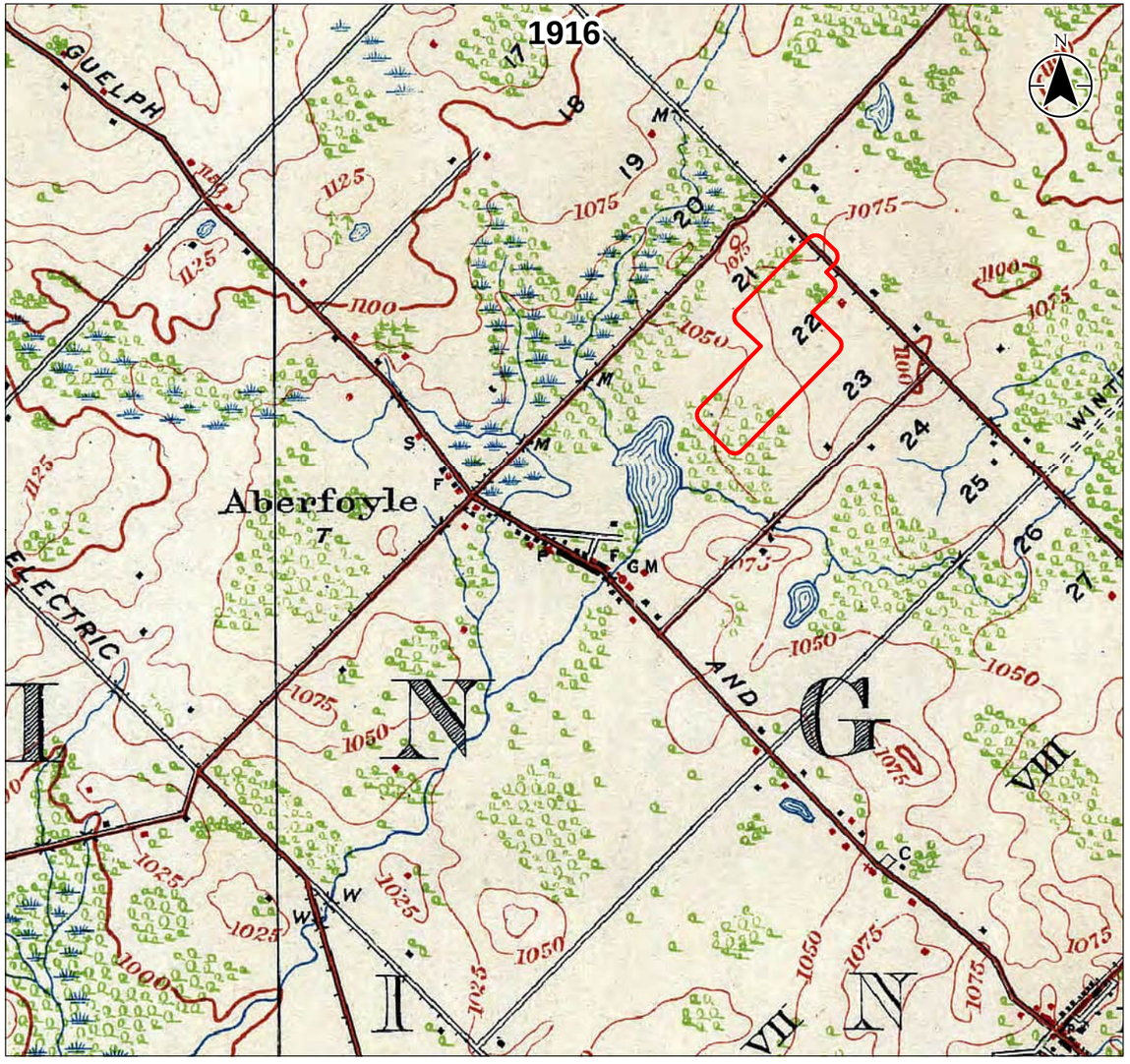

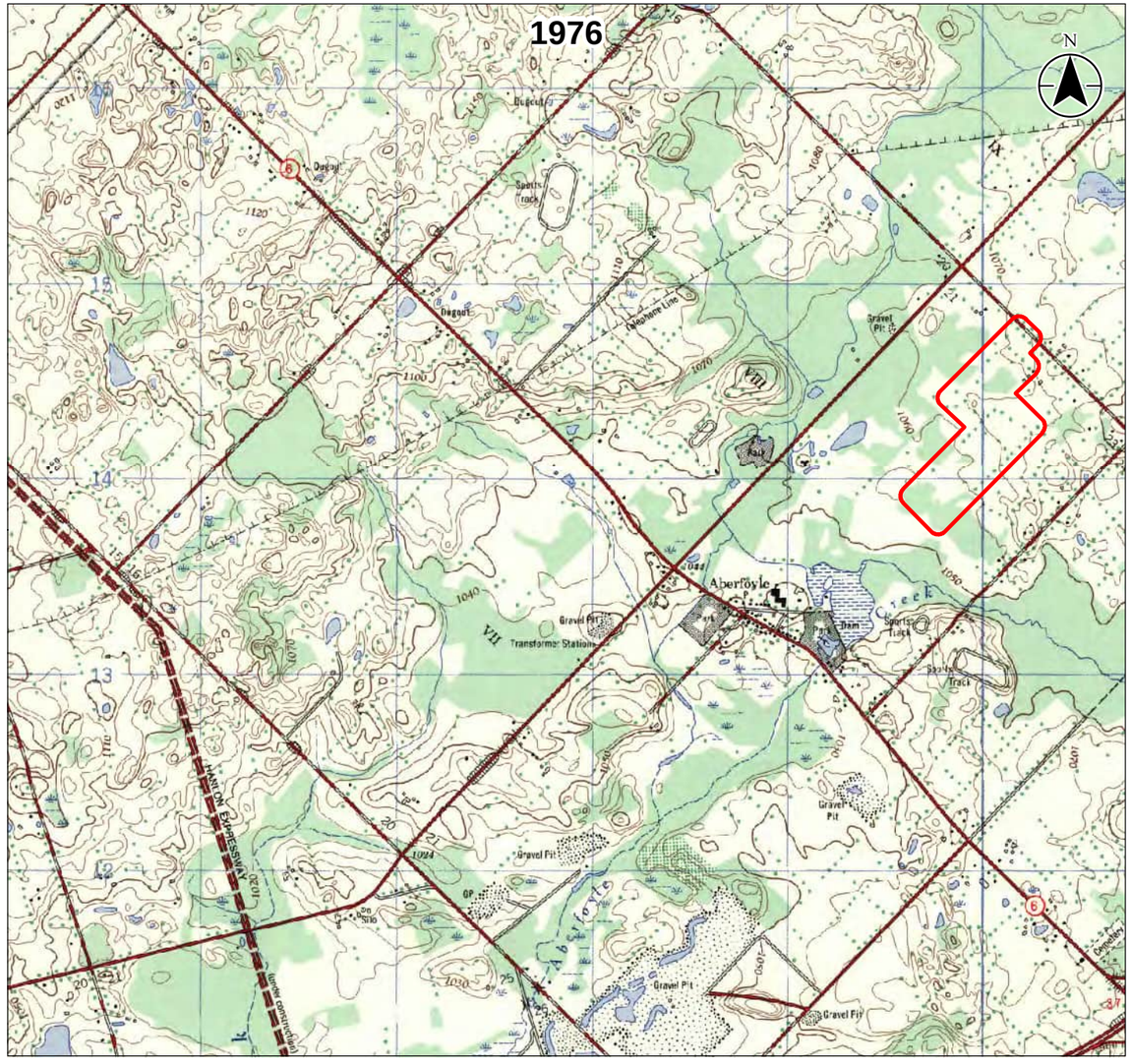

Legend

Study Area

Figure Not to Scale

Notes

1. Department of Militia and Defence. 1916. Topographic Map, Ontario, Galt Sheet.
2. Department of Energy, Mines, and Resources. 1976. Aberfoyle, Ontario. Ottawa: Surveys and Mapping Branch, Department of Energy, Mines, and Resources.

Stantec

Project Location	160961457 REVA
Township of Puslinch	Prepared by PRM on 2024-12-03
	Technical Review by LW on 2024-12-03

Client/Project

CULTURAL HERITAGE REPORT: EXISTING CONDITIONS AND PRELIMINARY IMPACT ASSESSMENT PROPOSED ANTHONY PIT

Figure No.

5

Title

20th Century Topographic Mapping

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\\Ca0004-pfs01\0809\active\160961457\03_data\gis_cad\gis\mxds\Cultural_Heritage\report_figures\Cultural_Heritage_Report\160961457_CH_Rpt_Fig05_20th_Century_Mapping.mxd Revised: 2024-12-03 By: PMoser

3.3 Municipal and Agency Consultation

To identify known BHRs or CHLs, the MCM, OHT, and Township of Puslinch were contacted, and municipal heritage registers were reviewed. As a result of the information request and review of heritage registers, six properties were identified within the Study Area. Table 3-1 summarizes the requests and results.

Table 3-1 Municipal and Agency Information Request Results

Organization	Result	Municipal Address	Level of Recognition	Relationship to Study Area
OHT	No OHT-owned properties or easements within or adjacent to the Study Area	Not applicable (N/A)	N/A	N/A
MCM	No properties designated by Minister or provincial heritage properties within or adjacent to the Study Area	N/A	N/A	N/A
Township of Puslinch	No listed or designated properties within or adjacent to the Study Area	N/A	N/A	N/A

3.4 Identification of Potential Built Heritage Resources and Cultural Heritage Landscapes

As described in Section 2.5 Stantec conducted a windshield survey of the Study Area to identify potential BHRs and CHLs within the Study Area. Where identified, the BHRs and CHLs were photographically documented from publicly accessible road rights-of-way and their locations digitally recorded.

The Project Location is situated northeast of the community of Aberfoyle, Ontario. The proposed pit is located southwest of the decommissioned Abefoyle – Tikal Aggregate Pit that is situated at the southeast corner of Wellington Road 34 and Victoria Road South. The Tikal Pit was operated until 2011 when available aggregate was removed, and operations ceased. A neighbouring aggregate pit (Dufferin Aggregate Pit) is situated immediately to the east (Photo 1). Victoria Road South, within the Study Area, is a two-lane asphalt paved road with very narrow gravel shoulders (Photo 2). Both sides of the road are lined with timber utility poles with no streetlighting. The road is lined with vegetation on private properties, with a mix of mature, young and intermediate trees, grassed area, brush and naturalized areas, as well as ditches and maintained lawns (Photo 3, Photo 4). The structures within the Study Area are mostly residential (with some commercial use in a residential setting) and include a mix of mid-to-late and late 20th century residences (Photo 5, Photo 6).

Photo 1: Aberfoyle Tikal Pit, looking east

Photo 2: Victoria Road South looking north to the intersection at Wellington Road 34

Photo 3: Victoria Road South, looking south

Photo 4: Victoria Road South, looking north

Photo 5: Mid-20th Century residence along Victoria Road South, looking north

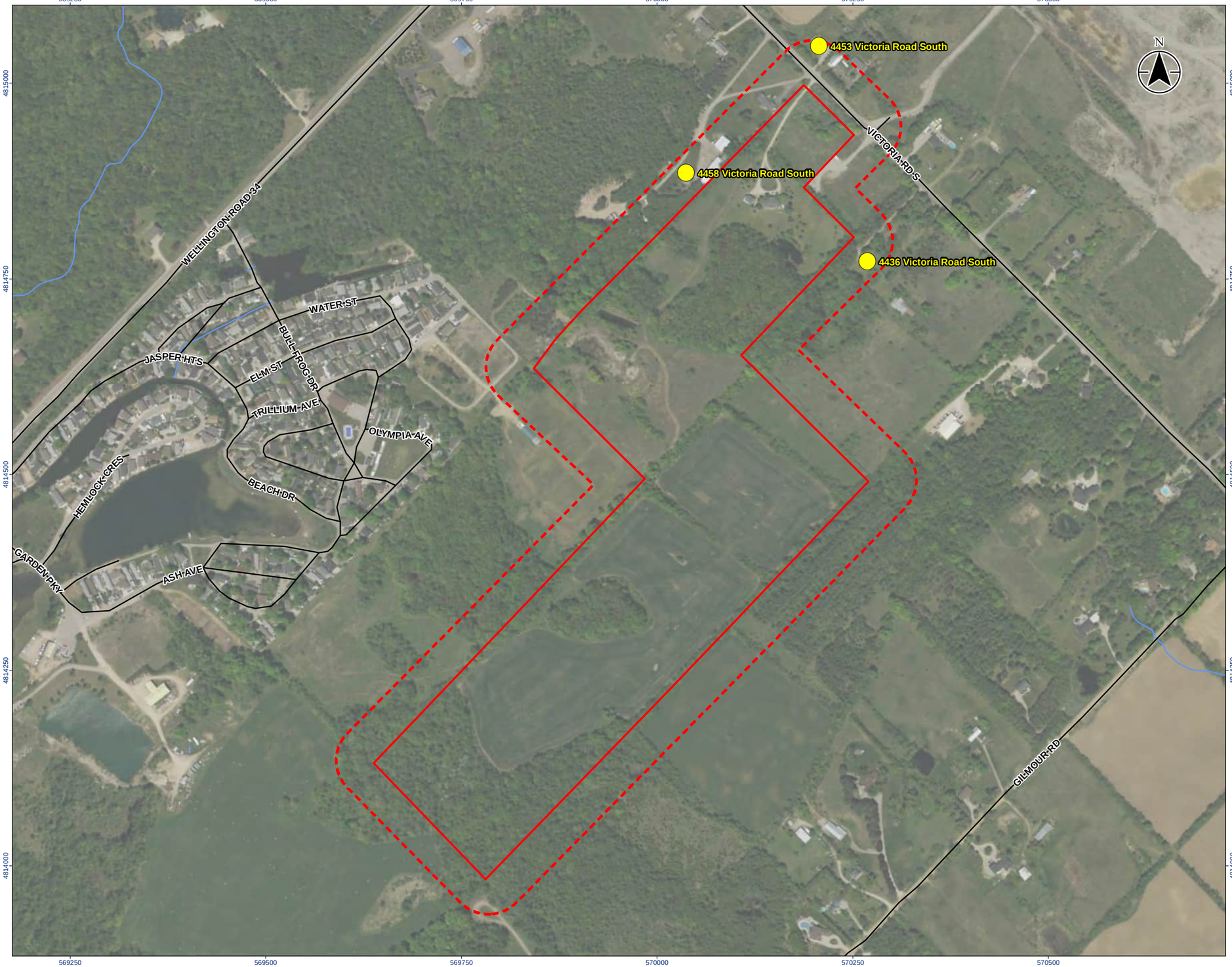
Photo 6: Late 20th/early 21st century residence along Victoria Road South, looking south

As described in Section 2, known and potential BHRs and CHLs were assessed based on the MCM's *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* (MCM 2016), supplemented by historical research and field investigations (Figure 6). Properties with buildings or structures 40 or more years old were field documented and screened as having potential CHVI if they met one or more of the criteria prescribed in O. Reg. 9/06 (Government of Ontario 2023). Each property was considered both as an BHR and as part of a larger potential CHL. If a cultural heritage resource was found to have the potential for CHVI, the built heritage resource (referred to as BHR) and cultural heritage landscape (referred to as CHL) was assigned a number. Those not determined to have CHVI were screened out and not given a BHR or CHL number.

An inventory of the identified BHR within the Study Area based on documentary research and field investigations is provided in Table 3-2 and is mapped in Figure 7.

Table 3-2 Identified Built Heritage Resources and Cultural Heritage Landscapes

Reference Number	Type of Property	Location	Heritage Recognition	Description of Known or Potential CHVI	Photograph
BHR-1	Residence	4436 Victoria Road South	Identified during the field survey	This property contains a residence and outbuildings. The residence is set back approximately 100 metres from the roadway and is screened by dense vegetation on the property. Even in leaf off conditions, details of the residence were difficult to observe, other than a 1.5 storey height and stone cladding. The location of the house and use of stone suggests it is likely structure depicted on the 1916 topographic mapping. The property has potential to demonstrate design or physical value as a late 19th or early 20th century rural residence, however architectural details of the structure are obscured from a view at the roadway.	



Stantec

Legend

- Project Location
- Potential Heritage Resources
- Road
- Watercourse
- Study Area

0 100 200 metres

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Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Orthoimagery © First Base Solutions, 2021.

Project Location
Township of Puslinch

160961457 REVA
Prepared by PRM on 2024-12-03
Technical Review by LW on 2024-12-03

Client/Project
CULTURAL HERITAGE REPORT: EXISTING CONDITIONS AND PRELIMINARY IMPACT ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
6

Title
Potential Heritage Resources

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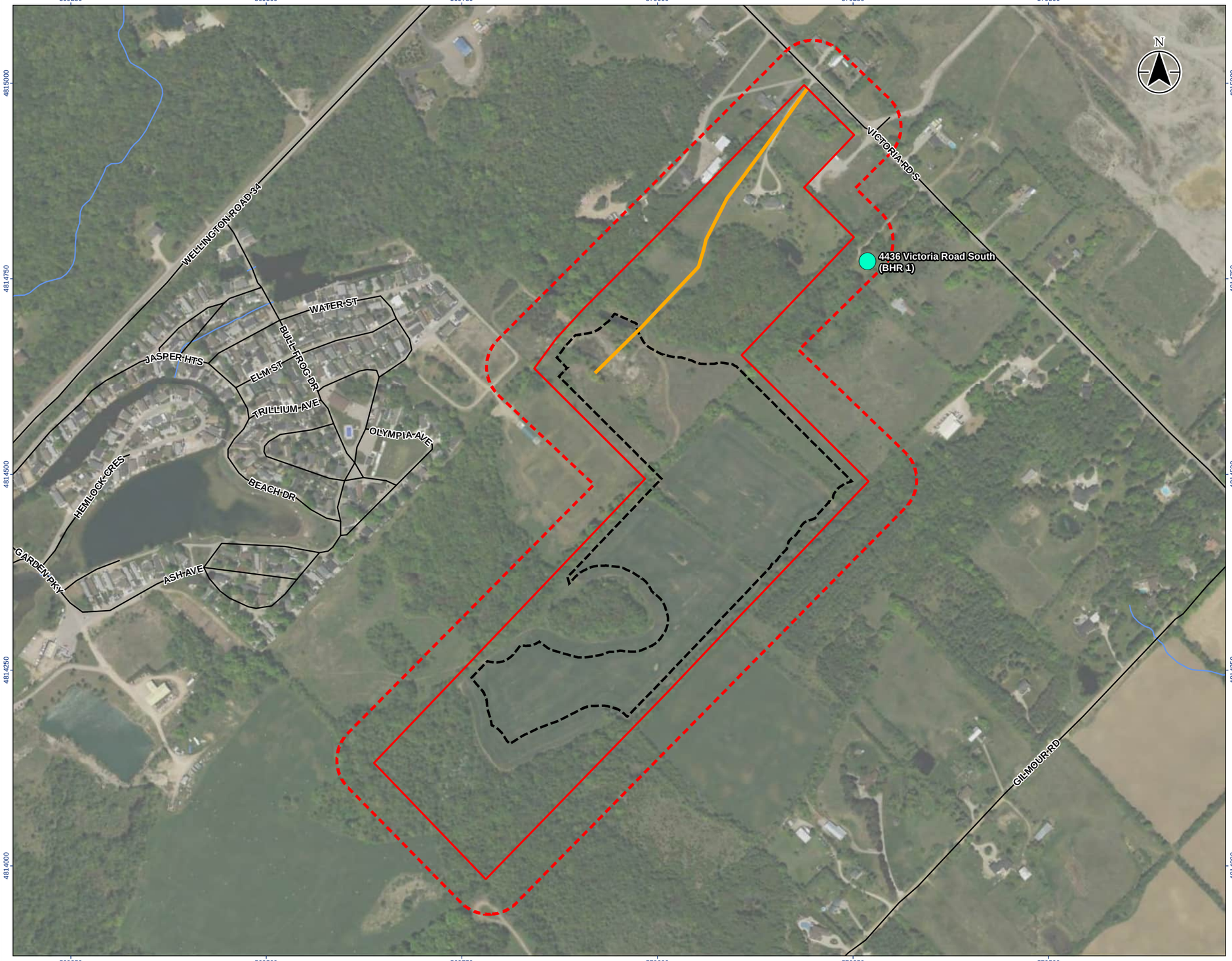

Stantec

Legend

- Project Location
- Identified Heritage Resources
- Road
- Watercourse
- Acces Route
- Area of Extraction Footprint
- Study Area

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021.
3. Orthoimagery © First Base Solutions, 2021.

Project Location
Township of Puslinch

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Technical Review by LW on 2025-02-04

Client/Project
CULTURAL HERITAGE REPORT: EXISTING CONDITIONS AND PRELIMINARY IMPACT ASSESSMENT
PROPOSED ANTHONY PIT

Figure No.
7

Title
Identified Heritage Resources

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4 Preliminary Impact Assessment

4.1 Description of Proposed Undertaking

The proponent is proposing to construct a new aggregate pit located at part Lot 22, Concession 8 (municipal address 4454 Victoria Road South), in the Township of Puslinch, Wellington County. There is one neighbouring active pit in operation (Dufferin Pit). The neighbouring gravel pit operates under a Class A Licence.

4.2 Identification of Preliminary Potential Project Specific Impacts and Proposed Mitigation Measures

The residence at BHR-1 is situated adjacent to the Project Location, however construction activities are not anticipated to occur within at least 150 m of BHR-1. Extraction is proposed, at its nearest point, about 200m south-west of the building and trucks will use the road about 190 m northwest of the building to access the site. The property at 4454 Victoria Road South and a Provincially Significant Wetland are located between BHR-1 and the proposed operations, as a result construction is not permitted to occur within 50m of BHR-1. As a result, direct and indirect impacts are not anticipated for BHR-1, and mitigation measures are not required.

5 Recommendations

Historical research, municipal and agency data requests, and field investigations conducted for this report identified one potential built heritage resource, 4436 Victoria Road South (BHR-1).

Based on the location of the BHR more than 150 m away from planned construction activities, separated by another property parcel and Provincially Significant Wetland, no direct or indirect impacts are anticipated to BHR-1, and no mitigation measures are required and there are no further recommended cultural heritage reporting requirements.

To assist in retaining historical information, a copy of this report should be deposited with a local repository of historical material. Therefore, it is recommended that this report be deposited at the following location:

Puslinch Public Library
29 Brock Road South
Puslinch, Ontario N0B 2J0

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APPENDICES

Appendix A MCM's Criteria for Evaluating Potential Built Heritage Resources and Cultural Heritage Landscapes

Ontario

Ministry of Tourism, Culture and Sport

Programs & Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes

A Checklist for the Non-Specialist

The **purpose of the checklist** is to determine:

- if a property(ies) or project area:
  - is a recognized heritage property
  - may be of cultural heritage value
- it includes all areas that may be impacted by project activities, including – but not limited to:
  - the main project area
  - temporary storage
  - staging and working areas
  - temporary roads and detours

Processes covered under this checklist, such as:

- *Planning Act*
- *Environmental Assessment Act*
- *Aggregates Resources Act*
- *Ontario Heritage Act* – Standards and Guidelines for Conservation of Provincial Heritage Properties

Cultural Heritage Evaluation Report (CHER)

If you are not sure how to answer one or more of the questions on the checklist, you may want to hire a qualified person(s) (see page 5 for definitions) to undertake a cultural heritage evaluation report (CHER).

The CHER will help you:

- identify, evaluate and protect cultural heritage resources on your property or project area
- reduce potential delays and risks to a project

Other checklists

Please use a separate checklist for your project, if:

- you are seeking a Renewable Energy Approval under Ontario Regulation 359/09 – separate checklist
- your Parent Class EA document has an approved screening criteria (as referenced in Question 1)

Please refer to the Instructions pages for more detailed information and when completing this form.

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Project or Property Name

Anthony Pit

Project or Property Location (upper and lower or single tier municipality)

Township of Puslinch, Wellington County

Proponent Name

CBM Aggregates

Proponent Contact Information

Stephen May, stephen.may@vcimentos.com

Screening Questions

	Yes	No
1. Is there a pre-approved screening checklist, methodology or process in place?	☐	☑

If Yes, please follow the pre-approved screening checklist, methodology or process.

If No, continue to Question 2.

Part A: Screening for known (or recognized) Cultural Heritage Value

	Yes	No
2. Has the property (or project area) been evaluated before and found **not** to be of cultural heritage value?	☐	☑

If Yes, do **not** complete the rest of the checklist.

The proponent, property owner and/or approval authority will:

- summarize the previous evaluation and
- add this checklist to the project file, with the appropriate documents that demonstrate a cultural heritage evaluation was undertaken

The summary and appropriate documentation may be:

- submitted as part of a report requirement
- maintained by the property owner, proponent or approval authority

If No, continue to Question 3.

	Yes	No
3. Is the property (or project area):		
a. identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value?	☐	☑
b. a National Historic Site (or part of)?	☐	☑
c. designated under the *Heritage Railway Stations Protection Act*?	☐	☑
d. designated under the *Heritage Lighthouse Protection Act*?	☐	☑
e. identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office (FHBRO)?	☐	☑
f. located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?	☐	☑

If Yes to any of the above questions, you need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report, if a Statement of Cultural Heritage Value has not previously been prepared or the statement needs to be updated

If a Statement of Cultural Heritage Value has been prepared previously and if alterations or development are proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No, continue to Question 4.

Part B: Screening for Potential Cultural Heritage Value

	Yes	No
4. Does the property (or project area) contain a parcel of land that:		
a. is the subject of a municipal, provincial or federal commemorative or interpretive plaque?	☐	☑
b. has or is adjacent to a known burial site and/or cemetery?	☐	☑
c. is in a Canadian Heritage River watershed?	☐	☑
d. contains buildings or structures that are 40 or more years old?	☑	☐

Part C: Other Considerations

	Yes	No
5. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area):		
a. is considered a landmark in the local community or contains any structures or sites that are important in defining the character of the area?	☐	☑
b. has a special association with a community, person or historical event?	☐	☑
c. contains or is part of a cultural heritage landscape?	☐	☑

If Yes to one or more of the above questions (Part B and C), there is potential for cultural heritage resources on the property or within the project area.

You need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report (CHER)

If the property is determined to be of cultural heritage value and alterations or development is proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No to all of the above questions, there is low potential for built heritage or cultural heritage landscape on the property.

The proponent, property owner and/or approval authority will:

- summarize the conclusion
- add this checklist with the appropriate documentation to the project file

The summary and appropriate documentation may be:

- submitted as part of a report requirement e.g. under the *Environmental Assessment Act, Planning Act* processes
- maintained by the property owner, proponent or approval authority

Instructions

Please have the following available, when requesting information related to the screening questions below:

- a clear map showing the location and boundary of the property or project area
    - large scale and small scale showing nearby township names for context purposes
- the municipal addresses of all properties within the project area
- the lot(s), concession(s), and parcel number(s) of all properties within a project area

For more information, see the Ministry of Tourism, Culture and Sport's Ontario Heritage Toolkit or Standards and Guidelines for Conservation of Provincial Heritage Properties.

In this context, the following definitions apply:

- **qualified person(s)** means individuals – professional engineers, architects, archaeologists, etc. – having relevant, recent experience in the conservation of cultural heritage resources.
- **proponent** means a person, agency, group or organization that carries out or proposes to carry out an undertaking or is the owner or person having charge, management or control of an undertaking.

1. Is there a pre-approved screening checklist, methodology or process in place?

An existing checklist, methodology or process may already be in place for identifying potential cultural heritage resources, including:

- one endorsed by a municipality
- an environmental assessment process e.g. screening checklist for municipal bridges
- one that is approved by the Ministry of Tourism, Culture and Sport (MTCS) under the Ontario government's Standards & Guidelines for Conservation of Provincial Heritage Properties [s.B.2.]

Part A: Screening for known (or recognized) Cultural Heritage Value

2. Has the property (or project area) been evaluated before and found not to be of cultural heritage value?

Respond 'yes' to this question, if all of the following are true:

A property can be considered not to be of cultural heritage value if:

- a Cultural Heritage Evaluation Report (CHER) - or equivalent - has been prepared for the property with the advice of a qualified person and it has been determined not to be of cultural heritage value and/or
- the municipal heritage committee has evaluated the property for its cultural heritage value or interest and determined that the property is not of cultural heritage value or interest

A property may need to be re-evaluated, if:

- there is evidence that its heritage attributes may have changed
- new information is available
- the existing Statement of Cultural Heritage Value does not provide the information necessary to manage the property
- the evaluation took place after 2005 and did not use the criteria in Regulations 9/06 and 10/06

Note: Ontario government ministries and public bodies [prescribed under Regulation 157/10] may continue to use their existing evaluation processes, until the evaluation process required under section B.2 of the Standards & Guidelines for Conservation of Provincial Heritage Properties has been developed and approved by MTCS.

To determine if your property or project area has been evaluated, contact:

- the approval authority
- the proponent
- the Ministry of Tourism, Culture and Sport

3a. Is the property (or project area) identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value e.g.:

i. designated under the *Ontario Heritage Act*

- individual designation (Part IV)
- part of a heritage conservation district (Part V)

Individual Designation – Part IV

A property that is designated:

- by a municipal by-law as being of cultural heritage value or interest [s.29 of the *Ontario Heritage Act*]
- by order of the Minister of Tourism, Culture and Sport as being of cultural heritage value or interest of provincial significance [s.34.5]. **Note**: To date, no properties have been designated by the Minister.

Heritage Conservation District – Part V

A property or project area that is located within an area designated by a municipal by-law as a heritage conservation district [s. 41 of the *Ontario Heritage Act*].

For more information on Parts IV and V, contact:

- municipal clerk
- Ontario Heritage Trust
- local land registry office (for a title search)

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ii. subject of an agreement, covenant or easement entered into under Parts II or IV of the *Ontario Heritage Act*

An agreement, covenant or easement is usually between the owner of a property and a conservation body or level of government. It is usually registered on title.

The primary purpose of the agreement is to:

- preserve, conserve, and maintain a cultural heritage resource
- prevent its destruction, demolition or loss

For more information, contact:

- Ontario Heritage Trust - for an agreement, covenant or easement [clause 10 (1) (c) of the *Ontario Heritage Act*]
- municipal clerk – for a property that is the subject of an easement or a covenant [s.37 of the *Ontario Heritage Act*]
- local land registry office (for a title search)

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iii. listed on a register of heritage properties maintained by the municipality

Municipal registers are the official lists - or record - of cultural heritage properties identified as being important to the community.

Registers include:

- all properties that are designated under the *Ontario Heritage Act* (Part IV or V)
- properties that have not been formally designated, but have been identified as having cultural heritage value or interest to the community

For more information, contact:

- municipal clerk
- municipal heritage planning staff
- municipal heritage committee

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iv. subject to a notice of:

- intention to designate (under Part IV of the *Ontario Heritage Act*)
- a Heritage Conservation District study area bylaw (under Part V of the *Ontario Heritage Act*)

A property that is subject to a **notice of intention to designate** as a property of cultural heritage value or interest and the notice is in accordance with:

- section 29 of the *Ontario Heritage Act*
- section 34.6 of the *Ontario Heritage Act.* **Note**: To date, the only applicable property is Meldrum Bay Inn, Manitoulin Island. [s.34.6]

An area designated by a municipal by-law made under section 40.1 of the *Ontario Heritage Act* as a **heritage conservation district study area**.

For more information, contact:

- municipal clerk – for a property that is the subject of notice of intention [s. 29 and s. 40.1]
- Ontario Heritage Trust

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v. included in the Ministry of Tourism, Culture and Sport's list of provincial heritage properties

Provincial heritage properties are properties the Government of Ontario owns or controls that have cultural heritage value or interest.

The Ministry of Tourism, Culture and Sport (MTCS) maintains a list of all provincial heritage properties based on information provided by ministries and prescribed public bodies. As they are identified, MTCS adds properties to the list of provincial heritage properties.

For more information, contact the MTCS Registrar at registrar@ontario.ca.

3b. Is the property (or project area) a National Historic Site (or part of)?

National Historic Sites are properties or districts of national historic significance that are designated by the Federal Minister of the Environment, under the *Canada National Parks Act*, based on the advice of the Historic Sites and Monuments Board of Canada.

For more information, see the National Historic Sites website.

3c. Is the property (or project area) designated under the *Heritage Railway Stations Protection Act*?

The *Heritage Railway Stations Protection Act* protects heritage railway stations that are owned by a railway company under federal jurisdiction. Designated railway stations that pass from federal ownership may continue to have cultural heritage value.

For more information, see the Directory of Designated Heritage Railway Stations.

3d. Is the property (or project area) designated under the *Heritage Lighthouse Protection Act*?

The *Heritage Lighthouse Protection Act* helps preserve historically significant Canadian lighthouses. The Act sets up a public nomination process and includes heritage building conservation standards for lighthouses which are officially designated.

For more information, see the Heritage Lighthouses of Canada website.

3e. Is the property (or project area) identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office?

The role of the Federal Heritage Buildings Review Office (FHBRO) is to help the federal government protect the heritage buildings it owns. The policy applies to all federal government departments that administer real property, but not to federal Crown Corporations.

For more information, contact the Federal Heritage Buildings Review Office.

See a directory of all federal heritage designations.

3f. Is the property (or project area) located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?

A UNESCO World Heritage Site is a place listed by UNESCO as having outstanding universal value to humanity under the Convention Concerning the Protection of the World Cultural and Natural Heritage. In order to retain the status of a World Heritage Site, each site must maintain its character defining features.

Currently, the Rideau Canal is the only World Heritage Site in Ontario.

For more information, see Parks Canada – World Heritage Site website.

Part B: Screening for potential Cultural Heritage Value

4a. Does the property (or project area) contain a parcel of land that has a municipal, provincial or federal commemorative or interpretive plaque?

Heritage resources are often recognized with formal plaques or markers.

Plaques are prepared by:

- municipalities
- provincial ministries or agencies
- federal ministries or agencies
- local non-government or non-profit organizations

For more information, contact:

- municipal heritage committees or local heritage organizations – for information on the location of plaques in their community
- Ontario Historical Society's Heritage directory – for a list of historical societies and heritage organizations
- Ontario Heritage Trust – for a list of plaques commemorating Ontario's history
- Historic Sites and Monuments Board of Canada – for a list of plaques commemorating Canada's history

4b. Does the property (or project area) contain a parcel of land that has or is adjacent to a known burial site and/or cemetery?

For more information on known cemeteries and/or burial sites, see:

- Cemeteries Regulations, Ontario Ministry of Consumer Services – for a database of registered cemeteries
- Ontario Genealogical Society (OGS) – to locate records of Ontario cemeteries, both currently and no longer in existence; cairns, family plots and burial registers
- Canadian County Atlas Digital Project – to locate early cemeteries

In this context, adjacent means contiguous or as otherwise defined in a municipal official plan.

4c. Does the property (or project area) contain a parcel of land that is in a Canadian Heritage River watershed?

The Canadian Heritage River System is a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage.

Canadian Heritage Rivers must have, and maintain, outstanding natural, cultural and/or recreational values, and a high level of public support.

For more information, contact the Canadian Heritage River System.

If you have questions regarding the boundaries of a watershed, please contact:

- your conservation authority
- municipal staff

4d. Does the property (or project area) contain a parcel of land that contains buildings or structures that are 40 or more years old?

A 40 year 'rule of thumb' is typically used to indicate the potential of a site to be of cultural heritage value. The approximate age of buildings and/or structures may be estimated based on:

- history of the development of the area
- fire insurance maps
- architectural style
- building methods

Property owners may have information on the age of any buildings or structures on their property. The municipality, local land registry office or library may also have background information on the property.

Note: 40+ year old buildings or structure do not necessarily hold cultural heritage value or interest; their age simply indicates a higher potential.

A building or structure can include:

- residential structure
- farm building or outbuilding
- industrial, commercial, or institutional building
- remnant or ruin
- engineering work such as a bridge, canal, dams, etc.

For more information on researching the age of buildings or properties, see the Ontario Heritage Tool Kit Guide Heritage Property Evaluation.

Part C: Other Considerations

5a. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) is considered a landmark in the local community or contains any structures or sites that are important to defining the character of the area?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has potential landmarks or defining structures and sites, for instance:

- buildings or landscape features accessible to the public or readily noticeable and widely known
- complexes of buildings
- monuments
- ruins

5b. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) has a special association with a community, person or historical event?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has a special association with a community, person or event of historic interest, for instance:

- Aboriginal sacred site
- traditional-use area
- battlefield
- birthplace of an individual of importance to the community

5c. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) contains or is part of a cultural heritage landscape?

Landscapes (which may include a combination of archaeological resources, built heritage resources and landscape elements) may be of cultural heritage value or interest to a community.

For example, an Aboriginal trail, historic road or rail corridor may have been established as a key transportation or trade route and may have been important to the early settlement of an area. Parks, designed gardens or unique landforms such as waterfalls, rock faces, caverns, or mounds are areas that may have connections to a particular event, group or belief.

For more information on Questions 5.a., 5.b. and 5.c., contact:

- Elders in Aboriginal Communities or community researchers who may have information on potential cultural heritage resources. Please note that Aboriginal traditional knowledge may be considered sensitive.
- municipal heritage committees or local heritage organizations
- Ontario Historical Society's "Heritage Directory" - for a list of historical societies and heritage organizations in the province

An internet search may find helpful resources, including:

- historical maps
- historical walking tours
- municipal heritage management plans
- cultural heritage landscape studies
- municipal cultural plans

Information specific to trails may be obtained through Ontario Trails.

Appendix B Heritage Project Personnel CVs

Lashia Jones B.A., M.A., CAHP

Senior Cultural Heritage Specialist

15 years of experience

Lashia Jones is a Senior Cultural Heritage Specialist and member of Stantec's Environmental Services Team, with experience in identifying, evaluating and planning for cultural heritage resources. Ms. Jones is a member of the Canadian Association of Heritage Professionals, and has a Master's Degree in Canadian Studies from Carleton University, specializing in Heritage Conservation. Ms. Jones has worked for both public and private sector clients, providing a variety of cultural heritage services including heritage impact assessments, cultural heritage evaluations, inventories of cultural heritage resources, heritage conservation districts, heritage master plans, conservation plans and cultural heritage bridge evaluations. Ms. Jones is well versed with local, provincial and national tools for the identification, evaluation and planning best practices for cultural heritage resources, including the Ontario Heritage Act, Provincial Policy Statement, Planning Act, Environmental Assessment Act, Ontario Heritage Tool Kit, Standards and Guidelines for the Conservation of Provincial Heritage Properties and the Standards and Guidelines for the Conservation of Historic Places in Canada. Lashia's role on various project types has given her experience in public engagement and consultation, constructive dialogue with clients, heritage committees, local councils and multi-disciplinary project teams.

EDUCATION

Master of Arts, Canadian Studies (Heritage Conservation Specialty), Carleton University, Ottawa, Ontario, Canada, 2012

Bachelor of Arts (Honours), Cultural Anthropology / English Literature, University of Toronto, Ontario, Canada, 2009

MEMBERSHIPS

Member, Canadian Association of Heritage Professionals, 2014-present

PROJECT EXPERIENCE

HERITAGE/ARCHAEOLOGICAL RESOURCE SECTIONS FOR ENVIRONMENTAL IMPACT ASSESSMENTS

Rehabilitation of Cambellford Crowe Bay Dam and Locks | Campbellford, Ontario, Canada | 2016 | Cultural Heritage Specialist

Columbus Road Detailed Design | Whitby, Ontario, Canada | 2023

Cultural Heritage Assessment Report, Malden Road | LaSalle, Ontario | 2020 | Cultural Heritage Specialist

Cultural Heritage Assessment Report, Denis St. Pierre Water Control Treatment Plant | Town of Lakeshore, Ontario | 2020 | Cultural Heritage Specialist

Heritage Impact Assessment, West London Dyke | London, Ontario | 2016-2018 | Cultural Heritage Specialist

Heritage Impact Assessment, Beaver Creek | Waterloo, Ontario | 2016

Cultural Heritage Assessment Report, Belle River | Belle River, Ontario | Cultural Heritage Specialist

Amherstburg Cultural Heritage Assessment Report | Amherstburg, Ontario | 2018 | Cultural Heritage Specialist

HERITAGE/ARCHAEOLOGICAL RESOURCE IMPACT ASSESSMENTS

Cultural Heritage Screening Report, Metrolinx Stouffville Corridor | Toronto and Markham, Ontario | 2016 | Cultural Heritage Specialist

Heritage Impact Assessment, 1664 Huron Road, | Kitchener, Ontario | 2017 | Cultural Heritage Specialist

Heritage Impact Assessment, former residence | Erin, Ontario | 2018

Cultural Heritage Evaluation Report, Nanticoke Generating Station | Nanticoke, Ontario | 2016 | Cultural Heritage Specialist

Cultural Heritage Evaluation Report, Lambton Generating Station | Township of St. Clair, Ontario | 2017 | Cultural Heritage Specialist

Heritage Impact Assessment, 36-40 York Street | London, Ontario | 2016-2017 | Cultural Heritage Specialist

Heritage Impact Assessment, 23 Queen's Park Crescent | Toronto, Ontario | Cultural Heritage Specialist

Heritage Impact Assessments/ Cultural Heritage Assessments* | Various | 2012-2016

Heritage Impact Assessment for Piers 5-8 West Harbour* | Hamilton, Ontario | 2013 | Heritage Planner

Heritage Impact Assessment for Residential Properties and Proposed Quarry Expansion* | Hamilton, Ontario | 2013 | Heritage Specialist

HERITAGE PLANNING

Downtown St. Thomas Heritage Conservation District Study | St. Thomas, Ontario | Cultural Heritage Specialist

Kincardine Heritage Conservation District Study | Kincardine , Ontario, Canada | 2019 | Cultural Heritage Specialist

Strategic Conservation Plan Niagara Power Generating Station | Niagara Falls, Ontario | 2019 | Cultural Heritage Specialist

** denotes projects completed with other firms*

Strategic Conservation Plan Sir Adam Beck II Generating Station | Niagara Falls, Ontario, Canada | 2018-2019 | Cultural Heritage Specialist

Downtown St. Thomas Heritage Conservation District Plan | St. Thomas, Ontario | 2017-2018 | Cultural Heritage Specialist; Project Manager

St. Clair Heritage Conservation District Plan Update | Hamilton, Ontario | 2018 | Cultural Heritage Specialist

St. George-Grosvenor Heritage Conservation District Study, London | London, Ontario | 2016 | Cultural Heritage Specialist

Strategic Conservation Plan, Nanticoke Generating Station | Nanticoke, Ontario | 2017 | Cultural Heritage Specialist

Conservation Plan, 1664 Huron Road, Kitchener | Kitchener, Ontario | 2017 | Cultural Heritage Specialist

Bloor West Village Heritage Conservation District Study | Toronto, Ontario | 2018-2021 | Cultural Heritage Specialist

Heritage Conservation Districts* | Various | 2009-2016

Cultural Heritage Plans / Management Plans* | Various | 2012-2016

Cultural Heritage Evaluation Report, King George School* | Hamilton, Ontario | 2015 | Heritage Specialist

Cultural Heritage Evaluation Report, 91 John Street South* | Hamilton, Ontario | Heritage Specialist

Burlington Heights Heritage Lands Management Plan* | Hamilton, Ontario | Heritage Researcher/Heritage Specialist

Cultural Heritage Evaluation Report, 140 Locke Street South* | Hamilton, Ontario | Heritage Specialist

Whitehern Landscape Conservation Management Plan* | Hamilton, Ontario | Heritage Specialist

HERITAGE BRIDGES

Cultural Heritage Evaluation Report, Victoria Street Pedestrian Bridge, Township of Centre Wellington | Township of Centre Wellington, Ontario | 2016 | Cultural Heritage Specialist

Cultural Heritage Evaluation Report, Riverside Bridge | London, Ontario | 2017 | Cultural Heritage Specialist

Bridge Design Guidelines | Township of Centre Wellington, Ontario | 2016 | Cultural Heritage Specialist

24 Cultural Heritage Bridge Evaluation Reports, City of Hamilton | Hamilton, Ontario | 2017-2018 | Cultural Heritage Specialist

Big Otter Creek Bridge Cultural Heritage Evaluation Report | Tillsonburg, Ontario | 2016 | Cultural Heritage Specialist

Heritage Impact Assessment, Victoria Street Pedestrian Bridge | Township of Centre Wellington, Ontario | 2016 | Cultural Heritage Specialist

Highway 6 Little Current Swing Bridge Heritage Impact Assessment | Northeastern Manitoulin and the Islands, Ontario, Canada | 2019-2021 | Cultural Heritage Specialist

Highway 6 Little Current Swing Bridge Cultural Heritage Evaluation Report | Northeastern Manitoulin and the Islands, Ontario | 2017-2018 | Cultural Heritage Specialist

Heritage Bridge Evaluations* | Various | 2012-2016

PIPELINE SURVEY

Cultural Heritage Assessment Report, Greenstone Pipeline | Greenstone, Ontario | 2017-2018

Cultural Heritage Assessment Report, Dawn Dover Pipeline | Lambton County, Ontario | 2016

EMPLOYMENT HISTORY

Stantec Consulting Ltd.
Senior Cultural Heritage Specialist
Since 2021 · 1 year

Stantec Consulting Ltd.
Cultural Heritage Specialist
2016 - 2020 · 6 years

MHBC Planning
Heritage Planner
2012 - 2016 · 4 years

Golder Associates
Built Heritage Technician
2009 - 2012 · 2 years

PRESENTATIONS

Integrating Heritage and Planning: Exploring the Value of Older Neighbourhoods. *Ontario Professional Planners Institute (OPPI) Annual Conference*, 2017.

Heritage Conservation and Urban Design: Challenges, Successes and Balances. *Ontario Professional Planners Institute (OPPI) Annual Conference*, 2015.

Industrial Heritage Districts and Harnessing Energy: Examples from Ontario. *National Trust for Canada Annual Conference*, 2015.

Rockway Centre: A Case Study of Balancing the Needs of an Older Adult Community and Heritage Conservation in Kitchener. *Heritage Canada Annual Conference*, 2013.

The Designating By-law: A Make-or-Break Tool. *National Trust for Canada Annual Conference* , 2018.

** denotes projects completed with other firms*

Laura Walter MA, BA

Cultural Heritage Specialist

13 years of experience

Laura Walter is a Cultural Heritage Specialist, with over 13 years of experience in the promotion and conservation of cultural heritage through education, public interaction, building conservation, and museums. Ms. Walter is a member of the Canadian Association of Heritage Professionals (CAHP), and has a Master's Degree in Public History from The University of Western Ontario. Laura is well experienced in managing and executing all aspects of cultural heritage studies, from research, site assessment, analysis and evaluation, and the development of mitigation measures and recommendations. Ms. Walter is well versed with local, provincial, and federal tools for the identification, evaluation, conservation, and planning best practices for cultural heritage resources. Laura has a passion for uncovering the unique cultural heritage of communities in Canada. With a strong focus on client relations, Ms. Walter works with clients to achieve a balance between heritage conservation and contemporary development.

EDUCATION

Master of Arts, Public History, The University of Western Ontario, London, Ontario, Canada, 2014

Bachelor of Arts, History Degree, University of Guelph, Guelph, Ontario, Canada, 2012

MEMBERSHIPS

Professional Member, Canadian Association of Heritage Professionals

PROJECT EXPERIENCE

ENVIRONMENTAL ASSESSMENT

Extension of Louis St. Laurent Boulevard | Milton, ON | Report Writer

Bass Pro Mills Extension | Vaughan, ON | Report Writer

Orangeville Water Supply | Orangeville, Ontario | Report Writer

Baffinland Culture, Resources and Land Use | Baffin Island, Nunavut | Report Writer

Peterborough East Side Transportation Study | Peterborough, ON | Report Writer

Colonel Talbot Pumping Station | London, Ontario | Report Writer

Newcastle Urban Area | Regional Municipality of Durham, Ontario | Report Writer

Bramalea Road Improvements | Brampton, Ontario | Report Writer

Upper Little River Watershed | County of Essex, Ontario | Report Writer

Silver Lake and Laurel Creek | Waterloo, Ontario | Report Writer

Living Arts Drive | Mississauga, Ontario | Report Writer

Stormwater Runoff Quality Control & Investigation of Basement Flooding: Area 35 and 37 | Toronto, Ontario | Report Writer

Ring of Fire | Ontario, Canada | Heritage Consultant

HIGHWAY AND TRANSPORTATION

5269 Tremaine Road | Milton, ON | Report Writer

Scheifele Bridge | Waterloo, ON | Report Writer

Bowmanville Rail Expansion - Thornton-CP Grade Separation | Durham Region, Ontario | Report Writer

Des Newman Boulevard | Whitby, Ontario | Report Writer

Roseville Underpass | Township of North Dumfries, Ontario | Report Writer

Thorndale Bridge | County of Middlesex, Ontario | Report Writer

Little Current Swing Bridge | Town of the Northeastern Manitoulin and the Islands, Ontario | Report Writer

Highway 401 Eastern Bridges and Culverts | Northumberland County, Ontario | Report Writer

Bridges No. 2, 3, and 13 | Blue Mountains, Ontario | Report Writer

Culvert on Gully Creek | Municipality of Centre Wellington, Ontario | Report Writer

Lincolnville GO Station Improvements | Municipality of Whitchurch-Stouffville, Ontario | Report Writer

Stouffville Corridor Grade | City of Markham and City of Toronto, Ontario | Report Writer

Bridge over the North Penetangore River | Kincardine, Ontario | Report Writer

Bridge over Highway 401 West, at Watson Road | Puslinch Township, Ontario | Report Writer

Halton North Truck Inspection Station | Town of Halton Hills, Town of Milton, Regional Municipality of Halton, and County of Wellington, Ontario | Report Writer

Bridge over Big Otter Creek | Tillsonburg, Ontario | Report Writer

Victoria Street Pedestrian Bridge | Township of Centre of Wellington, Ontario | Report Writer

Square One Drive Extension | Mississauga, Ontario | Report Writer

Colonel Talbot Pumping Station | London, Ontario | Report Writing

Bridges across the City of Hamilton | Hamilton, Ontario | Report Writer

1350 Courtice Road | Municipality of Clarington, Ontario | Report Writer

Bayview Avenue Improvements | Richmond Hill, Ontario, Canada | Task Manager and Report Writer

Waterfront Toronto Area 2B 2C | Toronto, Ontario, Canada | Task Manager and Report Writer

Highway 652 Extension to Highway 11 | Cochrane, Ontario, Canada | Heritage Consultant

Bridge 37 | Leamington, Ontario, Canada | Heritage Consulant

INDUSTRIAL BUILDINGS

Nipissing Generating Station | Nipissing, ON | Report Writer

Canadian Niagara Power, Ontario Power, and Toronto Power Generating Stations | City of Niagara Falls, Ontario | Report Writer

Lambton Generating Station | Lambton County, Ontario | Report Writer

Thunder Bay Generating Station | Thunder Bay, Ontario | Report Writer

Sir Adam Beck 1 Generating Station | Niagara-on-the-Lake, Ontario | Report Writer

Nanticoke Generating Station | Haldimand County, Ontario | Report Writer

Niagara Transformer Station | Niagara Falls, Ontario, Canada | Report Writer

Elliot Chute | Powassan, Ontario, Canada | Task Manager and Report Writer

Mountain Chute Generating Station | Ompah, Ontario, Canada | Task Manager and Report Writer

HERITAGE PLANNING

Downtown Kincardine | Kincardine, Ontario | Report Writer

Former London Psychiatric Hospital Lands | London, ON | Report Writer

Altona Heritage Commemoration Study | Pickering, Ontario | Report Writer

Heritage Planning Best Practices Review | Halifax, Nova Scotia | Report Writer

Heart Lake Road Corridor | Brampton , Ontario | Report Writer

Bloor West Village | Toronto, Ontario | Report Writer

Bowmanville Post Office | Clarington, Ontario | Report Writer

Downtown St. Thomas | St. Thomas , Ontario | Report Writer

Wolfe Street Tower Proposed Development | London, Ontario | Report Writer

32, 36, 40 York Street Proposed Development | London, Ontario | Report Writer

Salem Secondary Growth Development Plan | Barrie , Ontario | Report Writer

9770 Keele Street | Vaughan, Ontario | Report Writer

Dufferin Sanitary Trunk Sewer System Improvements at G. Ross Lord Reservoir | Toronto , Ontario | Report Writer

Thomasfield Homes Subdivision | Erin, Ontario | Report Writer

4243 Sixth Line | Oakville, Ontario | Report Writer

144 Brock Street, 442-448 George Street North, and 450 George Street North Proposed Development | Peterborough, Ontario | Report Writer

Carlsbad Land Assembly | Ottawa , Ontario | Report Writer

St. Clair Neighbourhood | Hamilton, Ontario | Report Writer

185-205 Derry Road West | Mississauga, Ontario | Report Writer

Floral Clock | Niagara-on-the Lake, Ontario | Report Writer

2093 Gordon Street | Guelph , Ontario | Report Writer

Lower Doon and Homer Watson Park | Kitchener , Ontario | Report Writer

Penetanguishene Mental Health Centre | Penetanguishene, Ontario | Report Writer

Portland Common | Toronto, Ontario | Report Writer

2591 Bradley Avenue | London, Ontario | Report Writer

2187 Gordon Street | Guelph , Ontario | Report Writer

Edwardsburgh Landbank | Edwardsburgh/Cardinal, Ontario | Report Writer

Brookside Youth Detention Centre | Cobourg, Ontario | Report Writer

Locust Hill School | Markham, Ontario | Report Writer

Peterborough Courts | Peterborough, Ontario | Report Writer

311 Jarvis Street | Toronto, ON, Canada | Report Writer

Osgoode Hall and Toronto Courthouse | Toronto, ON, Canada | Report Writer

244-248 Talbot Street | St. Thomas, ON, Canada | Project Manager and Report Writer

12635 Steeles Avenue | Halton Hills, ON, Canada | Project Manager and Report Writer

114 Blake Street | Barrie, ON, Canada | Project Manager and Report Writer

Rotary Pool | Oshawa, Ontario, Canada | Heritage Consultant

Former London Psychiatric Hospital Lands | London, ON, Canada | Report Writer

Sainte-Marie Among the Hurons and Discovery Harbour | Midland, ON, Canada | Task Manager and Report Writer

Prince of Wales Drive | Ottawa, Ontario, Canada | Heritage Consultant and Report Writer

239 Elizabeth Street | Guelph, Ontario, Canada | Project Manager and Report Writer

Maple Heritage Conservation District | Vaughan, Ontario, Canada | Report Writer

12035 Dixie Road | Caledon, Ontario, Canada | Heritage Consultant

Main Street East Heritage Conservation District Study | Grimsby, Ontario, Canada | Task Manager and Report Writer

317 Powerline Road | Brantford, Ontario, Canada | Project Manager and Report Writer

13-25 King Street East | Hamilton, Ontario, Canada | Project Manager

199, 203, 205, 207-209, 215-217, and 219-221 Main Street North, 34, 38, 42, 44 Thomas Street, and 4 Market Street | Brampton, Ontario, Canada | Project Manager and Report Writer

LANDSCAPE ARCHITECTURE

Peel Manor Health Care Facility | Report Writer

South Drive Accessibility Improvements | Ottawa, Ontario | Report Writer

Cliff Street Cooling and Heating Plant, Ottawa Ontario | Ottawa, Ontario | Cultural Heritage Specialist

Rehabilitation of the West Sector and Bank Street Valley | Ottawa, Ontario | Report Writer

West Employment Lands | Waterloo, Ontario | Report Writer

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Georgian Sands Pipeline | Township of Springwater, Ontario | Report Writer

Windsor Pipeline Replacement | Essex County and Municipality of Chatham-Kent, Ontario | Report Writer

Sarnia Pipeline | Lambton County, Ontario | Report Writer

Kirkwall-Hamilton Pipeline | Hamilton, Ontario | Report Writer

Pipeline to Serve Fenelon Falls | Municipality of Durham and City of Kawartha Lakes, Ontario | Report Writer

Pipeline to Serve Sarnia | Sarnia , Ontario | Report Writer

Pipeline to Serve Seaton Lands | Durham Region, Ontario | Report Writer

Pipeline Dawn to Dover, Panhandle Reinforcement, | Lambton County and Municipality of Chatham-Kent, Ontario | Report Writer

Pipeline to Serve Southern Bruce County | Counties of Bruce, and Grey , Ontario | Report Writer

Pipeline to Serve the Whitney Block | Toronto, Ontario | Report Writer

Pipeline to Serve Greenstone | Municipality of Greenstone, Ontario | Cultural Heritage Specialist

Pipeline to Serve Chatham-Kent | Municipality of Chatham-Kent, Ontario | Report Writer

Pipeline to Kingsville Expansion | Essex County, Ontario | Report Writer

NPS Don River Replacement and Supply | Toronto, Ontario | Report Writer

Pipeline to Serve Clarence-Rockland, | Clarence-Rockland, Ontario | Report Writer

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** denotes projects completed with other firms*

Level I and II Water_Report for Proposed Anthony Aggregate Pit, 4454 Victoria Road South, Puslinch, Ontario

Final Report

Stantec

Prepared for:
CBM Aggregates 55 Industrial Street, Toronto, Ontario, M4G 3W9

Prepared by:
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February 13, 2026

Project/File:
160961457

Stantec Consulting Ltd.

Limitations and Sign-off

The conclusions in the Report titled Level I and II Water Report for Proposed Anthony Aggregate Pit, 4454 Victoria Road South, Puslinch, Ontario are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from CBM Aggregates (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

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Acronyms / Abbreviations

ARA	Aggregate Resources Act
Anthony Pit	Anthony Aggregate Pit Site
AWT	Above Water Table
BGS	Below Ground Surface
BV Labs	Bureau Veritas Laboratories
BWT	Below Water Table
CBM	CBM Aggregates (a division of St. Marys Cement Inc.)
Dufferin Pit	Dufferin Aggregate Pit
FM	fineness modulus
GPM	Gallons Per Minute
GRCA	Grand River Conservation Authority
GW	groundwater
HVA	High Vulnerability Aquifer
Insitu	Insitu Contractors Inc.
ISI	Intrinsic Susceptibility Index
K	hydraulic conductivity
masl	m above sea level
MECP	Ministry of the Environment, Conservation and Parks
MNR	Ministry of Natural Resources
O.Reg.	Ontario Regulation
PSW	Provincially Significant Wetland
Report	Level I and II Water Report
SGRA	Significant Groundwater Recharge Area
Stantec	Stantec Consulting Ltd.
SW	surface water
the Site	Anthony Aggregate Pit Site / Anthony Pit

Tikal Pit	Aberfoyle-Tikal Aggregate Pit
WHPA	Well Head Protection Area
WWIS	Water Well Information System
WWR	Water Well Record

1 Introduction

CBM Aggregates a division of St. Marys Cement Inc. (Canada) (CBM) has retained Stantec Consulting Ltd. (Stantec) to prepare a Level I and II Water Report for a proposed new aggregate pit near Aberfoyle, Ontario. The property for the proposed aggregate pit development, shown in purple on Figure 1 (Appendix A) is approximately 23.37 hectares (ha.) in size and located at 4454 Victoria Road South, in the Township of Puslinch, Wellington County. The area to be licensed as the Anthony Aggregate Pit (the Site) is approximately 18.03 ha and shown in red on Figure 1. The legal description of the Site is Lot 22, Concession 8, Geographic Township of Puslinch, Wellington County. Aggregate extraction will reflect both above water table (AWT) and below water table (BWT), with an expected annual extraction rate of approximately one million tonnes.

1.1 Report Purpose

This Level I and II Water Report (Report) has been prepared in accordance with the Ontario Aggregate Resources Act (ARA; O. Reg. 244/97). This Report includes a summary and interpretation of the hydrogeological conditions and groundwater use in the area, a summary of collected field data at the Site, impacts assessment and mitigation, as well as a proposed monitoring program and recommendations. In accordance with the ARA, this Report satisfies the requirements for a Class A license supporting an aggregate pit that intends to extract aggregate material from above and below the established groundwater table.

In accordance with the technical reports and information standards for a Level 1 assessment, the following information is provided herein:

- Summary of borehole and shallow groundwater information based on drilling and monitor installation program completed at the Site, with monitoring commencing in November 2021, and continuing on a quarterly basis through November 2024.
- Characteristics of the shallow groundwater conditions, including stabilized water level, flow direction, gradient.
- Information compiled from a review of available publications and geological mapping for the area, including adjacent land uses, site topography, surficial geology, and site features.
- Information compiled from a review of Ministry of the Environment, Conservation and Parks (MECP) Water Well Records and Permit to Take Water (PTTW) database.
- Evaluation of the proximity of the Site to a WHPA-Q.
- Discussion on potential adverse impacts which could result from the proposed aggregate pit operation.

The Level II assessment (provided herein) expands on the discussion of potential adverse impacts, with discussion of mitigation measures and contingency measures to address potential concerns with contamination that could occur as a result of typical operations and aggregate extraction activities. As such, the following information has been incorporated into this report:

- Baseline groundwater quality has been documented with analytical testing on water samples collected from monitoring wells and shallow drive point piezometers installed at the Site.
- Groundwater modeling was conducted to assess potential impacts of development of the Site.
- Pre- and post-development water balance was completed to assess impacts of development.

Collectively, this Level I and II Water Report summarizes the factual results of the field study and technical analyses discussed above. An integrated impact assessment is included with the following key components:

- Surface water and groundwater contribution from the Site to nearby Aberfoyle Creek, during pre-development, normal pit operations and post-closure.
- Thermal changes to the groundwater flow regime, in response to proposed aggregate extraction.
- A recommended monitoring program, prior to and during pit operations.
- Recommendations for mitigation measures and contingency plans in support of the licensing review process.

This Report is expected to form part of a submission to the Ministry of Natural Resources (MNR) to comply with the requirements of the Aggregate Resources Act as well as address the requirements of the County of Wellington Official Plan (County of Wellington, 2025). Specifically, the Official Plan requires that for applications for new aggregate extraction operations, the following shall be considered as they relate to this hydrogeology assessment and water report:

- The impact to adjacent land use and residents.
- Impact on the physical environment, including the water table and surface drainage
- Existing municipal supply resources are protected in accordance with the applicable Source Protection Plans
- Operations and rehabilitation plan.

1.2 Report Limitations

It is noted that this Water Report involves a limited sampling of the subsurface conditions at specific borehole locations. The conclusions and recommendations presented in this report reflect site conditions existing at the time of the investigation and a review of available information presented herein. Should subsurface conditions be encountered which vary materially from those observed in the boreholes completed as part of this Water Report, we recommend that Stantec be consulted to review the additional information and verify if there are any changes to the recommendations and discussion provided in this report.

1.3 Report Structure

This Report is arranged in ten sections, including this introduction (Section 1). Section 2 provides an overview of regional environmental conditions. Section 3 describes the field study methodology and results, while Section 4 provides a detailed hydrogeological assessment of the Site. Section 5 discusses the proposed aggregate extraction plan and associated environmental effects expected. To confirm the predicted effects of the proposed Anthony Pit are consistent with predictions, a long-term environmental monitoring program is specified in Section 6. Recommended contingency planning and mitigation measures are specified in Section 7, to minimize potential effects of proposed operations. The study conclusions and recommendations are provided in Sections 8 and 9, respectively. The report references are provided in Section 10.

Report figures referenced in this Report are presented in Appendix A, with report tables presented in Appendix B. Borehole logs are provided in Appendix C and soil testing laboratory results are provided in Appendix D. Water quality laboratory certificates of analysis are provided in Appendix E. Water balance calculations, streamflow analysis and source water protection results are provided in Appendix F. Groundwater modelling analysis reporting is included within Appendix G. Curriculum Vitae for the report writers are provided in Appendix H.

2 Site Setting

2.1 Site Location And Surrounding Land Use

The Site is situated south of the former CBM Tikal Aggregate Pit (Tikal Pit) property, shown in yellow on Figure 1 (Appendix A). The Tikal Pit (28 hectares in size) was operated by CBM until 2011 when available aggregate was removed and the pit was rehabilitated. Also shown in black on Figure 1, is the location of an existing aggregate pit owned and operated by Dufferin Aggregates (a division of CRH Canada Group Inc.). The Dufferin Aggregate Pit (Dufferin Pit) is 78 hectares in size and is situated to the north of the Site.

Additional gravel pit operations being operated under Class A Licenses are also located within Puslinch Township, situated approximately 3 km southwest of the Site.

The Site is used for agricultural purposes and includes a private residential building near Victoria Road South. There are existing wetlands and wooded areas on the Site. Surrounding land uses reflect mainly the following:

- To the northeast: The former Tikal Pit and existing Dufferin Pit
- To the south-southwest: Agricultural lands, provincially significant wetland (PSW) area and Aberfoyle Creek
- To the west: Agricultural lands, PSW area, and residential area associated with the Mini Lakes residential community
- To the east: Agricultural lands and private residential buildings

2.2 Regional Topography and Drainage

Regional topographic relief and drainage are shown on Figure 2. The topography is dominated by the Paris Moraine, a major depositional feature forming a height of land approximately 3 km northwest of the Site. The Paris moraine, which trends in a southwesterly direction (i.e., along Maltby Road), is generally characterized as hummocky topography with ground surface elevation ranging from 345 to 365 m above sea level (masl).

The Site is located within the Aberfoyle Creek catchment area of the Mill Creek watershed. The north branch of Aberfoyle Creek flows in a westerly direction on the north side of County Road No. 34, located approximately 600 m north of the Site. The southern branch of the Aberfoyle Creek flows in a westerly directly about 300 m to the south of the Site. The north and south branches connect approximately 1 km west of Brock Road S. Aberfoyle Creek then flows west and connects with Mill Creek on the west side of Highway No. 6 North.

West of the Site is the Aberfoyle pond, which is online to Aberfoyle Creek. The Aberfoyle pond also receives drainage from a series of ponds (herein referred to as “Mini-Lakes”) located on the south side of Wellington Road No. 34.

2.3 Regional Geology

Mapping of near surface overburden soils and total overburden thickness near the Site, as shown on Figure 3, is provided by the Ontario Geological Survey (OGS, 2010). Overburden thickness varies slightly, ranging from approximately 20 m in the Aberfoyle Creek valleylands to approximately 35 m along the crest of the Paris Moraine. Near surface soils can generally be separated into three types from ground surface down:

1. Glacio-fluvial deposits, shown as beige (Soil Type 7b) on Figure 3, reflect silty-sand to sand and gravel deposition in glacial meltwater channels. This stratigraphic unit is predominantly constrained to the Mill Creek valleyland and reflect thicknesses ranging from 10 m to 20 m.
2. Glacial till, shown as green (Soil Type 5b) on Figure 3, is regionally extensive and the predominant soil type locally. Known as Port Stanley Till, this soil is typically characterized as a brown silty sand to sandy silt till. Details from local MECP water well records indicate that the till deposit generally varies in thickness from about 5 to 15 m in the vicinity of the Site.
3. Organic deposits, shown as grey (Soil Type 20) on Figure 3, are encountered in poorly drained areas locally.

The local area is underlain by Silurian bedrock of the Eramosa Formation. Locally, the Eramosa Formation consists of two members, the younger (upper) Reformatory Quarry member and older (lower) Vinemount member. According to the City of Guelph Tier 3 Study (Matrix, 2017), each of these formation members are approximately 5 to 10 m thick, locally.

The Reformatory Quarry member is described by Brunton (2009) as light brown to cream coloured, thickly bedded and coarsely crystalline dolostone. This unit is susceptible to karstification due to its uniform fine dolomite crystallinity. This unit often contains mud-rich and microbial mat-bearing lithofacies that may act as aquitard materials, resulting in a low vertical permeability across this unit.

The Vinemount Member is comprised of thinly bedded, fine crystalline dolostone with shaley beds that give off a distinctive petroliferous odour when broken (Brunton, 2009). This dark grey to black dolostone unit was commonly identified in water well records as ‘black shale’.

2.4 Natural Heritage Features

A total of four wooded areas exist on the Site that are ranked as significant by the County’s Official Plan. As shown on Figure 2, wetlands (both unevaluated and provincially significant) exist in different parts of the Site. The wetlands reflect low-lying areas (e.g., closed depressions) that receive overland drainage from the surrounding higher terrain. Further details regarding local natural heritage features are discussed in Stantec’s Natural Environment Report (NER; Stantec, 2026).

3 Hydrogeological Field Study and Results

Field studies undertaken as part of this Water Report can be organized into the following five components:

- Stratigraphic logging and monitoring well installation at five geological borehole locations.
- Installation of four drive point piezometers in local surface water features.
- Baseline groundwater elevation monitoring from November 2021 through to November 2025.
- Baseline Aberfoyle Creek surface water elevation and flow rate monitoring from November 2021 through to November 2025.

This section provides an overview of the field study methodology and interpretation of the results. Figure 4 shows the locations of field study instrumentation.

3.1 Borehole Drilling

Geological borehole drilling was carried out at five locations MW21-1 through MW21-5), between November 1 and 8, 2021. Table 1 (Appendix B) summarizes the monitoring well completion details. The boreholes were advanced by Insitu Contractors Inc. (Insitu), using a truck-mounted sonic drill-rig. Boreholes at the Site were advanced using 6-inch (152.4 mm) outer diameter sonic drill rods. Stantec was onsite supervising the drilling activities and completing soil core logging and sampling. The boreholes were advanced to depths ranging from 20.1 m to 23.8 m below existing grade.

Soil core samples recovered from the boreholes were logged and submitted to the Stantec soil testing laboratory in Markham, Ontario for analysis with respect to grain size distribution, fineness modulus (FM) of the total sample and sand, wash loss, crushable stone content, and stone/sand ratio. Geological logs of the boreholes are provided in Appendix C. Results of the soil testing are provided in Appendix D and summarized in Table 2.

Soil samples generally comprised of sand and gravel, with thin (e.g., less than 5 m thickness) lenses of higher silt content encountered in three of the boreholes (MW21-2 through MW21-4). A profile summary of the borehole drilling results (Cross Section A – A') are shown on Figure 5, with the location of the cross section delineated on Figure 4.

3.2 Field Study Instrumentation

Each borehole was instrumented with a 2-inch (50 mm) diameter PVC monitoring well. The base of the monitoring wells reflect a 1.5 m long, 10-slot well screen; seated at the base of the boreholes. The annular space of the monitoring wells were backfilled with silica sand to a height of approximately 1 m above the well screen. Above the sand pack, the annular space was backfilled with a bentonite slurry, up to ground surface. The monitoring wells were secured with a 4" x 4" lockable protective cover. Details of monitoring well construction are summarized in Table 1 and shown in the borehole logs (Appendix C). The monitoring wells have been registered with the MECP in accordance with Ontario Regulation (O.Reg.) 903. It is noted

that one additional shallow monitoring well (referred to by Stantec as MW06-ORG) was observed to be pre-existing at the Site; located in the southeastern portion of the Site and completed to depth of 4.3 m BGS. Each monitoring well was instrumented with an automated water level recorder (datalogger) to develop a continuous record of water level monitoring.

A total of four shallow drive point piezometers were installed within wetland areas located across the Site and referred to as DP21-01 to DP21-04 (see Figure 4). Each piezometer was driven to a depth of approximately 1.5 m BGS and instrumented with a datalogger (GW) to monitor groundwater levels at the drive point. A perforated 25 mm diameter PVC pipe was installed next to each piezometer and equipped with a datalogger (SW) to monitor the elevation of ponded water within the wetland areas. Table 1 provides a summary of the drive point construction details.

The nearest Aberfolye Creek gauging station (GRCA Station 9668042) is located at the Concession 7 crossing, approximately 3.5 km downstream of the Site (see Figure 2). Due to the significant downstream distance of this station, two surface water staff gauges (SG21-1 and SG21-2) were installed to characterize the Aberfoyle Creek (south branch) flow rates in the vicinity of the Site. As shown on Figure 4, SG21-1 was installed upstream of the Site at the Gilmour Road crossing, while SG21-2 was installed downstream of the Site at the Wellington Road 46 crossing.

Ground surface elevations and top of pipe reference point elevations at the five monitoring wells, four shallow drive point piezometers, and two staff gauges were surveyed by Stantec using a Trimble R10 GPS rover. Table 1 provides the GPS coordinate and elevation survey results.

3.3 Water Level And Temperature Monitoring

A 4-year water level and temperature monitoring program was carried out from November 2021 through November 2025. Automated water level recorders (dataloggers) were installed in each of the field study instruments, as described above, to provide a continuous record of water level measurements. A summary of manual water level measurements, collected by Stantec staff, is provided in Table 3. Hydrographs for each monitoring location, inclusive of both manual and datalogger measurements, are shown on Figure 6 and compared to precipitation and ambient temperature data from the nearby Environment Canada Region of Waterloo Airport Climate Station No. 6144239 (Environment Canada, 2026).

As shown on Figure 6, hydrographs for the on-Site monitors show consistent trends and minor seasonal variation. The total range of groundwater elevation varied approximately 1 m over the 4-year monitoring period. The hydrographs show a direct response to precipitation events and seasonal fluctuations. These seasonal fluctuations reflect a cyclical pattern that is common within shallow groundwater systems of southern Ontario. High water table conditions consistently occur in the spring (i.e., March and April) due to lower evapotranspiration losses and a melting snowpack, which provide a greater volume of water for recharge. Hydrographs also show high points in late July, from 2023 to 2025. These occurrences are related to major precipitation events (i.e., greater than 50 mm over 24-hour period). During the summer, more water is drawn from near surface soil to meet evapotranspiration demands. High evapotranspiration demand reduces groundwater recharge and results in a steady decline of the water table elevation through the summer and fall. In response to storage of snow at ground surface, low water table conditions carryon

until the end of December, annually. Therefore, low water table conditions are known to occur from the mid-summer (July) through early winter (December), annually.

Hydrographs for the drive point piezometers are shown relative to the local grade elevation on Figure 6. The drive point hydrographs are consistent with the monitoring well hydrograph trends, showing approximately 1 m variation year to year. During the spring and early summer (January through to July), hydrographs are above the local grade, reflecting ponded conditions within the wetland areas. During the late summer and fall months (July through to January), drive point hydrographs are typically below the local grade, reflecting dry conditions within the wetland areas (except for during major precipitation events).

Staff gauge hydrographs (SW21-1 and SW21-2) are a subdued reflection of the groundwater hydrographs, however, show similar trends and responses to precipitation. The seasonal variation of the staff gauge hydrographs is less than 0.35 m seasonally.

Water temperature data, as recorded by the dataloggers, are shown on Figure 7. Groundwater temperatures in the monitoring wells range between 8 ºC and 12 ºC, seasonally, with the exception of shallow monitoring well MW06-ORG which varies from 5 ºC to 15 ºC, seasonally. The temperature trends are similar to that of ambient air temperature trend, however, with an approximately three-month delay.

Due to their shallow depth (i.e., above the frost line), groundwater temperature in the drive-point piezometers ranges from approximately 3 ºC and 15 ºC, seasonally and a two-month delay relative to the ambient air temperature trends. The temperature of ponded water at the drive point piezometers generally ranges from 0 ºC to 30 ºC, fluctuating in accordance with the ambient air temperature. Water temperature at the staff-gauge locations also fluctuate in accordance with the ambient air temperature, ranging from 0 ºC to 30 ºC.

3.4 Soil Hydraulic Conductivity

Two approaches were undertaken to assess the hydraulic conductivity of local soils: 1) Grain size analysis of soil samples; and 2) In-situ well response tests. The results of both analyses are summarized in Table 2.

The hydraulic conductivity of sandy sediments can be estimated from grain-size distribution curve by the Hazen method (Fetter, 2001). Interpreted values of hydraulic conductivity general range on the order of 10^{-4} to 10^{-5} m/s, however, higher values (e.g., on the order of 10^{-2} to 10^{-3} m/s) were occasionally interpreted.

Stantec performed in-situ hydraulic response testing at each monitoring well in May 2023. The testing consisted of creating an instantaneous change in the well water level by adding or removing a known volume of water, followed by recording the time taken for the water level to return to static conditions. The water level response data were analyzed using the Hvorslev (1951) solution to estimate the horizontal hydraulic conductivity of native soils surrounding the well screen. Interpreted hydraulic conductivity of soils within the screened intervals of the monitoring wells, as summarized on Table 2, are generally consistent with that interpreted by grain size analyses (i.e., on the order of 10^{-4} to 10^{-5} m/s). This range of values is normal as per literature values for sand and gravel soils (Fetter, 2001).

3.5 Streamflow Monitoring

A total of 13 streamflow measurements were undertaken at SG21-1 and SG21-2, between April 2022 and November 2025. During each monitoring event, staff gauge readings, streamflow velocity and depth measurements were taken in 10 – 20 cm increments within a cross section to estimate the instantaneous flow. Velocity measurements were captured using an impellor flowmeter. The streamflow rates interpreted at each of the monitoring stations are summarized in Table 4. A comparison of streamflow elevation and streamflow rate at each monitoring station is provided on Figure F1 in Appendix F. The reported streamflow rate at GRCA Station 9668042 is shown on Figure F2,

The streamflow measurement approach (i.e., calculating the average velocity in a cross-section using a current meter along the stream width and depth profile) reflects a conventional practice. However, this approach is not a direct measure of the streamflow and interpreted values are subject to uncertainty. Potential sources of error could include:

- Imprecise characterization of the streamflow depths due to highly heterogeneous channels (i.e., woody debris, cascades, and step-pools) as documented by Montgomery and Dietrich (1989).
- Impellor flowmeter sensitivity.

For headwater courses, most streamflow measurement errors were estimated to be in the orders 10^{-1} to 10^{2} L/s (Bjerve & Grøterud, 1980; Hudson & Fraser, 2002). According to McMillan et al. (2012), the confidence bounds of the rating curve have typical values of 50–100% for low flows. Streamflow measurements reported herein should therefore be considered approximations, as opposed to precise values.

Streamflow at the upstream SG21-1 (Gilmour Road) ranged from 297.0 L/s (March 23, 2023) to 7.3 L/s (July 6, 2022), and at the downstream location SG21-2 (Brock Road) ranged from 483.0 L/s (March 23, 2023) to 33.0 L/s (September 20, 2024). The baseflow rates for SG21-1, SG21-2 and GRCA Station 9668042 were calculated using SepHydro, a hydrograph separation tool developed by the Canadian Rivers Institute, University of New Brunswick and Agricultural and Agri-Food Canada (Danielescu, 2018). Using local time-series flow data from these locations as an input, SepHydro was used to apply the Lynne and Hollick method (1979) for estimating the amount of baseflow for each station. SepHydro estimates are approximately 30 L/s at SW21-1, 50 L/s at SW21-2 and 231 L/s at GRCA Station 9668042.

To provide context regarding the streamflow monitoring data discussed above relative to precipitation normals, historic annual precipitation totals (1950 through 2025) are shown on Figure F3. Total annual precipitation values predominantly reflect Region of Waterloo Airport Climate Station No. 6144239. The data from this station indicates precipitation values were at or below historical norms during the monitoring period (2021 through 2025). These data trends are consistent with the GRCA Station 9668042 streamflow data, which show lower creek flow rates in 2021 and 2022.

3.6 Water Quality Laboratory Testing

To baseline local water quality, samples were collected from each of the five monitoring wells, four drive point piezometers and two staff gauge locations. The monitoring wells were developed by Insitu prior to sampling, including the removal of the equivalent of three water-columns of water. The water samples were collected using designated Waterra tubing and foot valve.

The analytical laboratory (Bureau Veritas Laboratories, or BV Labs) was contacted in advance to order sufficient water pre-cleaned (and pre- preserved, where applicable) sample containers for the desired analyses. Water samples collected at the Site were secured and transported to BV Labs in designated lab-supplies containers and stored in a chilled cooler for transport. The water samples were submitted for general chemistry analyses, which included pH, inorganics and dissolved metals, as well as calculated parameters for anion and cation summaries, hardness and total dissolved solids. Groundwater samples obtained from the monitoring wells were also analyzed for Petroleum Hydrocarbons (PHCs) and BTEX.

Results of groundwater quality monitoring are provided in Table 5, while results of surface water quality monitoring are provided in Table 6. The Certificate of Analysis provided by the laboratory is provided in Appendix E.

There were no detections of PHC's or BTEX within any of the samples. Groundwater samples from the monitoring wells were generally compliant with Ontario Drinking Water Standards (ODWS), except for the parameters of hardness and manganese. Exceedances of these parameters are typical within the overburden aquifers of southern Ontario. Water samples collected from the drive point piezometers consistently showed elevated concentrations of iron, manganese, organic carbon and zinc. The exceedances in the drive point piezometers are interpreted to reflect potential rust or wear of the drive point piezometers. Surface water quality was generally compliant with Provincial Water Quality Objectives (PWQO), with the exception of zinc.

Analytical results are collectively shown within the Piper plot on Figure 8. The results indicate that local groundwater and surface water both reflect a magnesium bicarbonate water type. This analysis indicates that the surface water and groundwater quality is consistent.

4 Hydrogeological Assessment

4.1 Geology

Borehole drilling results, as summarized on Figure 5, indicate local soil conditions are consistent with the regional geological mapping (shown on Figure 3). Underlying the Site is a large deposit of sand and gravel, encountered from near ground surface to less than 298 masl (representative thickness of approximately 23 m). Grain size analysis data, as provided in Appendix D, indicate the gravel size generally ranged from fine to coarse, while the sand size generally ranged from medium to coarse. These sand and gravel soils are typically well graded (i.e., uniformity coefficient greater than 10%) and contain trace amounts of fine-grained material (i.e., silt and clay). Sub-rounded cobbles were regularly encountered within this deposit.

Lenses of silty sand to silt and sand, approximately 2 m thick, were encountered at MW21-2 through MW21-4. These lenses of finer grained soil were generally encountered between 318 masl and 308.5 masl. These sand and silt lenses are poorly graded, with a uniformity coefficient less than 4%. These layers are not considered to be laterally extensive throughout the property or affect vertical / horizontal groundwater flow. Accordingly, these layers do not form part of the hydrogeological conceptual model (Section 4.3.3).

The bedrock surface was encountered at MW21-05, at an elevation of 307.33 masl. This observation is consistent with the City of Guelph's Tier 3 Study (Matrix, 2017), which indicates the bedrock surface dips in a southwesterly direction beneath the Site, ranging from 308 masl along Victoria Road to approximately 292 masl along the western limit of the Site. As described in Section 2.3, the bedrock surface reflects the Reformatory Quarry member of the Eramosa Formation.

4.2 Surface Drainage

Total topographic relief across the Site is approximately 7 m, ranging from approximately 329 masl at Victoria Road to approximately 322 masl at the southern limit of the Site. Local topography is hummocky, resulting in several internally draining, closed depressions amongst the otherwise gently rolling terrain towards Aberfoyle Creek. Using the ESRI ArcHydro for ArcMap software, the inferred boundaries of local surface drainage sub-catchments are delineated on Figure 10. Sub-catchment areas (CA) that intercept the Site are numbered CA-1 through CA-4. Details of each of these catchment areas are summarized in Table 7 and discussed below. Internally draining catchment areas (CA-1 and CA-3) occupy approximately comprising 50% of the Site Area. Closed depressions are encountered within each sub-catchment area. These depressions, numbered WE-1 through WE-8, reflect either dug ponds or low-laying wetland areas. Details of these closed depressions are also included within Table 7.

CA-1 and CA-2 are located in the southwestern portion of the Site. CA-1 is interpreted to be internally draining, with the lowest grade elevation reflected by WE-1d. CA-2 is interpreted to drain directly into Aberfolye Creek, through WE-1d.

CA-3, which is located within the middle of the Site, is internally draining. Within this sub-catchment, overland drainage flows towards WE-1c and WE-2, which reflect closed depressions.

The northern portion of the Site predominantly reflects CA-4, which drains in a northwesterly direction and through the Mini-Lakes. Within this broad sub-catchment, a series of closed depressions exist (shown as WE-3 and WE-5 through WE-8. The catchment areas for these isolated closed depressions are small (i.e., generally less than 0.1 ha).

Existing aggregate pit ponds are located on adjacent lands, north and northeast of the Site. These ponds, developed from aggregate extraction, reflect water table conditions. The Mini-Lakes ponds on the adjacent lands to the northwest are also inferred to reflect water table conditions, based on their elevations.

4.3 Hydrogeology

Based on the hydrogeological field study results, as described in Section 0, hydrogeological conditions in the vicinity of the Site are discussed below.

4.3.1 Groundwater Flow

The highest groundwater levels over the 4-year monitoring period, as shown on Figure 6, were manually observed on July 25, 2024. These values are shown in plan on Figure 9. The seasonal high water table is inferred to range from approximately 324 masl along the eastern limit of the Site to 320 masl along the western limit of the property. Groundwater flows in a southwesterly direction, towards Aberfoyle Creek, situated approximately 300 m southwest of the Site. The horizontal hydraulic gradient is approximately 0.003 m/m. As described in Section 3.3, seasonal variation of the water table is minor (i.e., less than 1 m annually).

4.3.2 Groundwater / Surface Water Interaction

Several observations from the hydrogeological field investigation indicate that surface water features (e.g., ponds, wetlands and watercourses) are directly connected with local groundwater flow. These observations include:

- Consistent elevation and hydrograph trends between the monitoring wells and drive point piezometers.
- Consistent quality of water within the monitoring wells and surface water stations.
- Limited size of the local surface catchments, which generally reflect closed depressions.
- Coarse grained nature of local overburden, facilitating prompt recharge of overland drainage.

These observations indicate that local surface water levels and flow rates are directly related to the local water table elevation.

4.3.3 Hydrogeological Conceptual Model

Based on the field study findings a hydrogeological conceptual model has been developed for the Site, for the purpose of assessing the effects of proposed aggregate extraction. The conceptual model represents a single groundwater flow system (i.e., unconfined, overburden aquifer), with the following hydraulic parameters:

Parameter	Value
Transmissivity	800 m^2/day
Saturated Aquifer Thickness	23 m
Formation hydraulic conductivity	4 $x10^{-4}$ m/s
Specific Yield	30%

The overburden aquifer is underlain by the Eramosa Formation, which is well known to be a regionally extensive aquitard. As reported by the City's Tier 3 Study (Matrix, 2017), the bulk vertical hydraulic conductivity of the Eramosa Formation is approximately 1 $x10^{-9}$ m/s. The bedrock surface is therefore considered to be the base of the shallow groundwater flow system locally. While it is recognized that minor vertical seepage through the bedrock will occur (in accordance with the 10^{-9} m/s vertical hydraulic conductivity) most groundwater recharge from surface will flow laterally towards Aberfoyle Creek.

As shown on Figure 5, the saturated thickness of the aquifer is approximately 23 m. The overburden aquifer receives groundwater recharge directly from infiltration of precipitation. Due to coarse texture of the overburden locally, local groundwater recharge is high (300 to 325 mm/yr according to Matrix, 2017). Infiltrated water seeps vertically downward, by gravity, and supplements the water table. The water table is a subdued reflection of the surface topography, sloping in a southwesterly direction along a consistent hydraulic gradient of approximately 0.003 m/m. Groundwater flow in the shallow aquifer converges on local surface water tributaries, providing a perennial base flow.

Hydraulic conductivity of the overburden aquifer have been inferred through a combination of grain size analysis and in-situ well response tests, as summarized in Table 2. To develop a cursory estimate of the bulk formation hydraulic conductivity (K_f), beneath the Site, the interpreted values in Table 2 were considered in accordance the following equation:

$$K_f = \sum_{i=1}^{n} \frac{K_i d_i}{d}, \text{ where}$$

K_i = hydraulic conductivity of each sample, as determined by the Hazen analysis;

d_i = thickness of each sample;

Based on the above analysis, the interpreted formation hydraulic conductivity is consistently interpreted to be on the order of 4 $x10^{-4}$ m/s at each of the monitoring well locations. It is noted, however, that this value is considered an on-Site condition (i.e., beneath the Site) and likely to vary across the broader local area.

4.3.4 Groundwater Use

A review of local water well records (WWRs) available through the MECP database (MECP, 2024) for the area was completed to review local geology and the water levels. Figure 11 shows the location of private water supply wells and active permits to take water (PTTW) locally. Within 120 m of the Site, there are four active PTTW (MECP, 2025). Each of the four PTTW are registered as water supply locations associated with communal groundwater wells to service the residents of the Mini Lakes Condominium Community located at 7541 Wellington County Road 34.

There are seven WWRs located within 120 m of the Site and 62 WWRs located within 250 m of the Site. All water supply wells within 120 m of the Site are completed within the underlying limestone bedrock aquifer, although one residential water supply well (WWR # 7100301) located within 130 m of the Site is noted to be completed within the deep sand and/or gravel overburden aquifer to depth of 22.3 m below ground surface (BGS) overlying limestone bedrock. At the well (WWR # 7100301), water was found at base depth of about 22 m BGS and a static groundwater level was recorded at about 6 m BGS, with a recommended pumping rate of 10 gallons per minute (GPM). It is also noted that there is one additional WWR (WWR # 6710785) located within 250 m of the Site (at distance of 190 m from the Site) that is completed within the shallow sand and/or gravel overburden aquifer to depth of 13.7 m BGS, with all remaining WWRs within 250 m of the Site completed within the underlying limestone bedrock aquifer. At the well (WWR # 6710785), water was found at base depth of about 13 m BGS and a static groundwater level was recorded at about 7 m BGS, with a recommended pumping rate of 20 GPM.

Additionally, based on the WWRs, at a distance of greater than 280 m but within 500 m of the Site, there are 10 additional water supply wells completed within the sand and/or gravel overburden aquifer and generally at lower depth overlying the limestone bedrock, and groundwater levels range from approximately 4 m to 15 m BGS (2 of 10 WWRs have groundwater levels above 7 m BGS). The remainder of the water supply wells are completed within the underlying dolostone bedrock.

4.4 Source Water Protection

Hydrogeological Source Protection areas, as delineated by the MECP Source Water Protection Information Atlas, is shown on Figure F4 (Appendix F). The Clean Water Act (2006) defines four critical Source Water Protection Areas: Wellhead Protection Area (WHPA), Highly Vulnerable Aquifer (HVA), Significant Groundwater Recharge Areas (SGRA) and Water Quantity Vulnerable Areas (WHPA-Q). This section provides a Source Water Impact Assessment relative to the proposed Site development plans.

4.4.1 Significant Groundwater Recharge Areas

Groundwater recharge is largely controlled by soil conditions, and typically occurs in upland areas. As defined in the Clean Water Act (2006), an area is a significant groundwater recharge area if,

- the area annually recharges water to the underlying aquifer at a rate that is greater than the rate of recharge across the whole of the related groundwater recharge area by a factor of 1.15 or more; or,

- the area annually recharges a volume of water to the underlying aquifer that is 55% or more of the volume determined by subtracting the annual evapotranspiration for the whole of the related groundwater recharge area from the annual precipitation for the whole of the related groundwater recharge area.

Figure F4 indicates the Site is located within a SGRA. The proposed aggregate pit development will not affect the groundwater recharge potential of the local overburden soils. Overburden soils will be removed at the Site, and therefore recharge potential will be increased due to a shorter vertical travel distance to recharge the local aquifer. The infiltration was estimated pre- and post-development and supports this assessment (Section 5.3.3).

4.4.2 High Vulnerability Aquifers

The susceptibility of an aquifer to contamination is a function of the susceptibility of its recharge area to the infiltration of contaminants. HVA's are mapped using the Intrinsic susceptibility index (ISI) method, which specifies low, medium and high vulnerability. Figure F4 indicates the Site is not located within an area dilieaned as HVA.

Future development at the Site should have regard for the sensitivity of the shallow aquifer, and operations associated with the aggregate extraction operations should incorporate suitable measures to minimize negative effects to the shallow groundwater aquifer. This can be addressed through the use of best-management practices for equipment maintenance and fueling activities, incorporating contingency and mitigation measures into operational plans, and effective monitoring.

4.4.3 Wellhead Protection Area

Lake Erie Region Source Protection Committee (2015) outlines that WHPAs are defined as the vulnerable areas around groundwater sources that have been delineated using three- dimensional groundwater flow models. The WHPA for each well field (or well) is based on an estimate of the groundwater travel time to the well, with defined zones extending out to a period of 25-years for groundwater travel to the well.

Based on Lake Erie Region Source Protection Committee (2015) and for the Grand River Source Protection Area the Site is not within or near a WHPA associated with water quality (WHPA-A through WHPA-D; Figure F4). Therefore, source water protection policies associated with WHPAs for water quality do not apply to the Site. The closest WHPA areas are as follows:

- City of Guelph Burke Well / Arkell Well Fields, WHPA maximum extents terminating 3.1 km northwest of the Site.
- City of Hamilton Freelton Well, WHPA maximum extent terminating 2.6 km south of the Site.

The Site is located within a WHPA associated with water quantity (Area A; WHPA-Q, Figure F5 in Appendix F), which requires demonstration that a new development will not negatively impact the availability of water for the municipal drinking water supply. A water budget was completed for the Site with details provided in Section 5.2.2.

5 Impact Assessment

The impact assessment, provided herein, focuses on the following two conditions:

- Aggregate extraction operations (i.e., short-term period of aggregate removal); and
- Post-rehabilitation of the pit (i.e., the long-term condition following cessation of operations).

Analytical solutions and computer modelling analyses have been undertaken to assess the short-term and long-term effects of the proposed Anthony Aggregate pit on local water resources, respectively. Stantec developed a three-dimensional numerical groundwater flow and thermal transport model. This model was constructed using the USGS modular groundwater flow modeling code, MODFLOW, and transient thermal transport was simulated using the MT3D solute transport code coupled to the MODFLOW flow model. The construction and calibration of the model, as well as simulated results are described in detail within Appendix G. Since the domain of the model extends beyond the far Site (i.e., approximately 2.5 km beyond the area of local field investigations), model parameters discussed within Appendix G may vary slightly from the interpretations provided within Section 4.3.3 above.

5.1 Proposed Aggregate Extraction

The sand and gravel soils encountered at the Site reflect a valuable aggregate resource from near ground surface to the bedrock surface. Extraction of the soils are proposed in accordance with the Site Plan provided in Appendix H. A hydraulic excavator and / or dragline set-up will be used to capture aggregate below the water table. Figure 12 shows the proposed above (AWT) and below (BWT) water table aggregate extraction plan for the Site, as well as the proposed maximum extraction limit. Specific estimated details of the proposed license application are as follows:

- Approximately 8.77 hectares of total area to be extracted and rehabilitated
- Approximately 1 million tonnes of aggregate to be removed (AWT and BWT) with 2:1 side slope

Removal of the aggregate and rehabilitation of the Site is expected to be completed within a 2-to-5-year timeframe. Above water table extraction is expected to be carried out from north to south across the Site, using conventional construction equipment, including trucks, loaders and cranes with draglines. Material will be loaded and hauled offsite to a CBM processing facility. Existing vegetation within the extraction area will be maintained until sequential stripping begins as extraction proceeds through the Site. The primary site access will be located at the northwestern corner of the Site, and travel between the existing PSWs along an existing driveway (Figure 2).

The BWT extraction will be executed from south to north, across the Site, using a crane with dragline. The proposed extraction will result in the development of two BWT pit ponds, a northern pond approximately 2.65 hectares and a south pond 1.86 hectares. The total depth of the ponds will be approximately 17.5 m (304 masl). Excavated overburden will be stockpiled to allow for drainage of captured groundwater back to the resulting pit ponds. The WE-2 wetland area will be preserved, with a 30 m setback from the extraction limit.

5.2 Effects of Extraction on the Water Table

There is no direct water taking proposed at the Site. However, in response to aggregate extraction, the following two conditions will affect the water table locally:

- Water replacement of extracted aggregate (short-term effect), and
- Adjustment of the water table gradient in response to new pit ponds (long-term effect).

A quantitative assessment of these potential effects are described below.

5.2.1 Short Term Water Table Adjustment

As aggregate is extracted from the proposed pit ponds, the local water table will replace the displaced aggregate volume. This displacement is therefore considered analogous to groundwater pumping. The equivalent pumping rate of the aggregate removal can be estimated, considering that the planned extraction rate is 3,000 tonnes per day. Considering the aggregate density of 2,000 kg/m^3 and a porosity (n) of 30%, the following calculation indicates an equivalent water pumping rate (Q_T) of approximately 1,050 m^3/day.

$$Q_T = (1 - n) \cdot \frac{aggregate\ tonnage}{aggregate\ density}$$

It is noted that excavated aggregate will be stockpiled on-Site, allowing water captured within the pore spaces of the aggregate to drain back to the pit ponds. A porosity of 30% is therefore considered appropriate in the above calculation.

Water table drawdown, in response to the equivalent water pumping rate (Q_T) can be estimated by applying the following equilibrium equation (Powers et al., 2007) for unconfined aquifer conditions:

$$Q_T = \frac{\pi K(H^2 - h^2)}{\ln R_o / r_w}$$

where Q_T = Equivalent pumping rate in response to aggregate extraction (1,050 m^3/day)
K = hydraulic conductivity of the on-Site overburden (4 x10^{-4} m/s)
H = thickness of the overburden groundwater flow system (322 masl – 299 masl = 23 m)
h = desired water height within active groundwater flow system (321.7 masl – 299 masl = 22.7 m)
R_o = radius of influence (520 m, representing a 400 m zone of influence beyond edge of pit pond)
r_w = equivalent radius of collective pit ponds (120 m)

Based on the above equation, the water table drawdown in response to active aggregate extraction is interpreted to be approximately 0.3 m at the pit pond and decrease with radial distance. The lateral extent of the zone of influence, roughly shown on Figure 13, is interpreted to be up to 400 m from the edge of the pit ponds. Recognizing a 30 m buffer between the pit ponds and adjacent wetlands, proposed drawdown extending into neighboring wetlands is interpreted to be less than 0.13 m; equivalent to 13% of the annual water table fluctuation. As discussed in Section 5.2.3 below, this small amount of drawdown will not interfere with the wetland hydroperiods.

The equivalent pumping rate of the aggregate extraction (approximately 1,050 m^3/day or 12 L/s) reflects approximately 24% of the Aberfoyle Creek flow rate observed at SG21-2 (approximately 50 L/s). While this potential reduction reflects a moderate risk of adversely affecting base flow conditions, the following mitigative measures should be considered:

- Interpreted base flow rates reflect periods of at or below normal precipitation. With annual precipitation rates at or above normal, potential reductions to base flow rates are unlikely to be realized.
- Proposed aggregate extraction will be short term, limited to a 2-to-5-year period. The extraction operations will therefore have no effect on long term flow conditions within Aberfoyle Creek.
- Former and existing aggregate operations within the Mill Creek watershed (LRG, 2019) on nearby properties has not resulted in measurable impacts on water temperatures and streamflows within Mill Creek.

Considering the above, the actual effects of short-term aggregate extraction are not likely to be distinguishable from typical seasonal fluctuations. Recognizing the small depth of drawdown and limited zone of influence, proposed aggregate extraction operations will not affect local groundwater supply wells within the WHPA-Q for the City of Guelph.

5.2.2 Long Term Water Table Adjustment

The water table gradient, as shown on Figure 9, will flatten in response to the creation of the proposed Anthony Pit ponds. Currently the water table drops approximately 1.5 m from the northern to southern limits of the proposed pit ponds (i.e., roughly 322.25 to 320.75 masl). The final pit pond elevations are expected to stabilize at approximately 321.7 masl for the north pond and 320.7 masl for the south pond. Using MODFLOW (Appendix H) to simulate the effects of the proposed ponds on the local water table, the permanent adjustment to the water table change (i.e., positive values for water table elevation decrease and negative values for water table elevation increase) are shown on Figure 15. A flatter hydraulic gradient will permanently exist, with the water table adjusting approximately 0.6 m lower at the northern limit of the North Pond and approximately 0.3 m higher at the southwestern limit of the South Pond.

It is noted that the pit ponds were specifically designed to minimize the potential long term water table changes in proximity to the adjacent wetlands. Simulated water table adjustments, as shown on Figure 15, are less than 0.3 m.

The water table adjustment, in response to formation of the Pit ponds, will not affect groundwater baseflow to Aberfoyle Creek. As described above, there will be no removal of aggregate or water from the ponds (except for evaporation) following the 2 to 5-year operating period. Over the long term, groundwater baseflow to Aberfoyle Creek should remain consistent with pre-pit conditions.

5.3 Effects of Extraction on Local Hydrology

Potential effects of proposed aggregate extraction and Site rehabilitation on local surface water features reflect the following:

- Groundwater flow rate reduction towards Aberfoyle Creek (short-term effect),
- Groundwater flow temperature increase towards Aberfoyle Creek (long-term effect),
- Adjustment of the Site water balance (long-term effect), and
- Adjustment of catchment areas for local closed depressions / wetlands (long-term effect).

Each of the above are assessed quantitatively below.

5.3.1 Groundwater Base Flow

As described in Section 5.2.1. above, the water replacement rate during aggregate extraction operations is estimated to be approximately 1,050 m^3/day (equivalent to 12 L/s) over a 2 to 5 year period. The actual rate will depend on the aggregate extraction rate. The water replacement would have otherwise flowed towards Aberfoyle Creek, reflecting approximately 24% of the 50 L/s baseflow rate observed at SG2-12. While this potential groundwater base flow rate reduction can be considered significant, no adverse water resources impacts have been observed within the Mill Creek catchment despite the prevalence of aggregate extraction operations (LRG, 2019). Long term monitoring of local water resources is recommended to confirm that surface water flow rates do not vary from their observed norms.

5.3.2 Groundwater Flow Temperature Changes

As shown on Figure 7, the typical groundwater temperature in local monitoring wells is 8ºC to 12ºC. Changes in the groundwater flow regime during aggregate operations and post-closure were simulated using MODFLOW, with the thermal changes using the MT3D transport model coupled to the MODFLOW flow model. The thermal modelling analysis (Appendix G) indicates that the average annual groundwater temperature within the proposed pit ponds could increase by approximately 6 ºC. As this groundwater flows towards Aberfoyle Creek, it will cool and mix with the regional groundwater flow. The temperature plume simulation, shown in Appendix G, reflects a maximum temperature increase of 2 ºC along a 200 m section on the east side of Aberfoyle Creek. The collective effects of the open pit ponds is therefore a potential groundwater baseflow temperature increase to 10 ºC to 14 ºC over a 200 m section of the creek. It is noted that once the groundwater base flow in this 200 m section mixes with the creek flow, no temperature difference is likely to be realized from normal creek flow conditions.

5.3.3 Water Budget Adjustment

Water budget calculations have been completed to approximate changes to on-Site infiltration volumes, in response to the proposed aggregate pits. Comparison of water balance data under pre- and post-development conditions have been completed to determine if post-rehabilitation measures are required to mitigate the effects of proposed development. A water budget assessment is an accounting of the distribution of components of the hydrologic cycle and can be simplified in the following equation:

$$P = ET + S + R + I$$

where:

P = precipitation; ET = evapotranspiration; S = change in groundwater storage;

R = runoff; and I = infiltration

The key component of the water balance is evapotranspiration (ET), which is calculated using the soil moisture balance model developed by Thornthwaite and Mather (1957). The Thornthwaite and Mather model assumes that different soil textures have a characteristic capacity to hold water. Any deficit to the soil holding capacity must be met before water can infiltrate. Monthly values of precipitation (rainfall plus snowmelt) and potential evapotranspiration rates are input to the model. Potential evapotranspiration is calculated based on temperature, heat index, and an adjusting factor for latitude. The actual evapotranspiration is calculated using the input precipitation, calculated potential evapotranspiration, and change in soil moisture storage. Infiltration and runoff are calculated using the water surplus, ground slope, soil type, and ground cover. Values for infiltration and runoff are generated as a depth and are reported in millimetres (mm). These depth values can generate annual volumetric values by inputting known areas for land use under pre- and post-development conditions. An infiltration deficit is calculated as the difference between pre-development infiltration and post-development infiltration.

Tables F1 and F2 (in Appendix F) show the pre- and post-development water budget calculations for the only area of the Site subject to alteration: the proposed extraction footprint (8.77 ha). Temperature and precipitation averages for the region from 1991-2020 climate normals were obtained from the Environment and Climate Change Canada (ECCC) website for the Region of Waterloo Airport Climate Station (ID 6144239), located approximately 20 km northwest of the Site.

For both pre- and post-development conditions, soil moisture capacity was set at 75 mm corresponding to predominantly sand soil with cultivated landscape according to the MECP *SWM Planning Design Manual* (MECP, 2003). Post-development, approximately 4.57 ha of the 8.77 ha extraction area, will reflect ponded terrain. At these pond locations, the average annual evaporation rate (850 mm/year according to GEO.CA) is nearly consistent with the average annual precipitation normal (851 mm/yr, according to Environment Canada). This will reduce the water surplus, relative to the pre-development condition.

The average annual volume of infiltration under pre-development conditions is estimated at approximately 22,345 m^3/year or unit rate of approximately 255 mm/year (Table F1). Under post-development conditions, the Site infiltration rate is estimated to decrease to approximately 10,747 m^3/year or unit rate of approximately 123 mm/year (Table F2). The effect of the proposed development on Site infiltration is therefore interpreted to reflect a water resource decrease of 11,598 m^3/year (equivalent to approximately 32 m^3/day). This reduction (equivalent to 0.4 L/s) is insignificant, reflecting less than 1% of the 50 L/s base flow rate interpreted at the downstream Aberfoyle Creek station. The proposed pit ponds should therefore have no effect on local surface water or groundwater flow conditions.

5.3.4 Catchment Area Adjustments for Local Wetlands

Final grading of the proposed development, as detailed by the proposed Site Plan (MHBC, 2025), makes no changes to the overall direction of overland drainage locally. The effect of the proposed development on local hydrology is limited to loss of catchment area within each of the four sub-catchments. These losses are shown on Figure 14 and summarized in Table 7. Reductions in sub-catchment areas range from 1% or less within CA-4 to 39% within CA-3a.

The catchment area changes should have no effect on the hydroperiods within the local wetlands. As noted in Section 4.3.2 above, the hydroperiods are directly dependent on the water table elevation. Wetland hydroperiods are therefore sensitive to water table fluctuations and insensitive to catchment area losses. Figure 16 shows the drive point piezometer hydrographs (DP21-1 in WE-1d, DP21-2 in WE-2, DP21-3 in WE-1b and DP21-4 in WE-1a). The grade elevations within each graph has been adjusted to reflect the simulated hydrograph drawdown or rise in accordance with that shown on Figure 16. This analysis indicates negligible changes to the hydroperiods would have been observed over the past 4 years. Ponded conditions would have consistently occurred over the winter and spring months annually.

5.4 Cumulative Effects

The Site is situated south (downgradient) of existing aggregate extraction pit properties (former Tikal Pit and Dufferin Pit). Additional gravel pit operations being operated under Class A Licenses are also located within Puslinch Township, situated approximately 3 km southwest of the Site. Long term monitoring in the area of Mill Creek (LRG, 2019) has shown that aggregate extraction below the water table has not resulted in measurable impacts on water temperatures and streamflows within Mill Creek.

It is noted that pit ponds on adjacent properties are immediately north of the proposed Anthony Pit Site. On-Site monitoring data presented in Section 4 shows no water resources impacts or influence from the operations on the adjacent lands (i.e., no indication of water table drawdown or groundwater temperature effects). Recognizing the proximity and upgradient location of these existing pit ponds, the water temperatures within the proposed onsite pit ponds are expected to be similar to that of the existing pit ponds. The cumulative effects of pit ponds are not expected to significantly influence local groundwater temperature or base flow rates towards local surface water features.

As noted in Section 5.2.1, the small depth of drawdown (0.3 m at the pit ponds) and limited zone of influence (interpreted to be approximately 400 m from the pit ponds) will not affect the operation of local groundwater supply wells. The Site is not within or near a WHPA associated with water quality (WHPA-A through WHPA-D; Figure F4). Recognizing there is no direct water taking from the Site, the proposed development will not affect the groundwater quantity within the local WHPA-Q or operation of municipal water supply wells (which are located over 2.5 km from the Site).

Alterations to the Site within the proposed extraction limit and the resulting creation of pit pond area are not expected to significantly alter the water table elevation, which sustains the hydroperiods within the surrounding wetland areas. In consideration of the above, the proposed extraction is not expected to have additional adverse impacts on the water resources of the area.

6 Proposed Monitoring Program

As noted above, there is no proposed dewatering of the Site for aggregate extraction operations, with aggregate extraction proposed for excavation below the water table using a drag line. The predicted changes to water balance are not significant, and localized changes that are expected to result in a flattening of the water table gradient are not expected to have an adverse impact on the wetland areas that are being maintained at and bordering the Site.

To confirm the assessment and predictions submitted herein, the following water resources monitoring program can be undertaken:

- Annual groundwater quality monitoring of samples collected from MW21-01 through MW21-05. The parameter analysis for the samples should be consistent with those described within Section 3.6.
- On-going groundwater elevation monitoring within monitoring wells MW21-01 through MW21-05, drive point piezometers DP21-01 through DP21-04 and staff gauge locations SG21-1 and SG21-2. The monitoring program should use dataloggers, collecting levels on an hourly basis. Manual measurements of water levels and streamflow's should be collected on a semi-annual basis.
- On-going groundwater elevation monitoring and streamflow measurements at staff gauge locations SG21-1 and SG21-2.

Timing of the reporting on quarterly monitoring should coincide with annual regulatory compliance reporting requirements to the MNR. A site plan showing wells / shallow drive point piezometers to be maintained and protected at the Site should be provided to the operations for the Licensee, so that monitoring wells are not inadvertently damaged during site preparation works and removal of overburden materials.

When the monitoring wells are determined to be no longer required, the wells should be properly decommissioned in accordance with Ontario Regulation 903. Decommissioning a well which is no longer in use is completed for the safety of those in the vicinity of the well, prevents surface water infiltration into an aquifer via the well, prevents the vertical movement of water within a well, conserves aquifer yield and hydraulic head and can potentially remove a physical hazard.

7 Contingency Plan And Mitigation Measures

7.1 Potable Water Supply Interference

Prior to below water table extraction, a private well survey shall be completed within 120 m of the Site to identify any private water supply wells in use. The following water well interference complaint protocol is recommended to address water supply interference to domestic and farm water supplies for properties located in proximity (within 120 m) to the Site (see Figure 11).

1. Provide 24-hour emergency contact information for the Licensee to the well owner, to facilitate reporting of perceived water supply impacts.

2. Should disruption or quality problems be experienced by the well owner this shall be notified to the Licensee, who will be responsible to report the well interference complain to MNRF and MECP.

3. In the event that the well owner experiences a significant disruption in their water supply, or experience significant adverse effects upon their water quality; and if the operation of the pit cannot obviously and definitively be excluded as the cause, the Licensee shall provide a temporary water supply within 24 hours and thereafter until such time as the cause of the disturbance can be determined and the situation addressed.

4. The Licensee shall investigate the cause of the water supply disturbance and shall report to the MNR, MECP and the well owner.

If it is determined that the aggregate extraction at the pit has been found to have caused a domestic or farm water supply to be adversely affected, the Licensee shall, at the Licensees expense, either restore or replace the water supply to ensure that historic water supply and quality are restored for such a resident. If it is determined that the operation of the pit has not caused any domestic or farm water supply to be adversely affected, the temporary water supply will be maintained for an additional 24 hours to allow the well owner to make alternate water supply arrangements.

7.2 Sediment And Erosion Control Measures

Surficial topsoil and overburden soils are to be stripped as part of the site preparation works and stockpiled at the Site for reuse during the site restoration. It is recommended that stockpiled materials be stored in areas where stormwater run-off will not drain directly into wetland and the woodlot areas being maintained at the Site. Additionally, berms constructed at the Site should be vegetated as soon as possible after placement, to help stabilize the berm side slopes.

7.3 Refuelling and Construction Equipment

The proposed aggregate extraction operation is expected to involve excavation of sand, and sand and gravel materials from above and below the water table. Proper operation and refuelling procedures must be followed for use of equipment in site operations to avoid potential risk of petroleum hydrocarbons such as fuels, oil and grease in entering the exposed groundwater system. Best management and good construction practices should be followed to reduce this potential and mitigate risks associated with the equipment operation.

Regarding fuel storage and refuelling procedures at the Site, the following recommendations are provided for consideration:

- Onsite fuel storage tanks will be installed and maintained in accordance with the Gasoline Handling Act
- Designated fuelling and equipment maintenance area, located at least 30 m away from surface water features, where possible

Implement spill contingency measures and spill action response plans for construction equipment.

8 Conclusions

Based on Stantec's hydrogeological field study results and analyses, the following conclusions have been developed with respect to the proposed Anthony Pit development Site and associated aggregate extraction operations. These conclusions are organized with respect to:

- The conceptual hydrogeological model of the Site
- Planned operations at the proposed Anthony Pit and associated effects on local water resources
- Proposed rehabilitated conditions at the Anthony Pit and associated effects on local water resources

Overall, the method of aggregate extraction at the Anthony Pit is designed to minimize potential effects on local water resources.

Conceptual Hydrogeological Model

1. The proposed Anthony Pit Site is underlain by a large deposit of sand and gravel (i.e., approximately 23 m thick). The sand and gravel overburden extends from near ground surface to the bedrock surface at approximately 298 masl. The bulk hydraulic conductivity value for the overburden is interpreted to be in the order of 4 $x10^{-4}$ m/s. The overburden is underlain by Silurian dolostone bedrock of the Eramosa Formation, with a vertical hydraulic conductivity on the order of $1x10^{-9}$ m/s. Considering the permeability contrast between the overburden and bedrock, the hydrogeological conceptual model considers the bedrock to reflect the base of the local groundwater flow system, while the overburden reflects a single layer, unconfined aquifer. The water table slopes in a southwesterly direction, ranging from approximately 324 masl at the eastern limit of the Site to approximately 320 masl at the western limit of the Site. Seasonal variation of the water table is minor (approximately 1 m or less, annually).
2. The Site straddles the upland areas between the north and south branches of Aberfoyle Creek (within the Mill Creek watershed). The local topography is hummocky, with two internally draining catchment areas comprising 50% of the Site Area. Surface catchments for the remainder of the Site drain into either the north or south branches of Aberfoyle Creek. Due to the hummocky topography, eight low-lying wetland areas exist within the four local surface water catchments. Dry conditions are observed within these wetlands during the late summer, fall and early winter months, annually. During the remainder of the year, these wetlands are flooded in response to the rising water table. Due to their limited catchment areas, the hydroperiod of these wetlands are completely dependant on the local water table. There are no open water bodies, watercourses or groundwater springs observed within the Site limits, aside from three dug ponds situated in the northern portion of the Site.
3. Groundwater samples from on-Site monitoring wells reflect quality that is typically of that observed in southern Ontario's overburden aquifers and within greenfield areas. The groundwater quality is compliant with all health-related criteria of the Ontario Drinking Water Standards and Provincial Water Quality Objectives (except for zinc). There were no detections of PHC's or BTEX within any of the groundwater samples. The quality of two Aberfoyle Creek surface water samples are consistent with the groundwater chemistry. Both reflect a magnesium bicarbonate water type. These results support the conclusion that local surface water features are well supported by groundwater base flow.

4. Stantec's 4-year field monitoring program extended through a period of predominantly below normal precipitation. Over this period, the average annual baseflow rate of Aberfoyle Creek – South Branch (1 km downstream of the Site, at the Brock Road crossing) was interpreted to be approximately 50 L/s.

Anthony Pit Operations and Short-Term Effects on Local Water Resources

5. The large deposit of sand and gravel soils beneath the Site has been deemed to be a financially viable aggregate extraction resource. Aggregate extraction is expected to include both above and below water operations; however, it is understood that the entire area proposed to be extracted at the Site may be applied for a licence as below water table extraction.
6. Above water extraction will be carried out from north to south, across the Site, using conventional construction equipment, including trucks, loaders, excavators, backhoes, bulldozers, scrapers, and conveyors. Material will be loaded and hauled offsite to a CBM processing facility. Below water extraction will be executed from south to north, across the Site, using a conventional dredge wireline excavator (i.e., cranes with draglines). The total area to be extracted and rehabilitated is 8.77 hectares, which will be organized to include two separate pit ponds (i.e., north pit pond 2.65 hectares and south pit pond 1.86 hectares). The total depth of the ponds will be approximately 17.5 m (304 masl). Excavated overburden will be stockpiled to allow for drainage of captured groundwater back to the resulting pit ponds. Aggregate operations are expected to be completed within a 2-to-5-year period.
7. The planned below water aggregate extraction rate is 3,000 tonnes per day. Removed aggregate will be replaced by local groundwater. This displacement reflects an equivalent water pumping rate of approximately 1,050 m^3/day (equivalent to 12 L/s). There will be no pumping / dewatering of the pit ponds. In response to water replacement of extracted aggregate, a water table drawdown of approximately 0.30 m is expected at the pit ponds. The water table drawdown will decrease with increasing distance from the pit. At a 30 m distance from the pit pond (i.e., equivalent to the buffer zone surrounding wetland areas), the forecasted drawdown is interpreted to be less than 0.13 m. The lateral extent of water table drawdown (e.g., zone of influence) is predicted to extend approximately 400 m from the edge of the pit pond. Due to the limited depth and lateral extent of the water table drawdown, the proposed works will not interfere with the operation of local groundwater supply wells.
8. Provincial source protection mapping indicates that the Site is not located within water quality Well Head Protection Areas or areas of high aquifer vulnerability. The Site is located within an area of high groundwater recharge; however, the proposed development will not significantly diminish groundwater recharge conditions. While the Site is located within a groundwater quantity protection area (WHPA-Q), no water taking from the Site is proposed. Therefore, the proposed pit will not affect the operation of municipal water supply wells (which are located over 2.5 km from the Site) or stress the local groundwater resource.
9. The forecasted water table drawdown within the below water extraction areas is small (less than 30%) relative to the 1 m seasonal water table fluctuations observed annually. As such, the water table drawdown should not affect the seasonal hydroperiods within local wetlands. Hydroperiods within local wetlands will continue throughout late winter, spring and early summer months, based on precipitation totals observed to date.

10. Short term groundwater base flow reduction towards Aberfoyle can be expected during aggregate extraction operations (e.g., 2 to 5 year period). During below normal annual precipitation years, the baseflow reduction could theoretically be as high as 24%. Actual baseflow reduction rates are likely to be lower, in response to normal or above normal precipitation. On-going streamflow and aquatic habitat monitoring can be undertaken to confirm continuity of streamflow rate and temperature observed to date, as well as aquatic habitat conditions.

Anthony Pit Post-Closure and Long-Term Effects on Local Water Resources

11. Based on a Thornthwaite water budget analysis, the average annual volume of infiltration under pre-development conditions is estimated at approximately 22,345 m^3/year or unit rate of approximately 255 mm/year. Under post-development conditions, increased evaporation (i.e., due to the open pit ponds) is expected to decrease the average annual infiltration to approximately 10,747 m^3/year or unit rate of approximately 123 mm/year. The presence of the pit ponds is therefore expected to reduce the on-Site infiltration rate by 11,598 m^3/year (equivalent to 65 m^3/day or 0.4 L/s). This reduction is small, equivalent to less than 1% of the interpreted base flow rate in Aberfoyle Creek (down stream of the Site). This adjustment should not affect normal groundwater or surface water flow conditions locally.
12. In response to the permanent formation of ponds, the local hydraulic gradient will decrease. The final pit pond elevations are expected to stabilize at approximately 321.7 masl for the north pond and 320.7 masl for the south pond, which is near the central range of the stabilized water levels recorded at the Site. Net changes to the local water table elevation will be approximately 0.6 m lower on the northeast side of the Extraction Area and approximately 0.3 m higher on the southwest side. Based on Stantec's 4-year monitoring program and hydrograph analysis, changes to the hydroperiods of local wetlands will be negligible in response to these permanent water table adjustments (interpreted to be less than ±0.3 m). Ponded conditions within the wetland areas will continue to occur over the winter and spring months annually.
13. Creation of the proposed pit ponds will reduce the surface catchment areas of some local closed depressions / wetlands. These features, however, are insensitive to catchment area reductions due to their limited size (less than 0.1 ha). Ponded conditions within these features are directly related to the water table surface elevation, which fluctuates approximately 1 m annually. The hydroperiods for local wetlands and PSWs (supported by direct precipitation and groundwater interaction), will remain unchanged in the post-development conditions.
14. Local groundwater temperature ranges from 8 ^oC to 12 ^oC. The average annual water temperature within the aggregate pit ponds is interpreted to increase approximately 6 ^oC, reflecting a range of 14 ^oC to 18 ^oC. This pond water will flow in a southwesterly direction, cooling along its flowpath and eventually outflowing into Aberfoyle Creek. At Aberfoyle Creek (along a 200 m section on the east side) the temperature of this groundwater could be 2^oC above the local ambient (e.g., reflecting a range of 10 ^oC to 14 ^oC. It is noted that once the groundwater base flow in this 200 m section mixes with the creek flow, no temperature difference is likely to be realized from normal creek flow conditions.
15. Subject to implementation of recommended contingency plans and mitigation measures, the proposed pit ponds do not reflect a source protection threat to local groundwater supply wells.

9 Recommendations

Based on the above conclusions of the Water Resources Report presented herein, the following recommendations are provided and should be considered to be incorporated into the site plans:

1. Groundwater level monitoring should continue at the Site on a semi-annual basis after the pit is licensed and continue until Site restoration is complete.
2. Groundwater samples have been collected at the Site to establish baseline water quality conditions for shallow groundwater within the unconfined aquifer which is expected to be encountered during the aggregate extraction operation. Future water quality testing should be undertaken on an annual basis for comparison to the background information presented within this report.
3. Fuel storage, equipment filling, and equipment maintenance should be carried out in accordance with best management practices outlined in Section 7.3, including designated fuelling locations and implementation of spills management response plans, as appropriate to reduce the potential and mitigate risks associated with the equipment operation.
4. Prior to below water table extraction, a private well survey shall be completed within 120 m of the Site to identify any private water supply wells in use. If complaints are received from nearby or neighbouring property owners (within 120 m of the Site), the Water Supply Interference Protocols outlined in Section 7.1 should be adhered to and followed.

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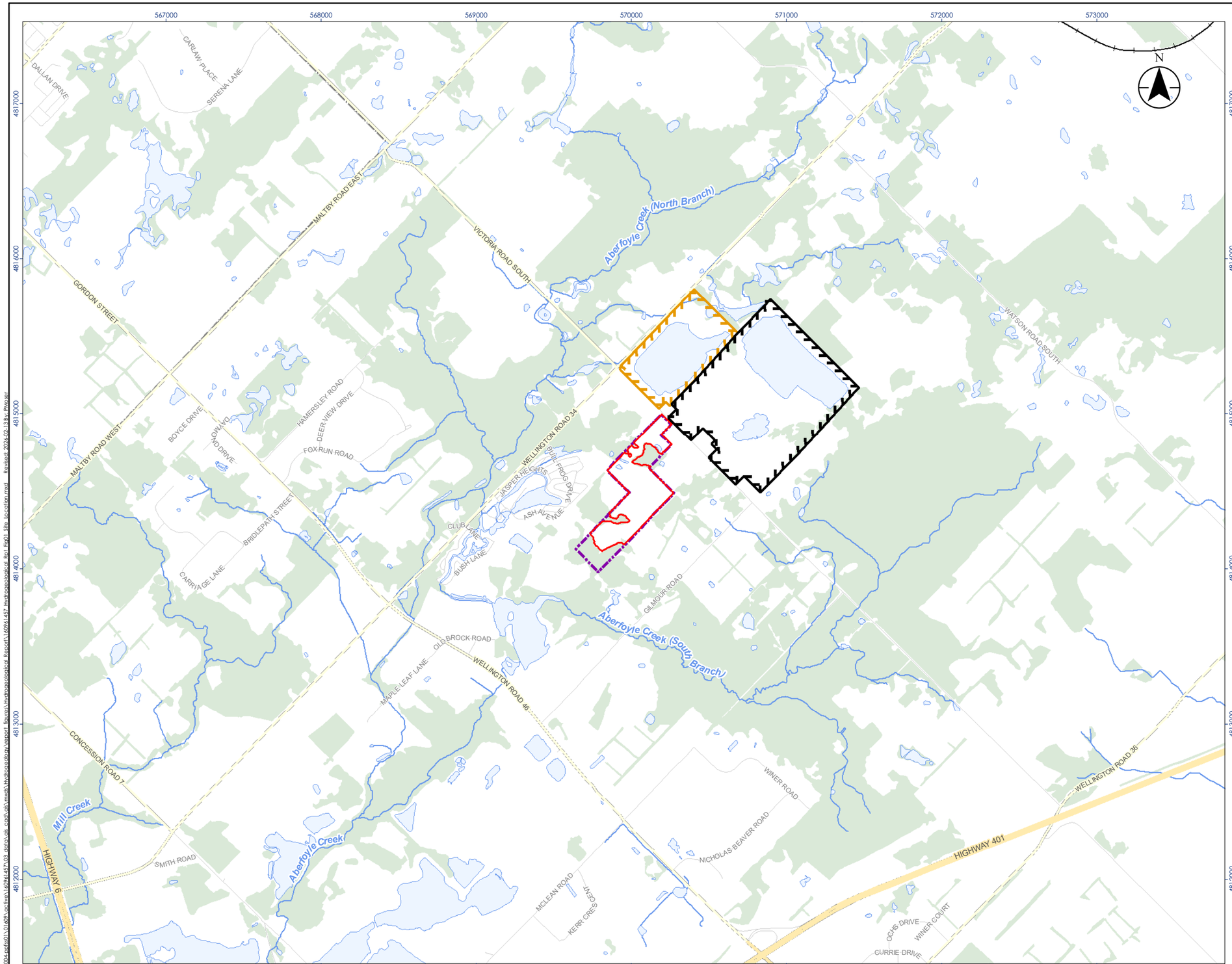
Appendix A

Figures



Stantec

Legend

- Site
- 4454 Victoria Road South
- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Wooded Area
- Municipal Boundary - Lower Tier
- Dufferin Aggregate Pit
- CBM Tikal Pit (Licence Surrendered)

0 500 1,000 metres

1:25,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
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Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-10

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
1

Title
Site Location

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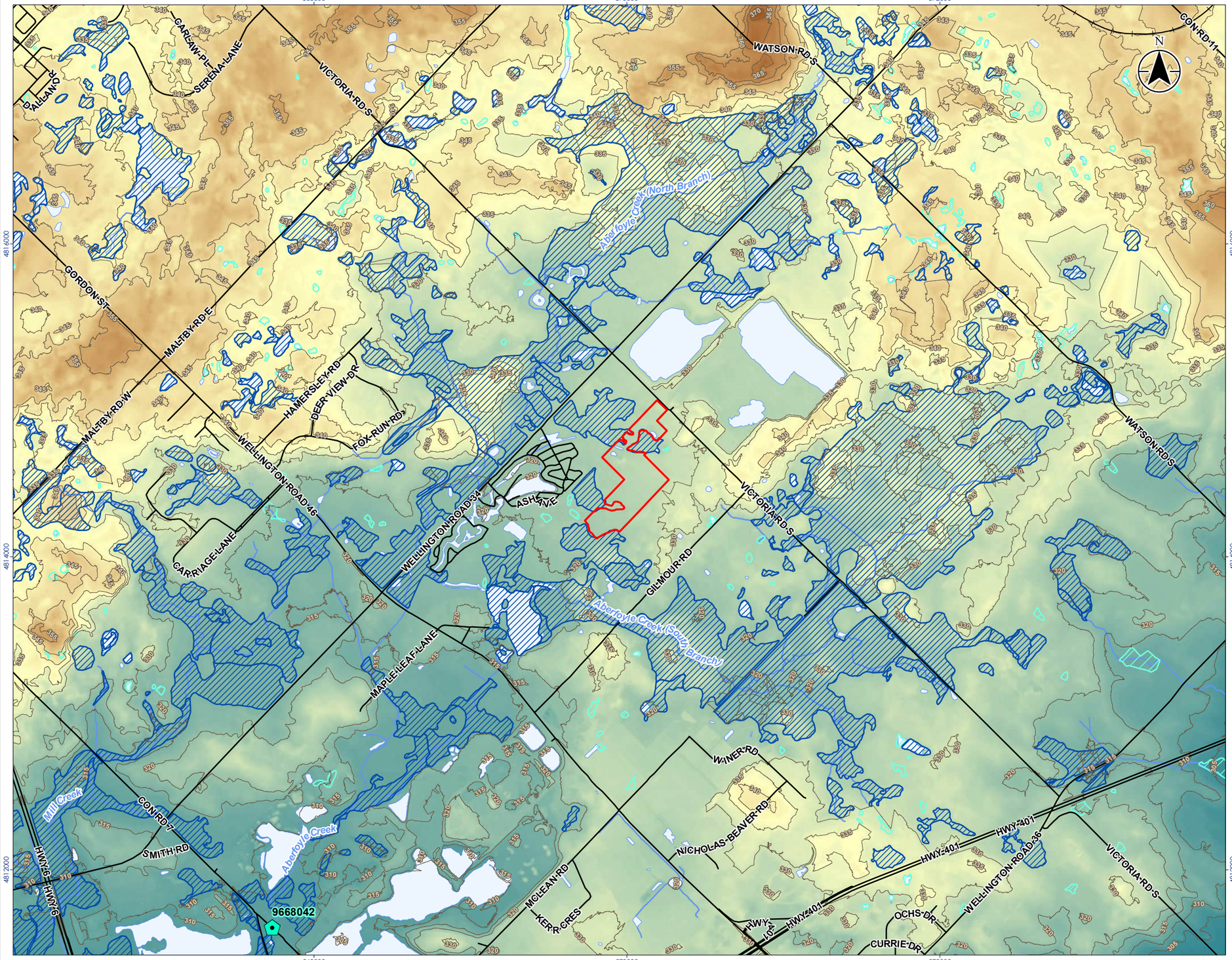

Stantec

Legend

- Site
- GRCA Gauging Station
- Road
- Railway
- Topgraphic Contour (m AMSL)
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System

Ground Surface Elevation (m AMSL)

High : 375

Low : 300

0 500 1,000 metres

1:25,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
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3. Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-13

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
2

Title
Topography and Drainage

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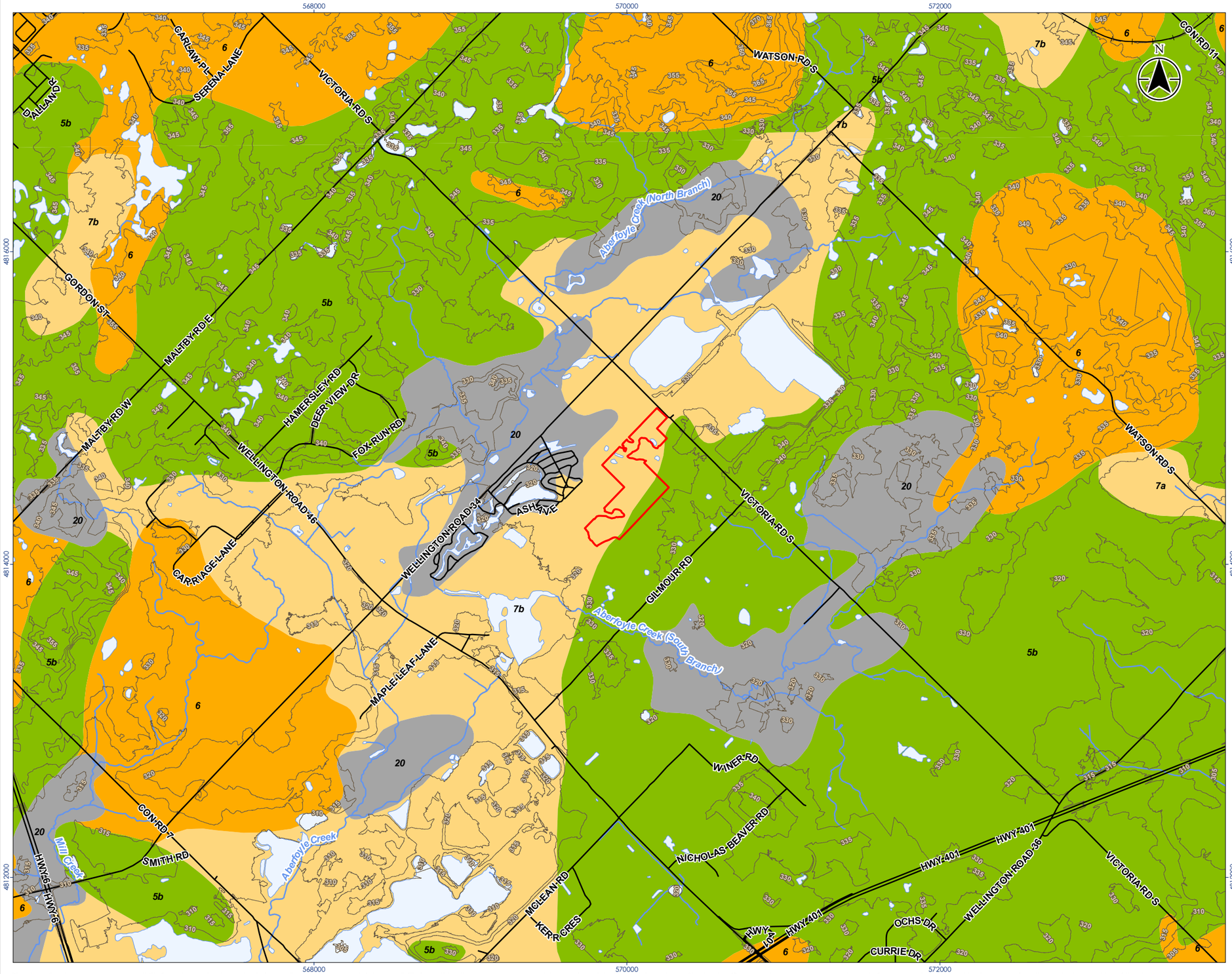

Stantec

Legend

- Site
- Topgraphic Contour (m AMSL)
- Road
- Railway
- Watercourse
- Waterbody

Surficial Geology

- 20: Organic deposits
- 7a: Glaciofluvial deposits (Sandy deposits)
- 7b: Glaciofluvial deposits (Gravelly deposits)
- 6: Ice-contact stratified deposits
- 5b: Stone-poor, carbonate-derived silty to sandy till

0 500 1,000 metres
1:25,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
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3. Ontario Geological Survey 2010. Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV ISBN 978-1-4435-2483-4.

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-09

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
3

Title
Surficial Geology

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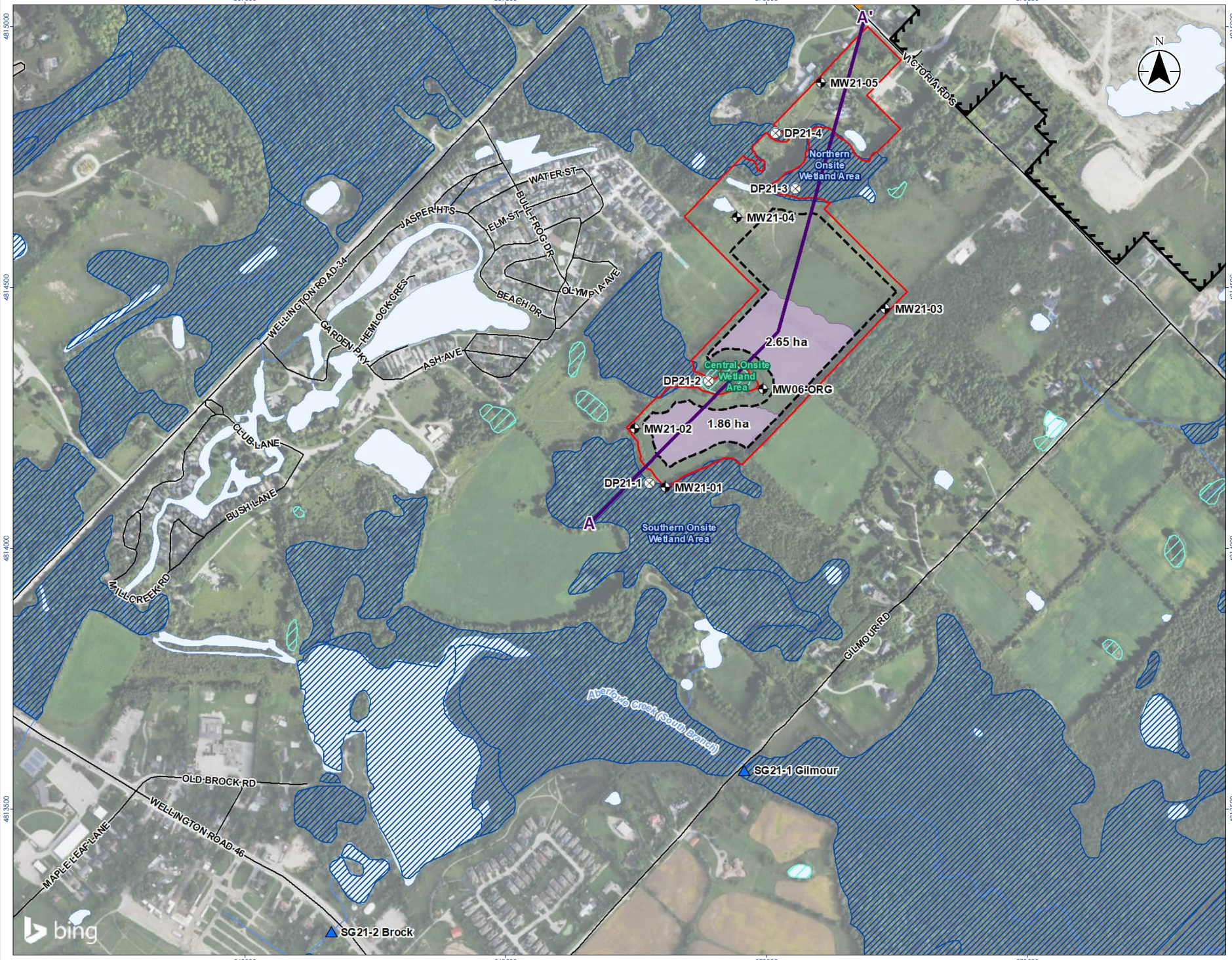

Stantec

Legend

- Site
- Monitoring Well
- Drive-point Piezometer
- Surface Water Monitoring Location
- Cross-Section Location
- Road
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System
- Dufferin Aggregate Pit

Extraction Footprints

- Area of Extraction Footprint
- Below Water Table Extraction Footprint

0 200 400 metres

1:7,500 (At original document size of 11x17)

Notes

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Project Location
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160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by AW on 2025-08-27

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
4

Title
Site Instrumentation

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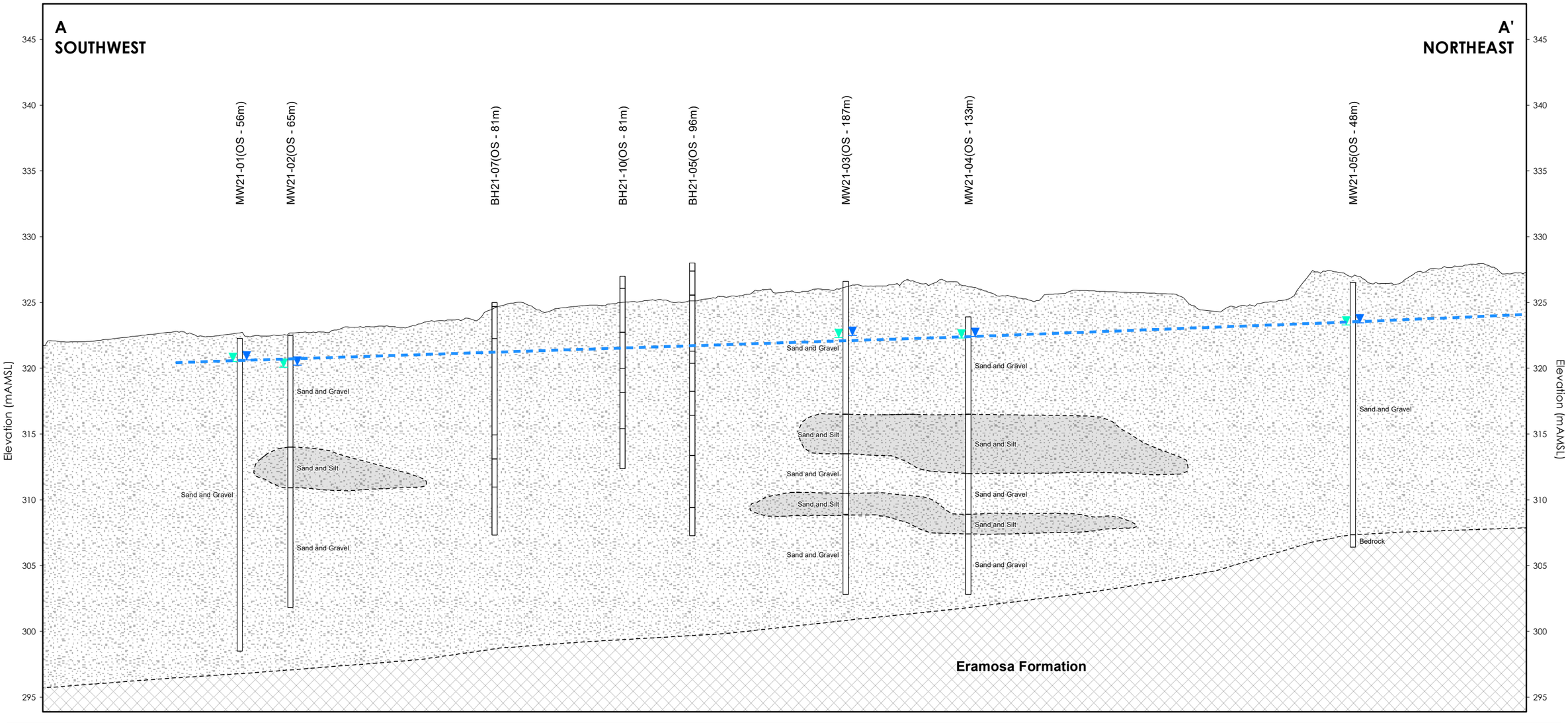
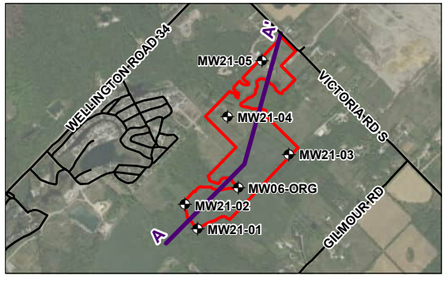
A
SOUTHWEST

A'
NORTHEAST





MW21-05 (OS m)

Sand

Well ID (Offset)

Stratigraphy

Water Level (April 5, 2022)
Water Level (June 1, 2022)
Well Screen

Legend
- Ground Surface
- Interpreted Geological Transition
- Groundwater Elevation
- Sand / Sand & Gravel
- Sand and Silt
- Dolostone Bedrock

10x Vertical Exaggeration

0 50 100 metres

1:3,000 (At original document size of 11x17)

Notes
1.

Stantec

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-10

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
5

Title
Cross-Section A-A'

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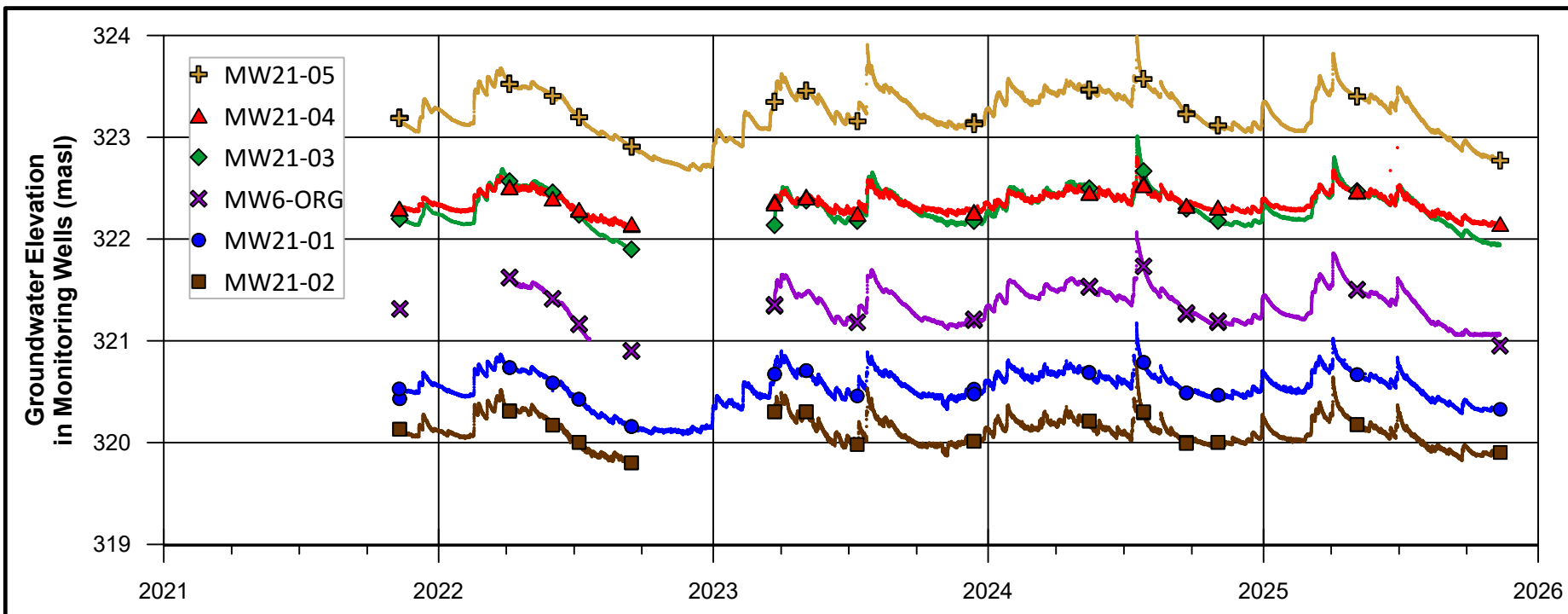
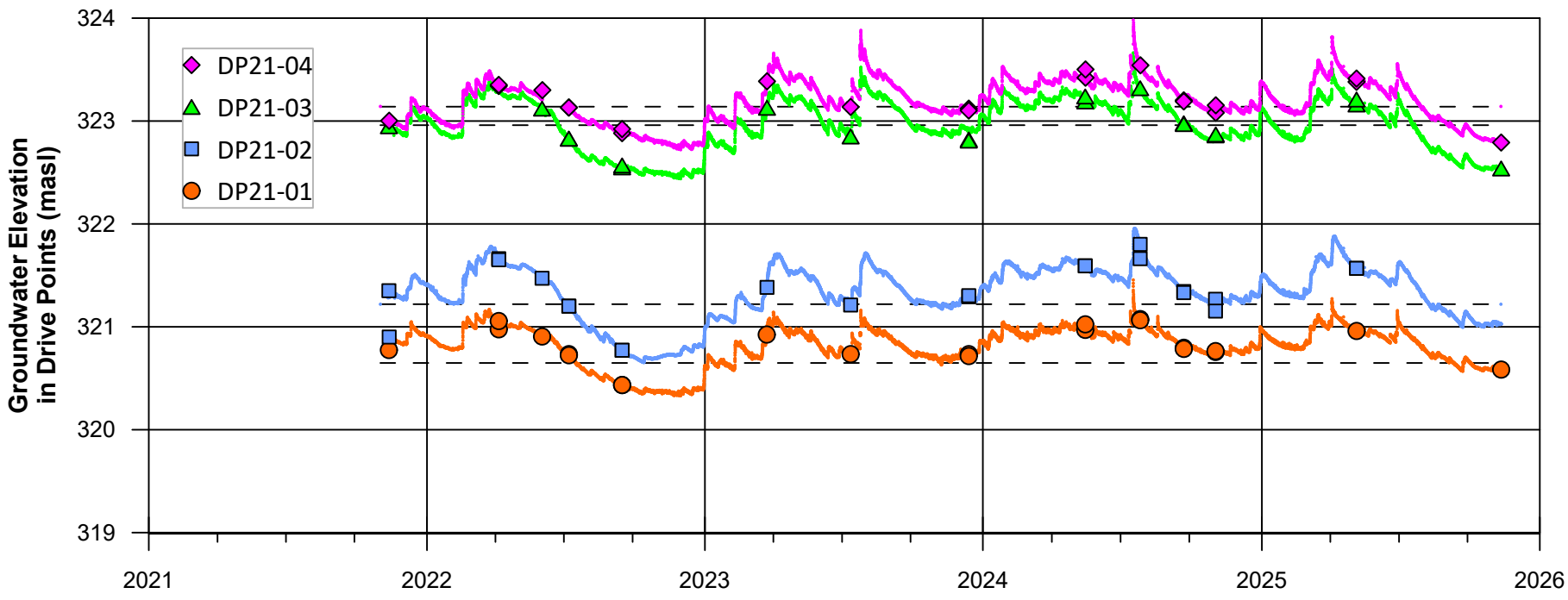
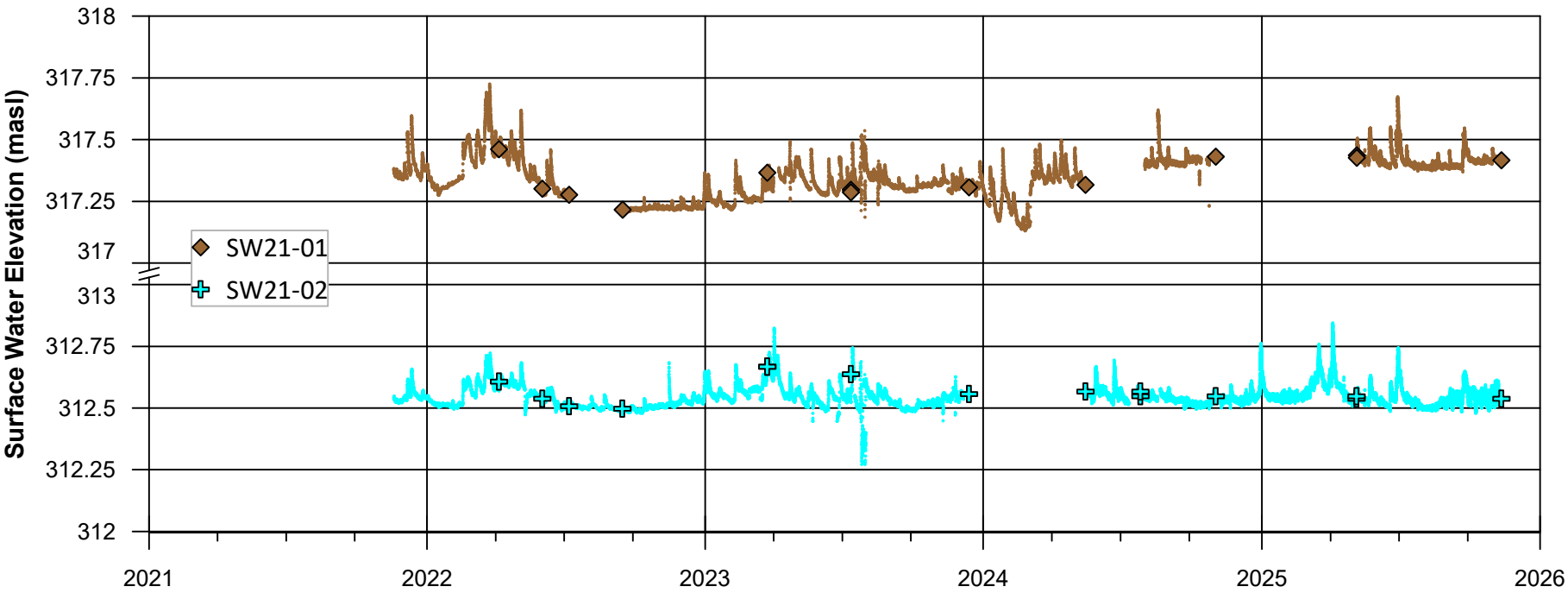
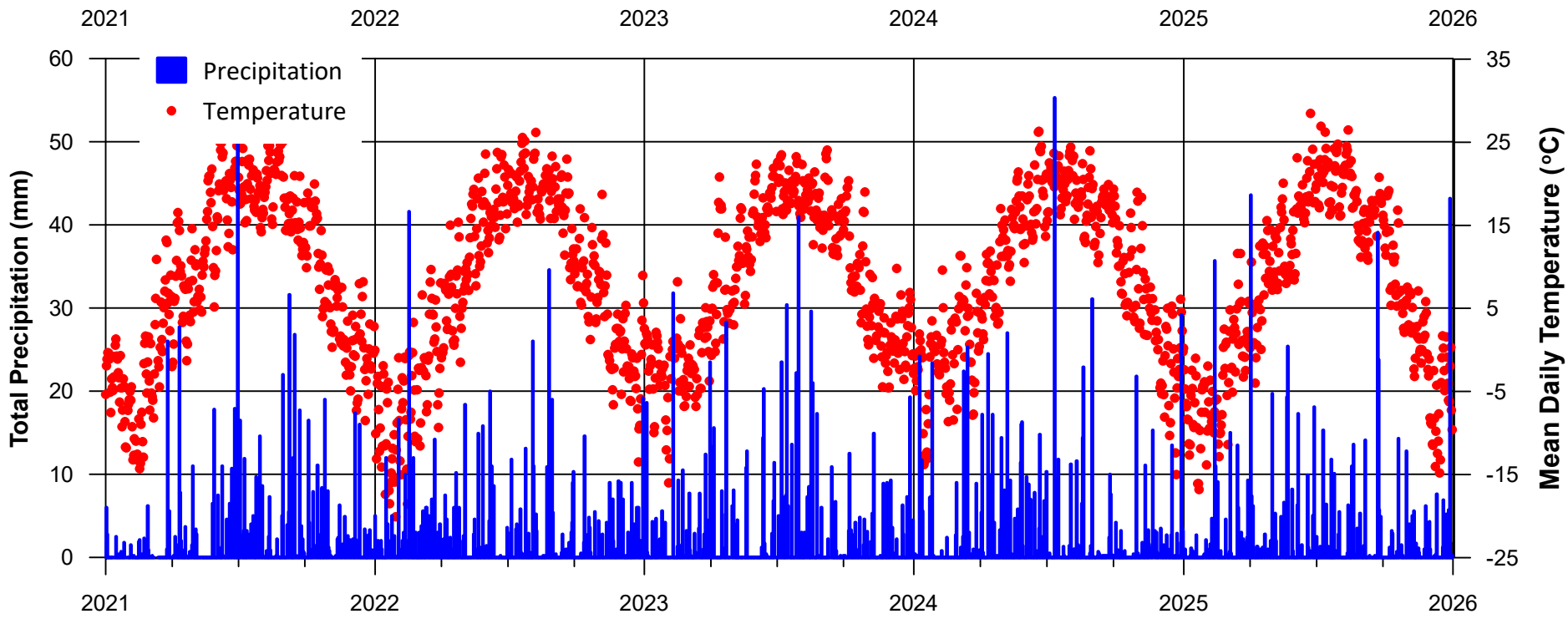
\\Cd0004-pgfs01\01691\active\160961457\03_data\gis_cad\gis\mxds\Hydrogeology\report figures\Hydrogeological Report\160961457 Hydrogeological Rpt Fig05 CrossSection AA.mxd Revised: 2026-02-13 By: PMoser







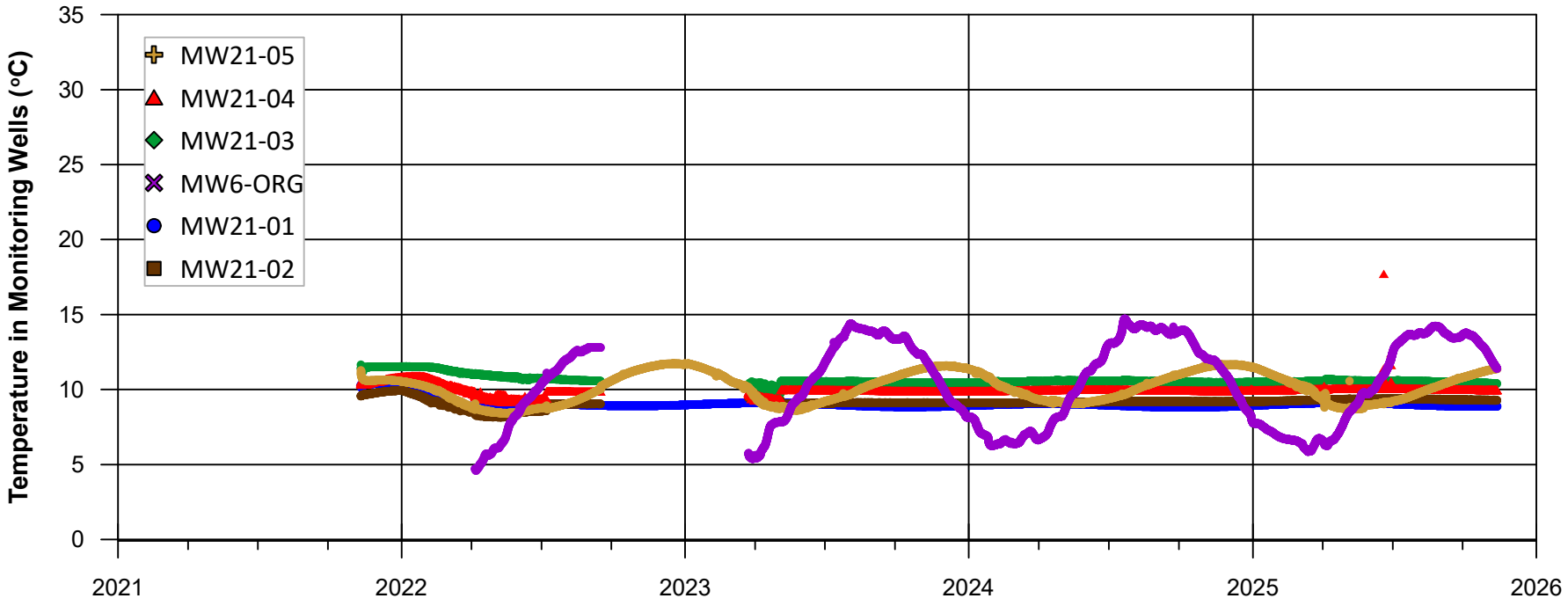


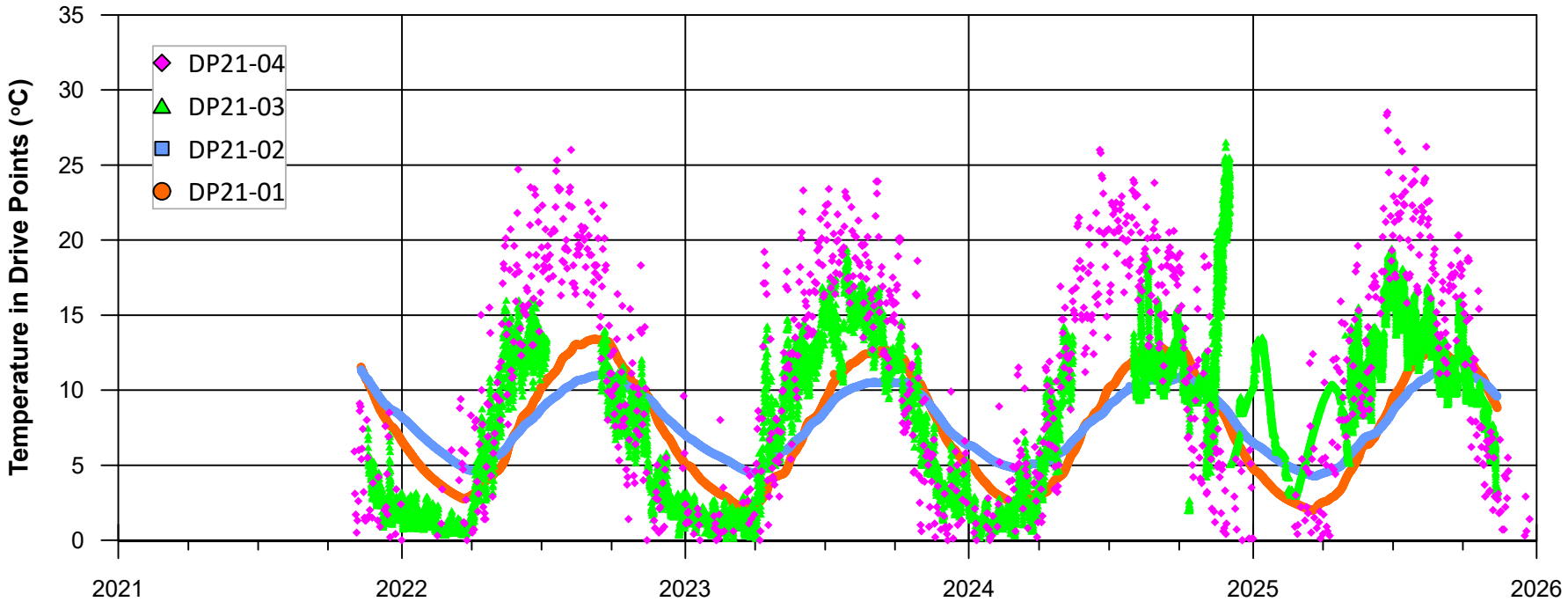
Notes:

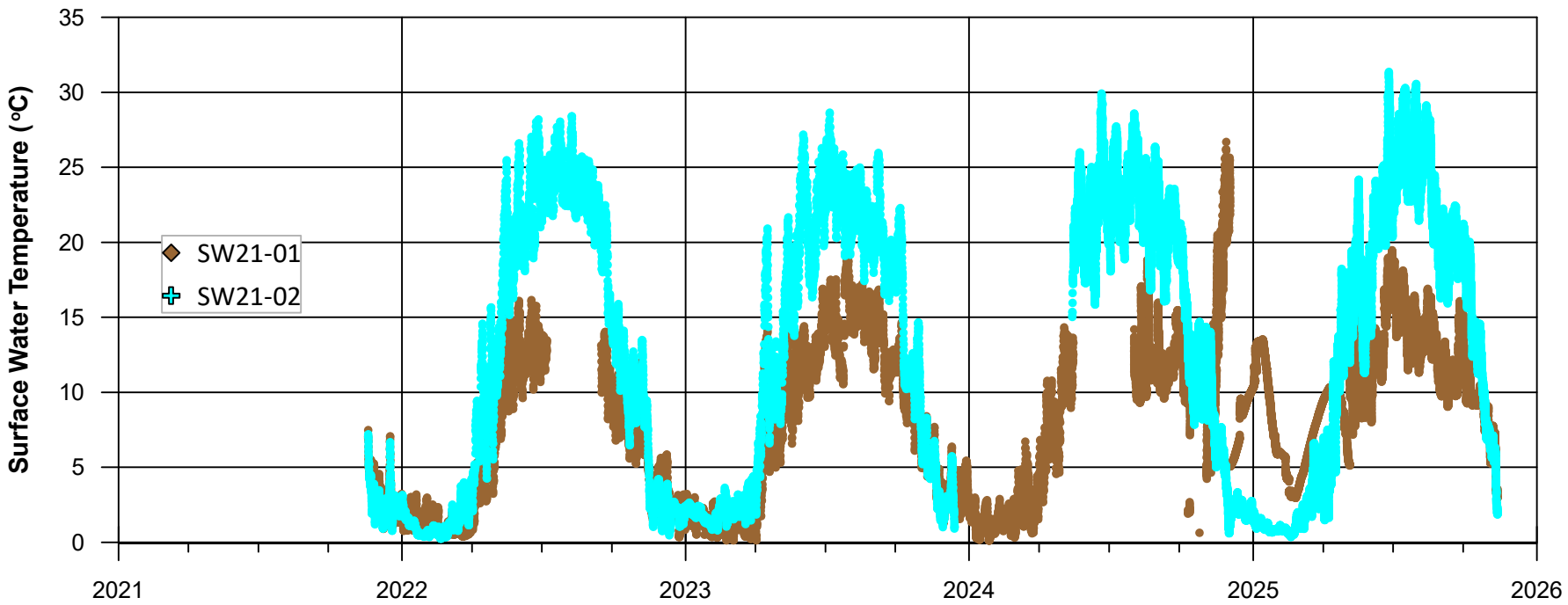
- - - - - - indicates grade elevation at Drive Point locations (below which wetland areas are dry)

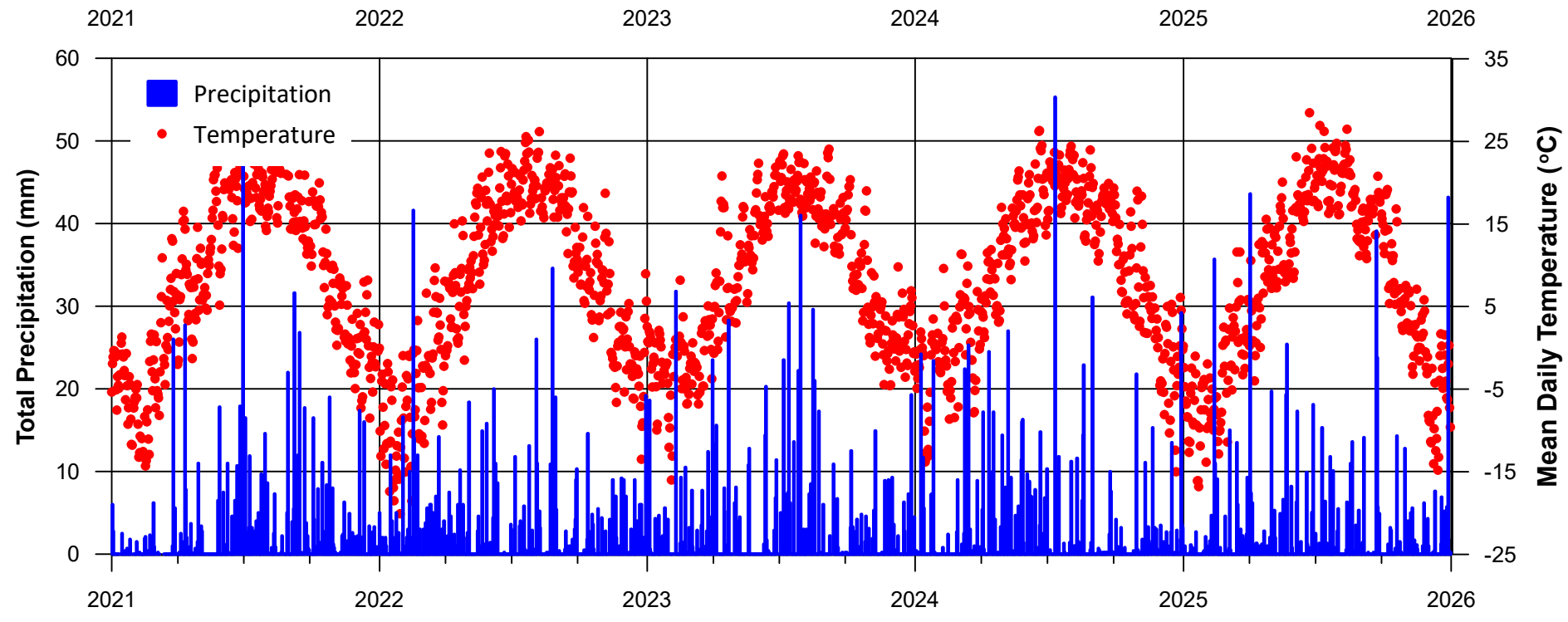
Precipitation / Temperature data obtained from the Environment Canada Station No. 6144239, Region of Waterloo Airport Climate Station

Water Level Monitoring Data	Stantec	
DRAWN: DG	APPROVED: SMD	DATE: Janary 2026
PROJECT NUMBER: 160961457		FIGURE: 6





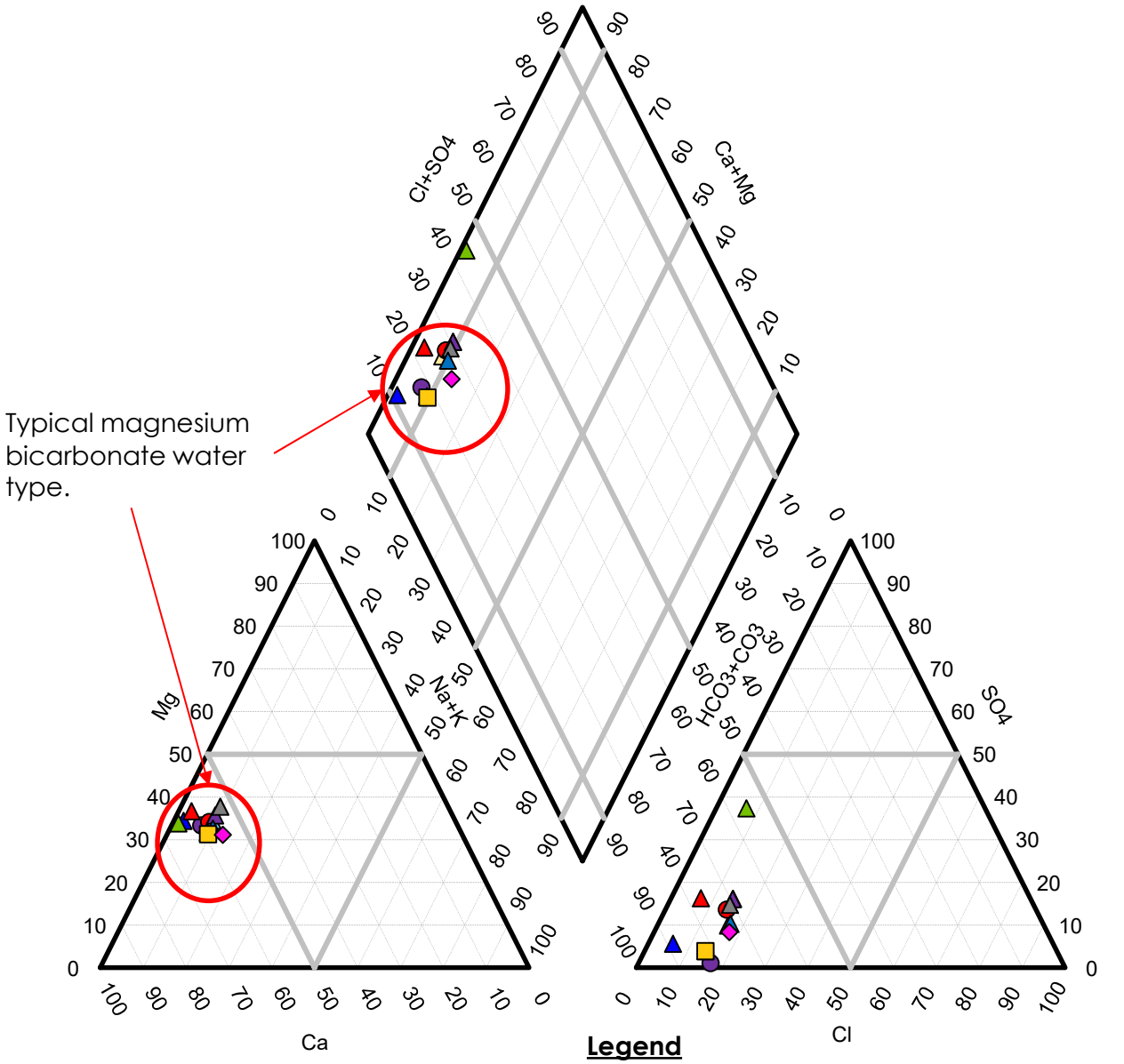




Notes:

- Precipitation / Temperature data obtained from the Environment Canada Station No. 6144239, Region of Waterloo Airport Climate Station

Water Temperature Monitoring Data		Stantec
DRAWN: DG	APPROVED: SMD	DATE: Janary 2026
PROJECT NUMBER: 160961457		FIGURE: 7



Client/Project

LEVEL I AND II WATER REPORT FOR PROPOSED ANTHONY AGGREGATE PIT

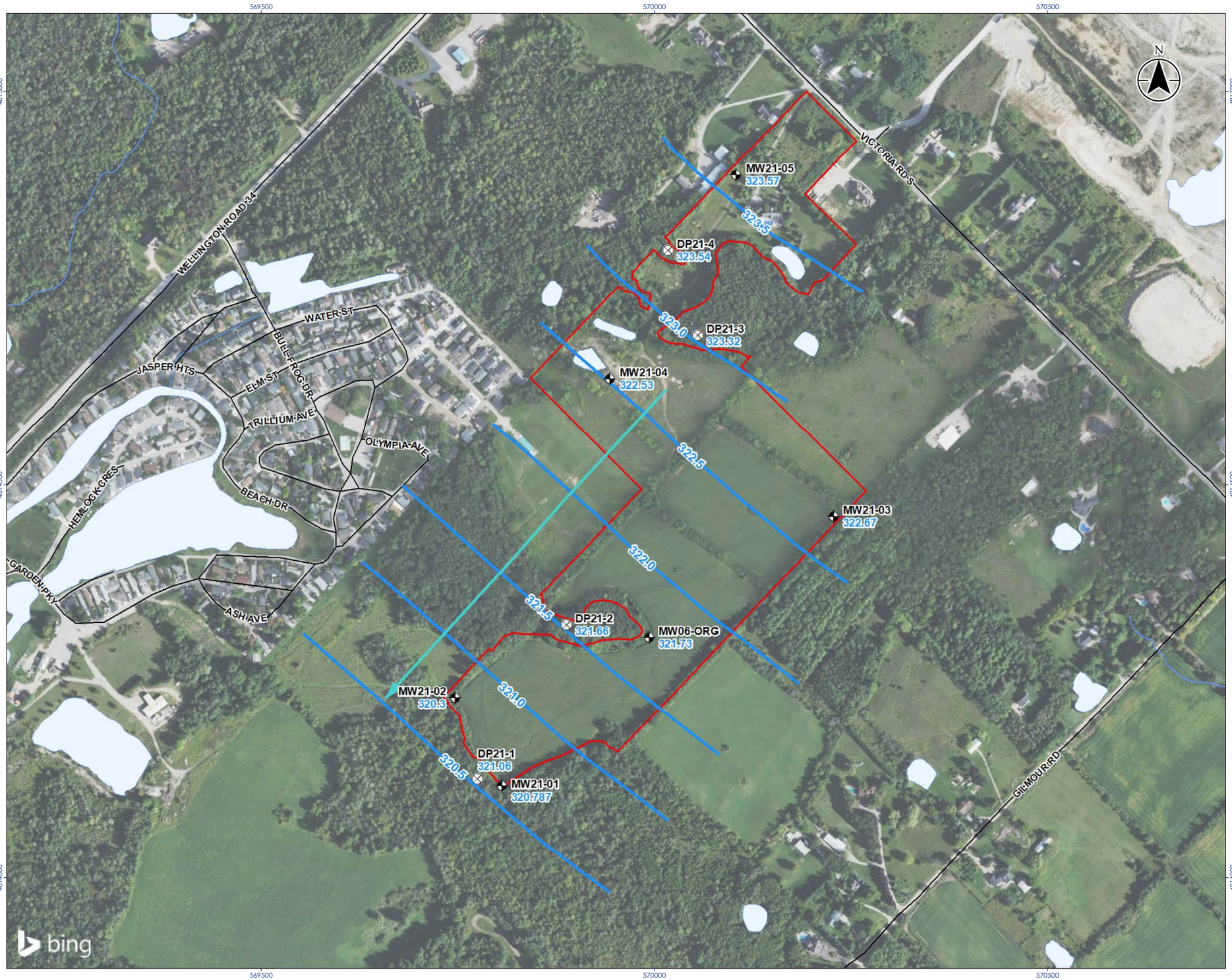
Figure No.

8

Title

Piper Plot Analysis of Water Quality Samples

Stantec



Stantec

Legend

- Site
- 319.90 Observed Groundwater Elevation (masl), July 25, 2024
- Monitoring Well
- Drive-point Piezometer
- Road
- Interpreted Groundwater Flow Direction
- Interpreted Groundwater Elevation Contour (masl)
- Watercourse
- Waterbody

0 100 200 metres
1:5,000 (At original document size of 11x17)

Notes

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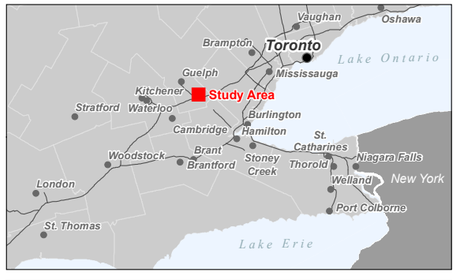

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-13

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
9

Title
High Groundwater Table Elevations - July 25, 2024

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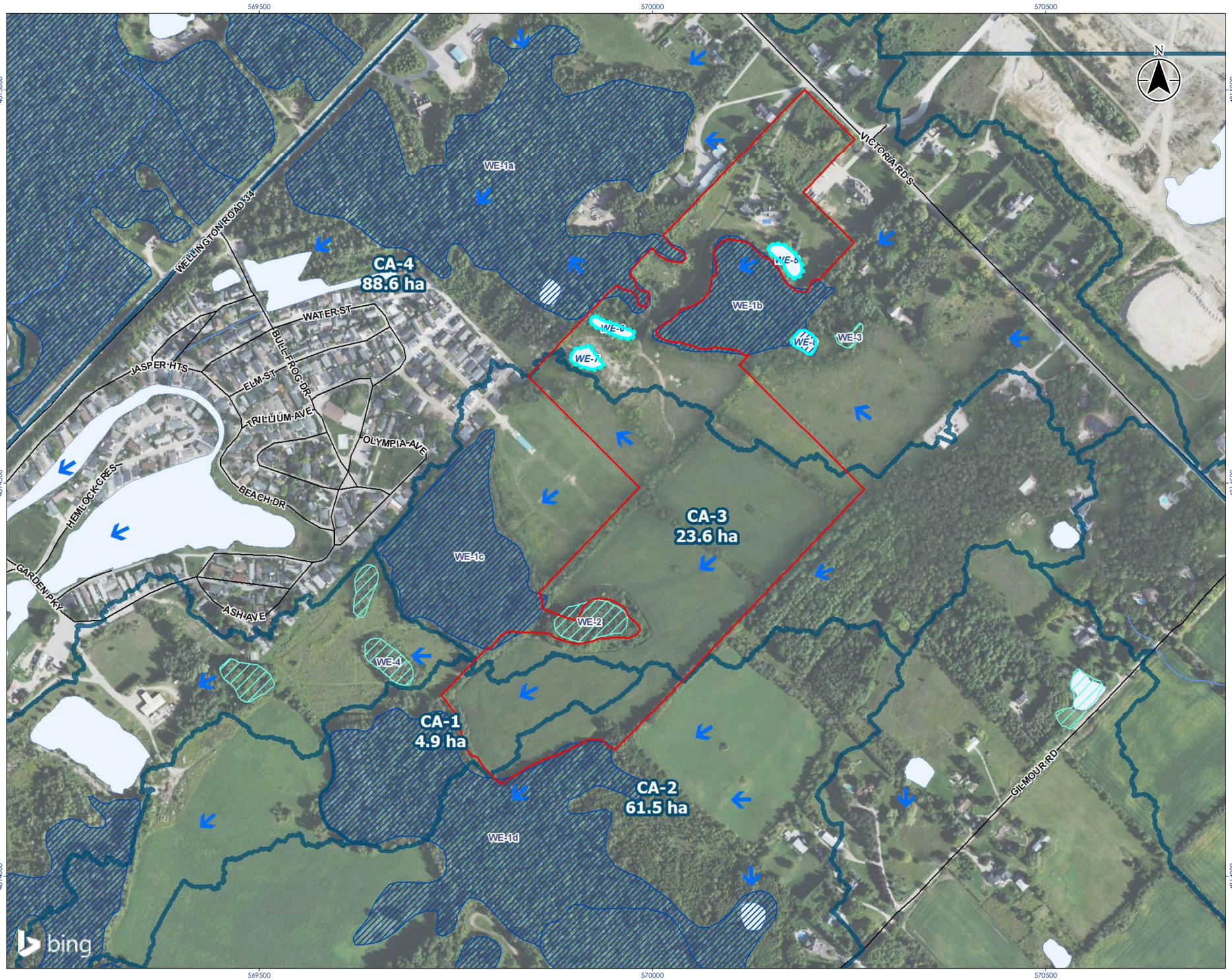

Stantec

Legend

- Site
- Overland Flow Direction
- Road
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System
- Closed Depression
- Catchment Boundary

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

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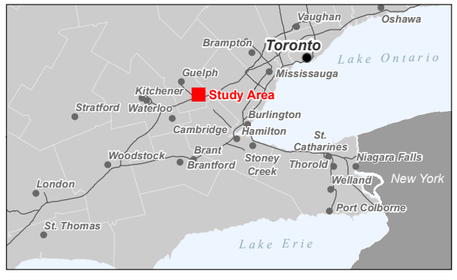

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-01-27

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
10

Title
Existing (Pre-development) Surface Catchment Areas

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Stantec

Legend

- Site
- Monitoring Well
- Water Well Location (MECP)
- Road
- Watercourse
- Waterbody
- Proposed Anthony Pit Site Buffer (500m)

0 250 500 metres

1:10,000 (At original document size of 11x17)

Notes

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4. MECP water well record locations have been positioned based on published UTM coordinates and their locations should be considered approximate.

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-09

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
11

Title
MECP Water Well Records

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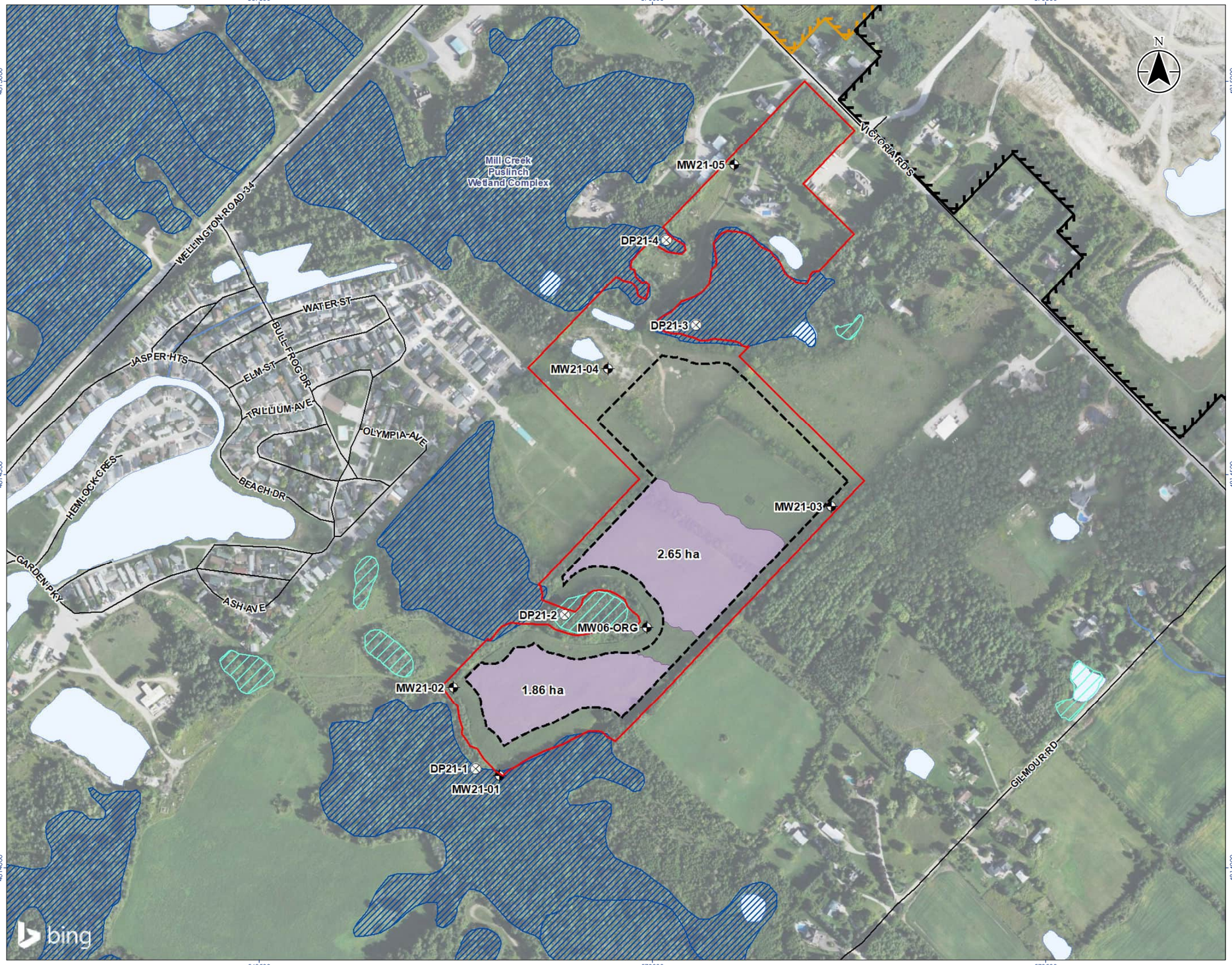

Stantec

Legend

- Site
- Monitoring Well
- Drive-point Piezometer
- Road
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System
- Dufferin Aggregate Pit
- CBM Tikal Pit (Licence Surrendered)

Extraction Footprints

- Area of Extraction Footprint
- Below Water Table Extraction Footprint

0 100 200 metres
1:5,000 (At original document size of 11x17)

Notes

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Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-09

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
12

Title
Proposed Anthony Pit Site Plan

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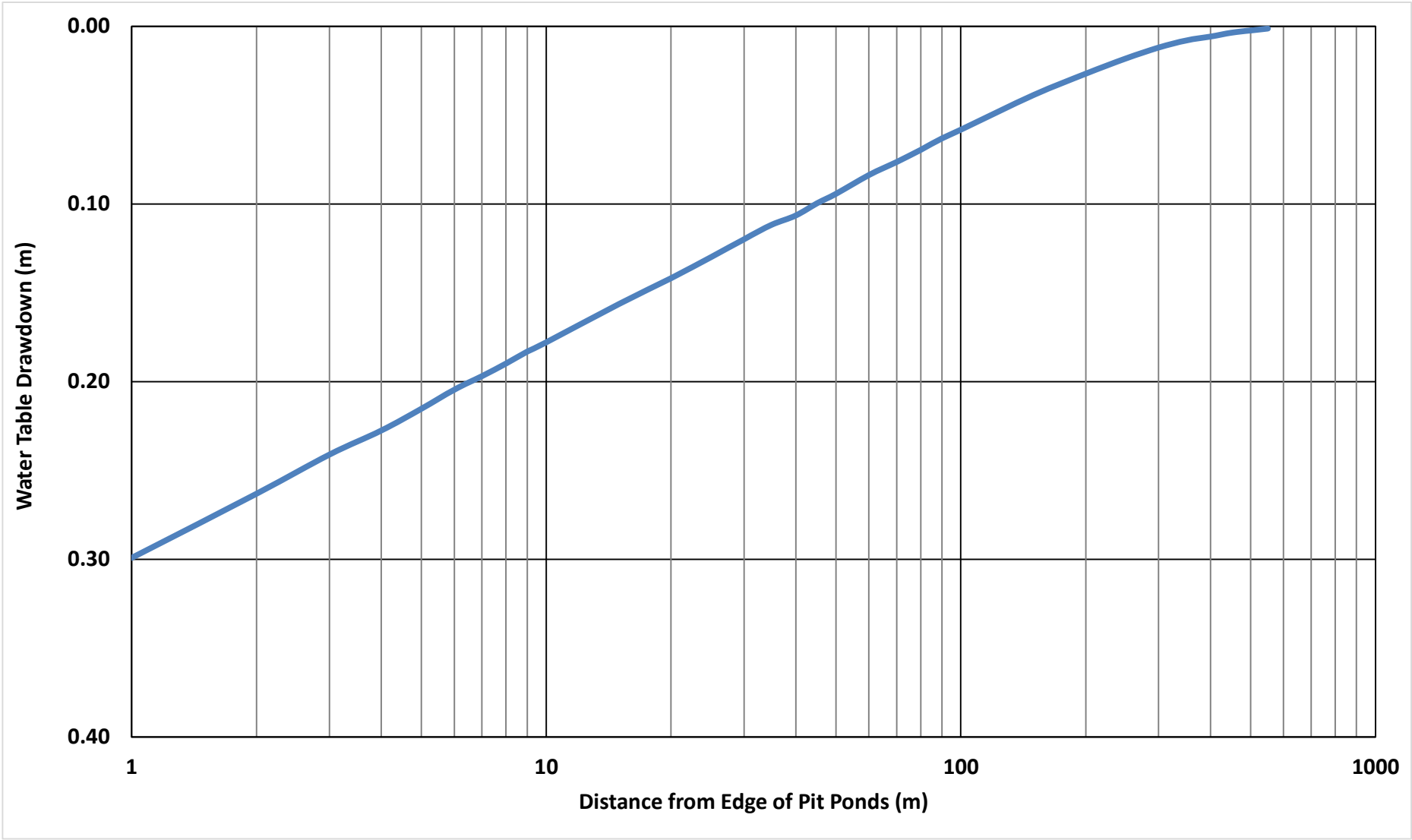
Interpreted Water Table Drawdown from Short-Term Aggregate Extraction

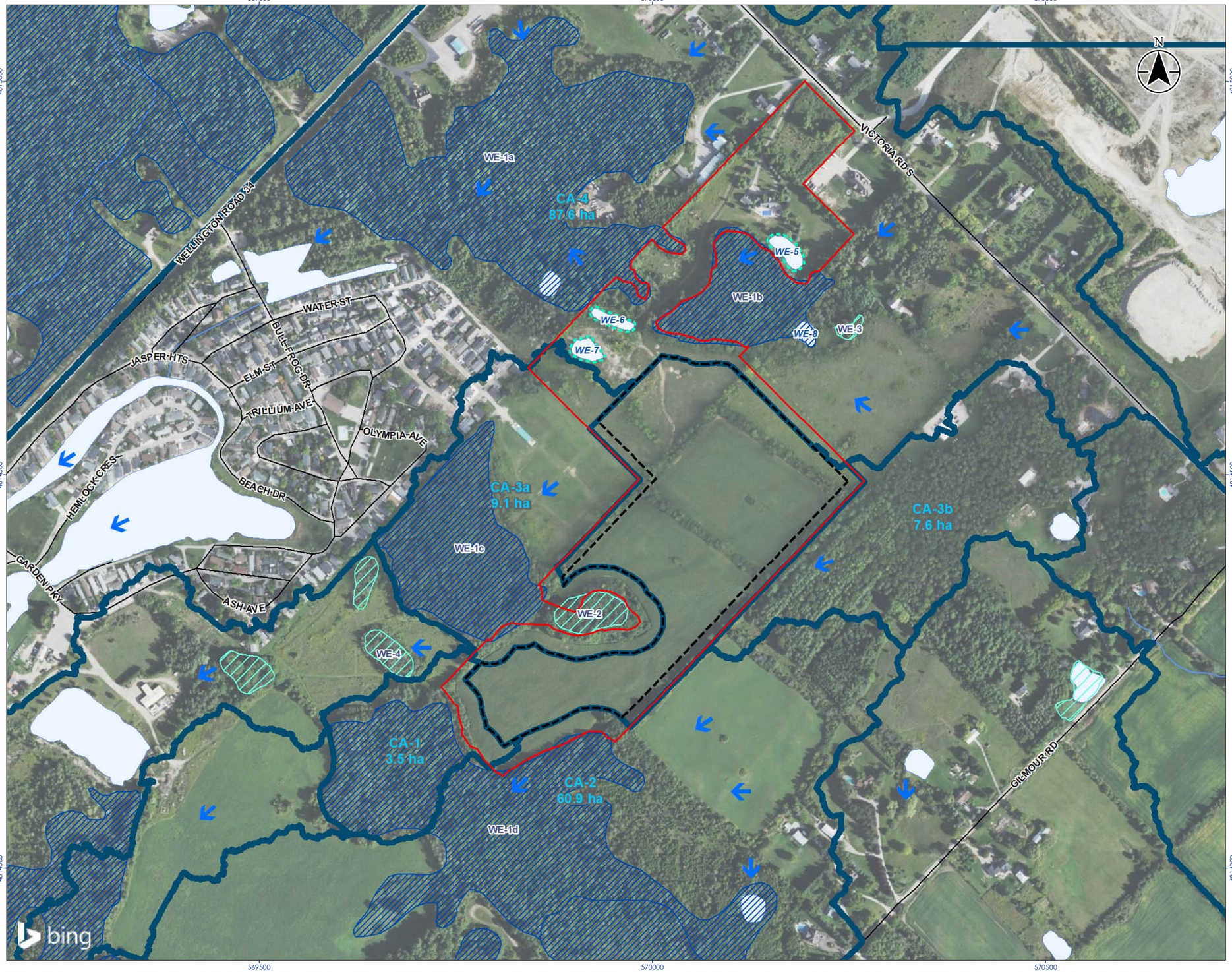
FIGURE 13



DATE: February 2026

PROJECT: 160961457

Stantec



Stantec

Legend

- Site
- Overland Flow Direction
- Road
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System
- Closed Depression
- Catchment Boundary
- Extraction Site Footprint

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

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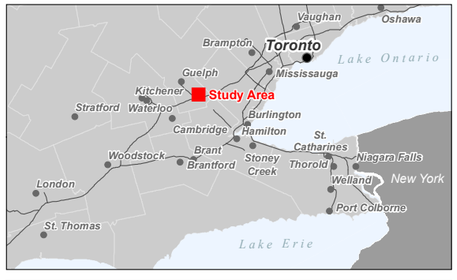

Project Location
Puslinch, ON

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-06

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
14

Title
Post-Development Catchments

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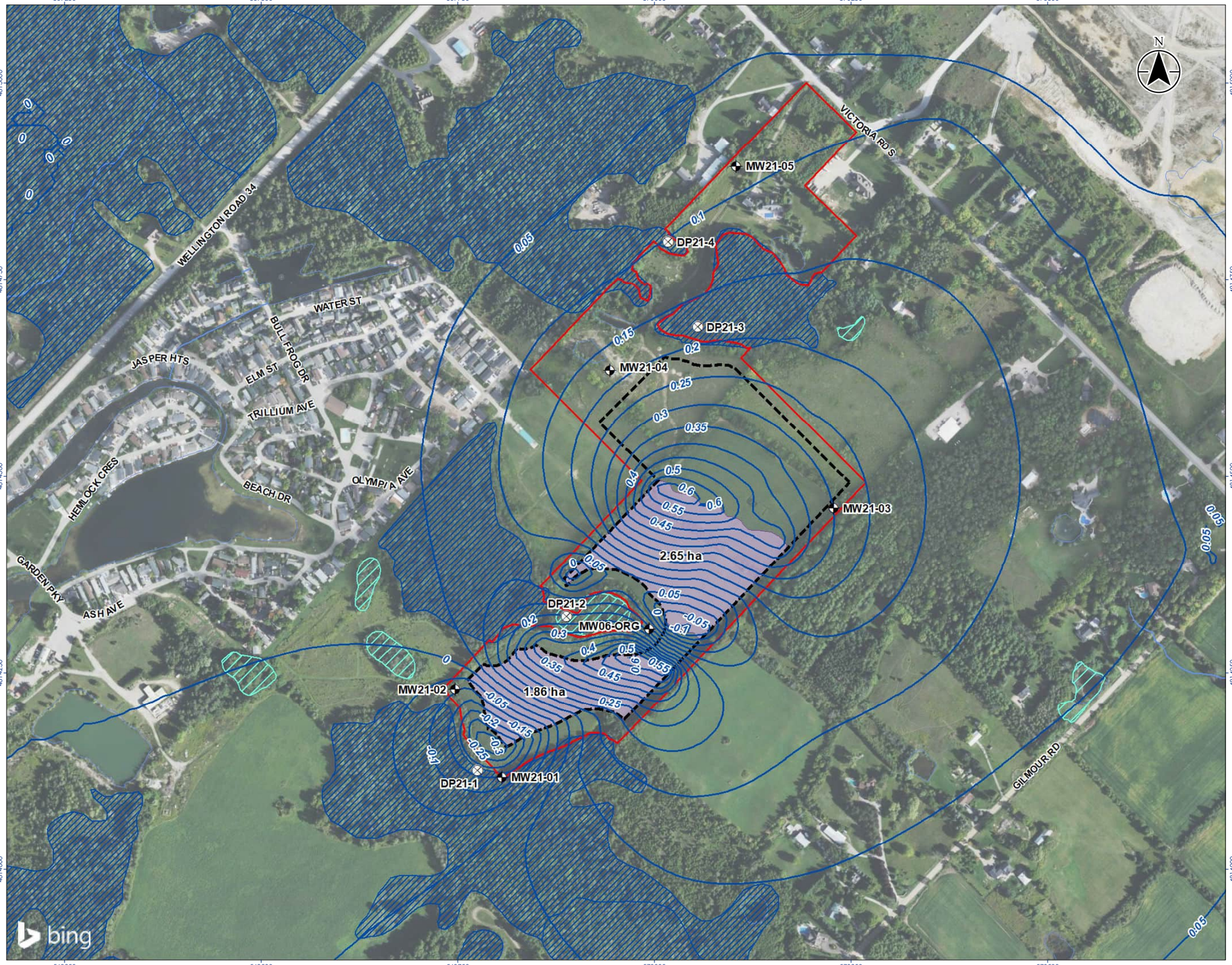

Stantec

Legend

- Site
- Monitoring Well
- Drive-point Piezometer
- Drawdown Contour (0.05m Interval)
- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Wetland - Not evaluated per Ontario Wetland Evaluation System

Extraction Footprints

- Area of Extraction Footprint
- Below Water Table Extraction Footprint

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

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Project Location
Township of Puslinch

160961457 REVA
Prepared by PRM on 2026-02-13
Technical Review by SMD on 2026-02-13

Client/Project
HYDROGEOLOGICAL REPORT
PROPOSED ANTHONY AGGREGATE PIT,
4454 VICTORIA ROAD SOUTH, PUSLINCH, ONTARIO

Figure No.
15

Title
Rehabilitated Condition Water Level Change

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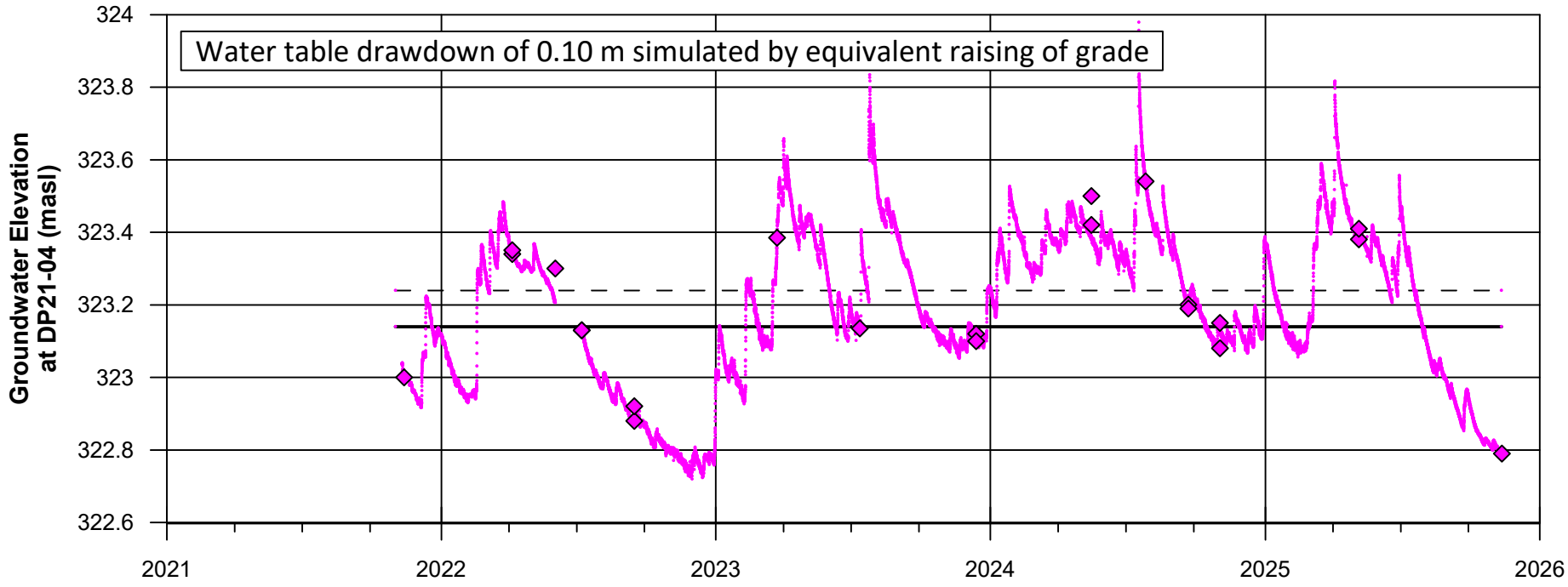
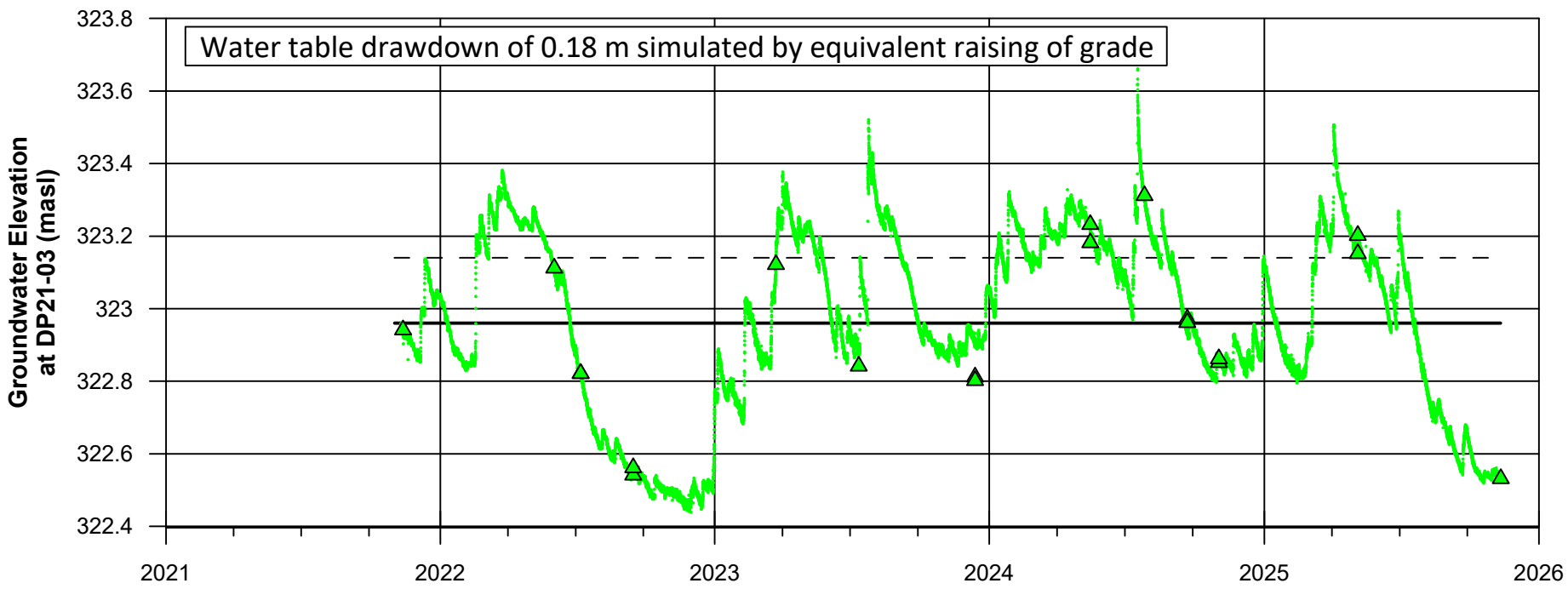
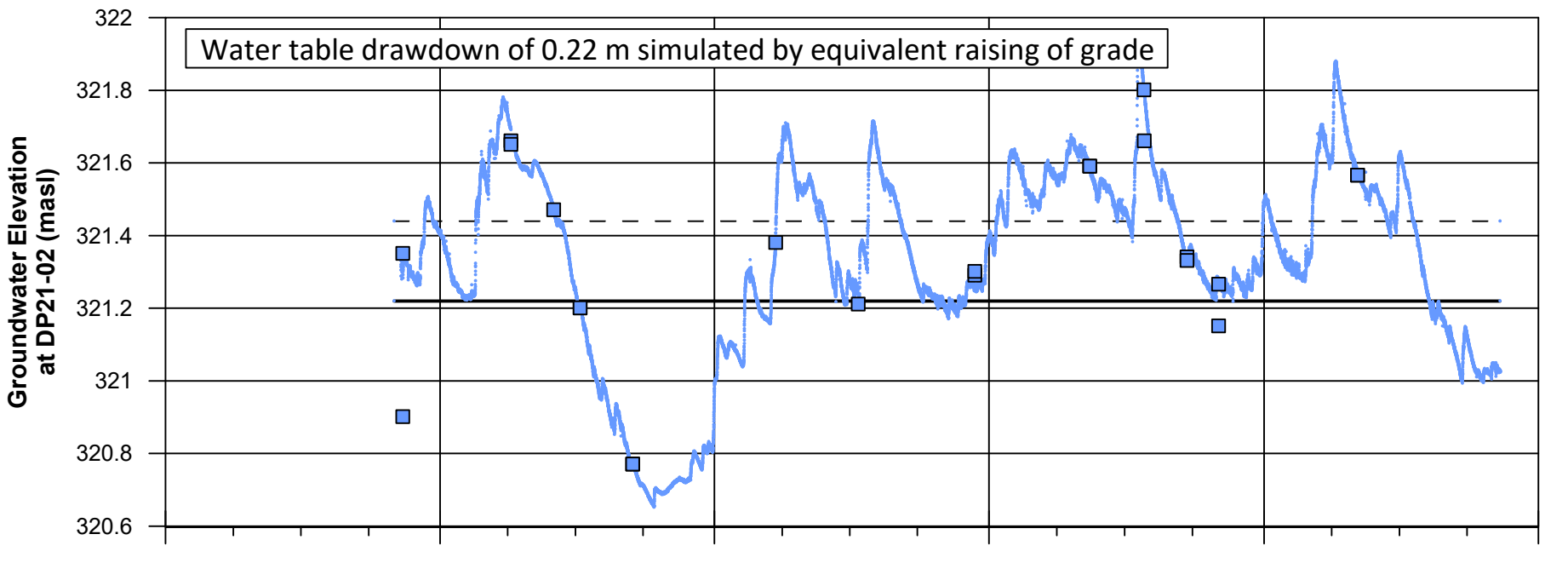
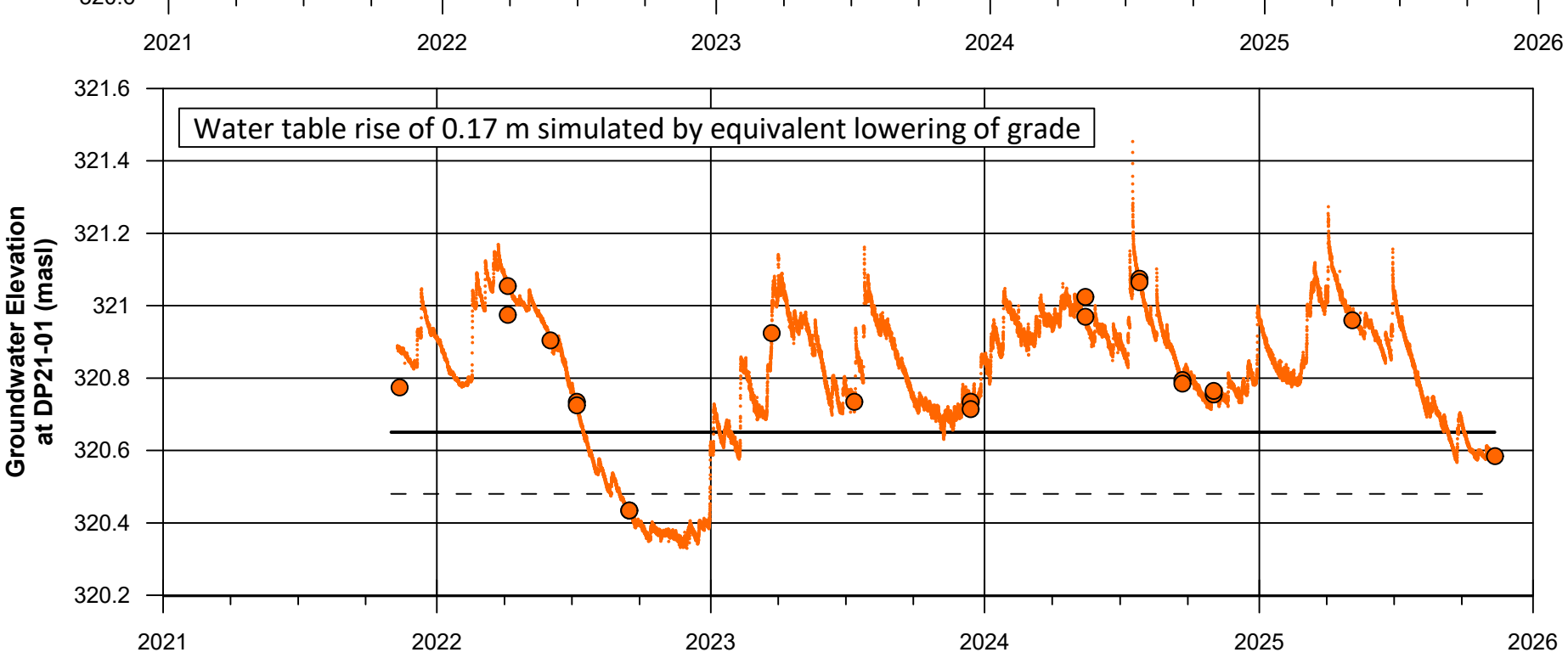








Notes:

_____ indicates actual grade elevation

- - - - - - indicates adjusted grade elevation to simulate changes in water table elevation.

Simulated Changes of Wetland Water Levels		Stantec
DRAWN: DG	APPROVED: SMD	DATE: Janary 2026
PROJECT NUMBER: 160961457		FIGURE: 16

Appendix B

Tables

Table 1
Monitor Completion Details
Hydrogeological Assessment Level I and II Report
Proposed Anthony Aggregate Pit

Monitor ID	Location	Installation Date	Coordinates		Elevation		Stick-up	Borehole Depth	Screen Diameter	Screened Interval				Screened Unit
			Easting	Northing	Ground Surface m AMSL	Top of Casing m AMSL	(m AGS)	(m BGS)	(mm)	Bottom of Screen/Open Hole (m BGS)	Bottom of Screen/Open Hole (m AMSL)	Top of Screen/Open Hole (m BGS)	Top of Screen/Open Hole (m AMSL)	
Monitoring Wells														
MW21-01	Aberfoyle, ON	2021	569805.7	4814118	322.27	323.05	0.78	23.77	50	20.42	301.85	18.90	303.37	Sand/Gravel
MW21-02	Aberfoyle, ON	2021	569746.8	4814230	322.48	323.27	0.79	20.88	50	18.59	303.89	15.54	306.94	Sand/Gravel
MW21-03	Aberfoyle, ON	2021	570227.5	4814460	326.6	327.5	0.90	23.77	50	16.76	309.84	13.72	312.88	Sand/Gravel
MW21-04	Aberfoyle, ON	2021	569943.3	4814635	323.85	324.63	0.78	21.03	50	20.73	303.12	17.68	306.17	Sand/Gravel
MW21-05	Aberfoyle, ON	2021	570103.8	4814894	326.53	327.37	0.84	20.12	50	8.23	318.30	5.18	321.35	Sand/Gravel
MW06-ORG	Aberfoyle, ON	unknown	569992.9	4814306	322.74	323.81	1.07	4.31	50	4.31	318.43	unknown	unknown	Sand/Gravel
Drive-Point Piezometers														
DP21-1	Aberfoyle, ON	2021	569774.9	4814127	320.65	321.73	1.08	1.47	25	1.47	319.18	1.05	319.60	Organics/Sand/Gravel
DP21-2	Aberfoyle, ON	2021	569888.2	4814322	321.22	322.35	1.13	1.42	25	1.42	319.80	1.00	320.22	Organics/Sand/Gravel
DP21-3	Aberfoyle, ON	2021	570055.1	4814690	322.96	323.97	1.01	1.54	25	1.54	321.42	1.12	321.84	Organics/Sand/Gravel
DP21-4	Aberfoyle, ON	2021	570017.5	4814798	323.14	324.2	1.06	1.49	25	1.49	321.65	1.07	322.07	Organics/Sand/Gravel
Staff Gauges														
SG21-1	Aberfoyle, ON	2021	569957.7	4813575	317.17	318.7	1.53	-	-	-	-	-	-	-
SG21-2	Aberfoyle, ON	2021	569165.7	4813266	312.31	313.53	1.22	-	-	-	-	-	-	-

Notes:

- not applicable
m AGS: metres above ground surface
m BGS: metres below ground surface
m AMSL: metres above mean sea level

Table 2
Summary of Soil Testing Results
Hydrogeological Assessment Report
Proposed Anthony Aggregate Pit

Monitor ID	Sample ID	Run Depth Range (m)	Run Depth Range (mASL)	% Gravel	% Sand	%Silt/Clay	d_{10} value (cm)	C coefficient value	K* (m/s)	K+ (m/s)	General Soil Description
MW21-01	1	0 to 2.44	322.27 to 319.83	43.5	53.1	3.4	0.01	115	1E-04		SAND and GRAVEL, trace silt
	2	2.44 to 5.49	319.83 to 316.78	47.0	52.1	0.9	0.04	140	2E-03		SAND and GRAVEL, trace silt
	3	5.49 to 8.53	316.78 to 313.74	14.3	84.9	0.8	0.011	140	2E-04		gravelly SAND, trace silt
	4	8.53 to 9.14	313.74 to 313.13	36.3	63.3	0.4	0.025	145	9E-04		SAND and GRAVEL, trace silt
	5	9.14 to 10.06	313.13 to 312.21	16.4	78.2	5.4	0.008	95	6E-05		gravelly SAND, some silt
	6	10.06 to 11.58	312.21 to 310.69	2.7	91.7	5.6	0.008	95	6E-05		SAND, some silt, trace gravel
	7	11.58 to 13.11	310.69 to 309.16	48.1	51.2	0.7	0.011	142	2E-04		SAND and GRAVEL, trace silt
	8	13.11 to 14.63	309.16 to 307.64	0.7	97.5	1.8	0.009	132	1E-04		SAND, trace gravel and silt
	9	14.63 to 16.15	307.64 to 306.12	32.4	67.0	0.6	0.02	145	6E-04		gravelly SAND, trace silt
	10	16.15 to 17.68	306.12 to 304.59	59.2	39.7	1.1	0.025	139	9E-04		SAND and GRAVEL, trace silt
	11	17.68 to 19.20	304.59 to 303.07	49.6	48.7	1.7	0.011	132	2E-04		SAND and GRAVEL, trace silt
	12	19.20 to 20.73	303.07 to 301.54	56.2	43.1	0.7	0.02	145	6E-04	3E-04	SAND and GRAVEL, trace silt
	13	20.73 to 22.25	301.54 to 300.02	49.1	49.6	1.3	0.011	137	2E-04		SAND and GRAVEL, trace silt
	14	22.25 to 23.77	300.02 to 298.5	36.3	62.4	1.3	0.011	137	2E-04		SAND and GRAVEL, trace silt
MW21-02	1	0 to 1.52	322.48 to 320.96	70.8	28.8	0.4	0.09	145	1E-02		sandy GRAVEL, trace silt
	2	1.52 to 2.44	320.96 to 320.04	68.7	30.3	1.0	0.05	140	4E-03		gravelly SAND, trace silt
	3	2.44 to 3.96	320.04 to 318.52	87.0	12.8	0.2	0.3	148	1E-01		GRAVEL, some sand, trace silt
	4	3.96 to 5.49	318.52 to 316.99	50.5	49.1	0.4	0.03	145	1E-03		SAND and GRAVEL, trace silt
	5	5.49 to 7.01	316.99 to 315.47	0.0	96.0	4.0	0.08	110	7E-03		SAND, trace silt
	6	7.01 to 8.53	315.47 to 313.95	0.0	97.5	2.5	0.08	125	8E-03		SAND, trace silt
	7	8.53 to 10.06	313.95 to 312.42	0.0	50.8	49.2	0.005	40	1E-05		SAND and SILT
	8	10.06 to 11.58	312.42 to 310.90	0.0	62.2	37.8	0.006	52	2E-05		SAND and SILT
	9	11.58 to 13.11	310.9 to 309.37	3.5	94.5	2.0	0.01	130	1E-04		SAND, trace gravel and silt
	10	13.11 to 14.63	309.37 to 307.85	65.1	34.5	0.4	0.035	145	2E-03		SAND and GRAVEL, trace silt
	11	14.63 to 16.15	307.85 to 306.33	25.1	71.9	3.0	0.01	120	1E-04	2E-04	gravelly SAND, trace silt
	12	16.15 to 17.68	306.33 to 304.80	13.5	84.8	1.7	0.01	132	1E-04		gravelly SAND, trace silt
	13	17.68 to 19.20	304.8 to 303.28	0.0	99.2	0.8	0.01	141	1E-04		SAND, trace silt
	14	19.20 to 20.73	303.28 to 301.75	36.4	61.5	2.1	0.01	129	1E-04		SAND and GRAVEL, trace silt
MW21-03	1	0 to 1.52	326.60 to 325.08	43.7	55.6	0.7	0.023	140	7E-04		SAND and GRAVEL, trace silt
	2	1.52 to 3.05	325.08 to 323.55	75.6	24.1	0.3	0.1	143	1E-02		sandy GRAVEL, trace silt
	3	3.05 to 3.96	323.55 to 322.64	88.4	11.5	0.1	0.4	143	2E-01		sandy GRAVEL, trace silt
	4	3.96 to 5.49	322.64 to 321.11	63.3	36.4	0.3	0.08	143	9E-03		SAND and GRAVEL, trace silt
	5	5.49 to 8.53	321.11 to 318.07	80.8	19.0	0.2	0.18	143	5E-02		sandy GRAVEL, trace silt
	6	8.53 to 10.06	318.07 to 316.54	0.4	98.4	1.2	0.011	138	2E-04		SAND, trace gravel and silt
	7	10.06 to 11.58	316.54 to 315.02	0.0	94.2	5.8	0.008	97	6E-05		SAND, some silt
	8	11.58 to 13.11	315.02 to 313.49	0.0	92.8	7.2	0.0078	94	6E-05		SAND, some silt
	9	13.11 to 14.63	313.49 to 311.97	0.8	97.2	2.0	0.0087	130	1E-04	1E-04	SAND, trace gravel and silt
	10	14.63 to 16.15	311.97 to 310.45	34.1	62.8	3.1	0.012	118	2E-04		gravelly SAND, trace silt
	11	16.15 to 17.68	310.45 to 308.92	0.0	85.7	14.3	0.007	80	4E-05		SAND and SILT
	12	17.68 to 19.20	308.92 to 307.40	35.3	63.8	0.9	0.0089	140	1E-04		SAND and GRAVEL, trace silt
	13	19.20 to 20.73	307.40 to 305.87	26.9	69.7	3.4	0.0087	115	9E-05		gravelly SAND, trace silt
	14	20.73 to 22.25	305.87 to 304.35	3.5	94.0	2.5	0.01	125	1E-04		SAND, trace gravel and silt
	15	22.25 to 23.77	304.35 to 302.83	0.4	93.7	5.9	0.008	96	6E-05		SAND, some silt, trace gravel
MW21-04	1	0 to 1.52	323.85 to 322.33	47.1	51.7	1.2	0.011	138	2E-04		SAND and GRAVEL, trace silt
	2	1.52 to 2.74	322.33 to 321.11	54.0	45.3	0.7	0.017	140	4E-04		SAND and GRAVEL, trace silt
	3	2.74 to 4.27	321.11 to 319.58	52.7	47.1	0.2	0.05	146	4E-03		SAND and GRAVEL, trace silt
	4	4.27 to 5.79	319.58 to 318.06	48.4	51.3	0.3	0.04	146	2E-03		SAND and GRAVEL, trace silt
	5	5.79 to 7.32	318.06 to 316.53	0.0	98.7	1.3	0.008	138	9E-05		SAND, trace silt
	6	7.32 to 8.84	316.53 to 315.01	0.0	65.1	34.9	0.005	55	1E-05		Silty SAND
	7	8.84 to 10.36	315.01 to 313.49	0.0	58.0	42.0	0.005	47	1E-05		SAND and SILT
	8	10.36 to 11.89	313.49 to 311.96	0.0	82.0	18.0	0.0066	75	3E-05		Silty SAND
	9	11.89 to 13.41	311.96 to 310.44	10.3	89.2	0.5	0.0088	142	1E-04		gravelly SAND, trace silt
	10	13.41 to 14.94	310.44 to 308.91	2.3	92.3	5.4	0.009	96	8E-05		SAND, some silt, trace gravel
	11	14.94 to 16.46	308.91 to 307.39	0.0	61.7	38.3	0.005	51	1E-05		SAND and SILT
	12	16.46 to 17.98	307.39 to 305.87	2.1	96.9	1.0	0.017	140	4E-04		SAND, trace gravel and silt
	13	17.98 to 18.59	305.87 to 305.26	90.5	9.4	0.1	0.27	150	1E-01	6E-05	GRAVEL, some sand, trace silt
	14	18.59 to 20.12	305.26 to 303.73	69.8	29.7	0.5	0.08	145	9E-03		sandy GRAVEL, trace silt
	15	20.12 to 21.03	303.73 to 302.82	99.4	0.6	0.0	1	150	2E+00		GRAVEL, trace sand
MW21-05	1	0 to 1.52	326.53 to 325.01	67.8	31.5	0.7	0.006	142	5E-05		sandy GRAVEL, trace silt
	2	1.52 to 2.44	325.01 to 324.09	74.8	24.9	0.3	0.009	145	1E-04		sandy GRAVEL, trace silt
	3	2.44 to 3.96	324.09 to 322.57	70.6	29.2	0.2	0.008	147	9E-05		sandy GRAVEL, trace silt
	4	3.96 to 5.49	322.57 to 321.04	83.2	16.6	0.2	0.2	147	6E-02		sandy GRAVEL, trace silt
	5	5.49 to 7.01	321.04 to 319.52	76.8	23.1	0.1	0.11	150	2E-02	1E-02	sandy GRAVEL, trace silt
	6	7.01 to 8.53	319.52 to 318.00	0.0	86.9	13.1	0.007	85	4E-05		silty SAND
	7	8.53 to 10.06	318.00 to 316.47	52.2	45.8	2.0	0.014	130	3E-04		SAND and GRAVEL, trace silt
	8	10.06 to 11.58	316.47 to 314.95	34.4	64.3	1.3	0.011	135	2E-04		gravelly SAND, trace silt
	9	11.58 to 13.11	314.95 to 313.42	31.0	65.5	3.5	0.01	115	1E-04		gravelly SAND, trace silt
	10	13.11 to 14.63	313.42 to 311.9	34.2	62.3	3.5	0.01	115	1E-04		gravelly SAND, trace silt
	11	14.63 to 16.15	311.9 to 310.38	35.0	60.4	4.6	0.01	105	1E-04		SAND and GRAVEL, trace silt
	12	16.15 to 17.68	310.38 to 308.85	26.0	69.8	4.2	0.01	105	1E-04		gravelly SAND, trace silt
	13	17.68 to 19.20	308.85 to 307.33	64.7	34.6	0.7	0.015	142	3E-04		sandy GRAVEL, trace silt

Note: * - indicates hydraulic conductivity has been interpreted from grain size analyses using Hazen Method

+ - indicates hydraulic conductivity has been interpreted from in-situ well response tests

Table 3
Water Level Monitoring Results
Hydrogeological Assessment Level I and II Report
Proposed Anthony Aggregate Pit

Location ID	Coordinates		Date	Time	Elevation		Stick-up	GW level	SW level	GW Elev	SW Elev
	Easting	Northing			Ground Surface m AMSL	Top of Casing m AMSL	(m AGS)	m BTOC	m BTOC	m AMSL	m AMSL
MW21-01	569805.7	4814118	10-Nov-21	10:13	322.27	323.05	0.78	2.62	-	320.44	-
MW21-01	569805.7	4814118	5-Apr-22	10:40	322.27	323.05	0.78	2.31	-	320.74	-
MW21-01	569805.7	4814118	1-Jun-22	12:57	322.27	323.05	0.78	2.46	-	320.59	-
MW21-01	569805.7	4814118	6-Jul-22	13:10	322.27	323.05	0.78	2.62	-	320.43	-
MW21-01	569805.7	4814118	14-Sep-22	10:10	322.27	323.05	0.78	2.89	-	320.16	-
MW21-01	569805.7	4814118	23-Mar-23	11:10	322.27	323.05	0.78	2.38	-	320.68	-
MW21-01	569805.7	4814118	4-May-23	10:55	322.27	323.05	0.78	2.34	-	320.71	-
MW21-01	569805.7	4814118	11-Jul-23	10:43	322.27	323.05	0.78	2.59	-	320.46	-
MW21-01	569805.7	4814118	13-Dec-23	13:04	322.27	323.05	0.78	2.52	-	320.53	-
MW21-01	569805.7	4814118	14-May-24	10:41	322.27	323.05	0.78	2.36	-	320.70	-
MW21-01	569805.7	4814118	25-Jul-24	14:35	322.27	323.05	0.78	2.26	-	320.79	-
MW21-01	569805.7	4814118	20-Sep-24	15:04	322.27	323.05	0.78	2.56	-	320.49	-
MW21-01	569805.7	4814118	1-Nov-24	12:44	322.27	323.05	0.78	2.58	-	320.47	-
MW21-01	569805.7	4814118	5-May-25	9:52	322.27	323.05	0.78	2.38	-	320.67	-
MW21-01	569805.7	4814118	11-Nov-25	11:02	322.27	323.05	0.78	2.72	-	320.33	-
MW21-02	569746.8	4814230.1	10-Nov-21	11:43	322.48	323.27	0.79	3.14	-	320.13	-
MW21-02	569746.8	4814230.1	5-Apr-22	11:05	322.48	323.27	0.79	2.96	-	320.31	-
MW21-02	569746.8	4814230.1	1-Jun-22	12:50	322.48	323.27	0.79	3.10	-	320.17	-
MW21-02	569746.8	4814230.1	6-Jul-22	14:25	322.48	323.27	0.79	3.27	-	320.00	-
MW21-02	569746.8	4814230.1	14-Sep-22	10:35	322.48	323.27	0.79	3.47	-	319.80	-
MW21-02	569746.8	4814230.1	23-Mar-23	11:10	322.48	323.27	0.79	2.97	-	320.30	-
MW21-02	569746.8	4814230.1	4-May-23	10:55	322.48	323.27	0.79	2.97	-	320.30	-
MW21-02	569746.8	4814230.1	11-Jul-23	10:43	322.48	323.27	0.79	3.29	-	319.98	-
MW21-02	569746.8	4814230.1	13-Dec-23	13:04	322.48	323.27	0.79	3.26	-	320.01	-
MW21-02	569746.8	4814230.1	14-May-24	10:41	322.48	323.27	0.79	3.06	-	320.21	-
MW21-02	569746.8	4814230.1	25-Jul-24	14:35	322.48	323.27	0.79	2.98	-	320.29	-
MW21-02	569746.8	4814230.1	20-Sep-24	15:04	322.48	323.27	0.79	3.27	-	320.00	-
MW21-02	569746.8	4814230.1	1-Nov-24	12:44	322.48	323.27	0.79	3.27	-	320.00	-
MW21-02	569746.8	4814230.1	5-May-25	9:42	322.48	323.27	0.79	3.10	-	320.18	-
MW21-02	569746.8	4814230.1	11-Nov-25	10:51	322.48	323.27	0.79	3.37	-	319.90	-
MW21-03	570227.5	4814460	10-Nov-21	12:23	326.60	327.50	0.90	5.30	-	322.20	-
MW21-03	570227.5	4814460	5-Apr-22	11:56	326.60	327.50	0.90	4.93	-	322.57	-
MW21-03	570227.5	4814460	1-Jun-22	13:57	326.60	327.50	0.90	5.04	-	322.46	-
MW21-03	570227.5	4814460	6-Jul-22	15:42	326.60	327.50	0.90	5.26	-	322.24	-
MW21-03	570227.5	4814460	14-Sep-22	11:57	326.60	327.50	0.90	5.60	-	321.90	-
MW21-03	570227.5	4814460	23-Mar-23	12:53	326.60	327.50	0.90	5.36	-	322.14	-
MW21-03	570227.5	4814460	4-May-23	12:41	326.60	327.50	0.90	5.12	-	322.38	-
MW21-03	570227.5	4814460	11-Jul-23	12:00	326.60	327.50	0.90	5.32	-	322.18	-
MW21-03	570227.5	4814460	13-Dec-23	12:11	326.60	327.50	0.90	5.31	-	322.19	-
MW21-03	570227.5	4814460	14-May-24	12:53	326.60	327.50	0.90	5.00	-	322.50	-
MW21-03	570227.5	4814460	25-Jul-24	14:06	326.60	327.50	0.90	4.83	-	322.67	-
MW21-03	570227.5	4814460	20-Sep-24	14:45	326.60	327.50	0.90	5.19	-	322.31	-
MW21-03	570227.5	4814460	1-Nov-24	12:27	326.60	327.50	0.90	5.32	-	322.18	-
MW21-03	570227.5	4814460	5-May-25	9:06	326.60	327.50	0.90	5.05	-	322.46	-
MW21-03	570227.5	4814460	11-Nov-25	9:33	326.60	327.50	0.90	5.55	-	321.95	-
MW21-04	569943.3	4814635.2	10-Nov-21	11:03	323.85	324.63	0.78	2.33	-	322.30	-
MW21-04	569943.3	4814635.2	5-Apr-22	12:27	323.85	324.63	0.78	2.12	-	322.52	-
MW21-04	569943.3	4814635.2	1-Jun-22	12:22	323.85	324.63	0.78	2.23	-	322.40	-
MW21-04	569943.3	4814635.2	6-Jul-22	16:28	323.85	324.63	0.78	2.34	-	322.29	-
MW21-04	569943.3	4814635.2	14-Sep-22	13:25	323.85	324.63	0.78	2.49	-	322.14	-
MW21-04	569943.3	4814635.2	23-Mar-23	14:05	323.85	324.63	0.78	2.26	-	322.37	-
MW21-04	569943.3	4814635.2	4-May-23	13:49	323.85	324.63	0.78	2.21	-	322.42	-
MW21-04	569943.3	4814635.2	11-Jul-23	13:11	323.85	324.63	0.78	2.38	-	322.25	-
MW21-04	569943.3	4814635.2	13-Dec-23	12:00	323.85	324.63	0.78	2.36	-	322.27	-
MW21-04	569943.3	4814635.2	14-May-24	14:04	323.85	324.63	0.78	2.18	-	322.46	-
MW21-04	569943.3	4814635.2	25-Jul-24	16:14	323.85	324.63	0.78	2.08	-	322.55	-
MW21-04	569943.3	4814635.2	20-Sep-24	16:05	323.85	324.63	0.78	2.30	-	322.33	-
MW21-04	569943.3	4814635.2	1-Nov-24	14:04	323.85	324.63	0.78	2.32	-	322.31	-
MW21-04	569943.3	4814635.2	5-May-25	10:21	323.85	324.63	0.78	2.17	-	322.47	-
MW21-04	569943.3	4814635.2	11-Nov-25	11:49	323.85	324.63	0.78	2.48	-	322.15	-
MW21-05	570103.8	4814894.3	10-Nov-21	9:24	326.53	327.37	0.84	4.18	-	323.20	-
MW21-05	570103.8	4814894.3	5-Apr-22	12:57	326.53	327.37	0.84	3.84	-	323.53	-
MW21-05	570103.8	4814894.3	1-Jun-22	14:30	326.53	327.37	0.84	3.96	-	323.41	-
MW21-05	570103.8	4814894.3	6-Jul-22	17:53	326.53	327.37	0.84	4.17	-	323.20	-
MW21-05	570103.8	4814894.3	14-Sep-22	14:05	326.53	327.37	0.84	4.46	-	322.91	-
MW21-05	570103.8	4814894.3	23-Mar-23	14:50	326.53	327.37	0.84	4.02	-	323.35	-
MW21-05	570103.8	4814894.3	4-May-23	14:33	326.53	327.37	0.84	3.91	-	323.46	-
MW21-05	570103.8	4814894.3	11-Jul-23	13:58	326.53	327.37	0.84	4.21	-	323.16	-
MW21-05	570103.8	4814894.3	13-Dec-23	13:50	326.53	327.37	0.84	4.22	-	323.15	-
MW21-05	570103.8	4814894.3	14-May-24	14:59	326.53	327.37	0.84	3.91	-	323.46	-
MW21-05	570103.8	4814894.3	25-Jul-24	17:11	326.53	327.37	0.84	3.80	-	323.58	-
MW21-05	570103.8	4814894.3	20-Sep-24	16:40	326.53	327.37	0.84	4.13	-	323.24	-
MW21-05	570103.8	4814894.3	1-Nov-24	16:32	326.53	327.37	0.84	4.25	-	323.12	-
MW21-05	570103.8	4814894.3	5-May-25	12:54	326.53	327.37	0.84	3.97	-	323.41	-
MW21-05	570103.8	4814894.3	11-Nov-25	13:02	326.53	327.37	0.84	4.60	-	322.78	-
MW06-ORG	569992.9	4814306.4	10-Nov-21	13:35	322.74	323.81	1.07	2.50	-	321.31	-
MW06-ORG	569992.9	4814306.4	5-Apr-22	11:14	322.74	323.81	1.07	2.19	-	321.62	-
MW06-ORG	569992.9	4814306.4	1-Jun-22	13:45	322.74	323.81	1.07	2.40	-	321.41	-
MW06-ORG	569992.9	4814306.4	6-Jul-22	14:45	322.74	323.81	1.07	2.65	-	321.16	-
MW06-ORG	569992.9	4814306.4	14-Sep-22	11:17	322.74	323.81	1.07	dry	-	dry	-
MW06-ORG	569992.9	4814306.4	23-Mar-23	12:36	322.74	323.81	1.07	2.47	-	321.34	-
MW06-ORG	569992.9	4814306.4	11-Jul-23	11:44	322.74	323.81	1.07	2.63	-	321.18	-
MW06-ORG	569992.9	4814306.4	13-Dec-23	12:23	322.74	323.81	1.07	2.61	-	321.20	-
MW06-ORG	569992.9	4814306.4	14-May-24	12:36	322.74	323.81	1.07	2.29	-	321.53	-
MW06-ORG	569992.9	4814306.4	25-Jul-24	15:55	322.74	323.81	1.07	2.08	-	321.73	-
MW06-ORG	569992.9	4814306.4	20-Sep-24	15:49	322.74	323.81	1.07	2.55	-	321.26	-
MW06-ORG	569992.9	4814306.4	1-Nov-24	13:56	322.74	323.81	1.07	2.63	-	321.18	-
MW06-ORG	569992.9	4814306.4	5-May-25	9:24	322.74	323.81	1.07	2.31	-	321.50	-
MW06-ORG	569992.9	4814306.4	11-Nov-25	9:49	322.74	323.81	1.07	2.86	-	320.95	-

Table 3
Water Level Monitoring Results
Hydrogeological Assessment Level I and II Report
Proposed Anthony Aggregate Pit

Location ID	Coordinates		Date	Time	Elevation		Stick-up	GW level	SW level	GW Elev	SW Elev
	Easting	Northing			Ground Surface m AMSL	Top of Casing m AMSL	(m AGS)	m BTOC	m BTOC	m AMSL	m AMSL
DP21-1	569774.9	4814126.6	12-Nov-21	10:57	320.65	321.73	1.08	0.96	0.88	320.77	320.85
DP21-1	569774.9	4814126.6	5-Apr-22	10:51	320.65	321.73	1.08	0.76	0.72	320.97	321.01
DP21-1	569774.9	4814126.6	1-Jun-22	13:12	320.65	321.73	1.08	0.83	dry	320.90	dry
DP21-1	569774.9	4814126.6	6-Jul-22	13:38	320.65	321.73	1.08	1.00	dry	320.73	dry
DP21-1	569774.9	4814126.6	14-Sep-22	10:27	320.65	321.73	1.08	1.30	dry	320.43	dry
DP21-1	569774.9	4814126.6	23-Mar-23	11:30	320.65	321.73	1.08	0.81	0.82	320.92	320.91
DP21-1	569774.9	4814126.6	11-Jul-23	10:55	320.65	321.73	1.08	1.00	dry	320.73	dry
DP21-1	569774.9	4814126.6	13-Dec-23	13:17	320.65	321.73	1.08	1.00	dry	320.73	dry
DP21-1	569774.9	4814126.6	14-May-24	10:57	320.65	321.73	1.08	0.77	0.77	320.97	320.96
DP21-1	569774.9	4814126.6	25-Jul-24	14:46	320.65	321.73	1.08	0.66	0.67	321.07	321.06
DP21-1	569774.9	4814126.6	20-Sep-24	15:17	320.65	321.73	1.08	0.94	dry	320.79	dry
DP21-1	569774.9	4814126.6	1-Nov-24	13:00	320.65	321.73	1.08	0.98	dry	320.75	dry
DP21-1	569774.9	4814126.6	5-May-25	10:00	320.65	321.73	1.08	0.78	0.79	320.96	320.94
DP21-1	569774.9	4814126.6	11-Nov-25	11:24	320.65	321.73	1.08	1.15	dry	320.58	dry
DP21-2	569888.2	4814322.1	12-Nov-21	11:21	321.22	322.35	1.13	1.00	0.94	321.35	321.41
DP21-2	569888.2	4814322.1	5-Apr-22	11:40	321.22	322.35	1.13	0.69	0.62	321.66	321.73
DP21-2	569888.2	4814322.1	1-Jun-22	12:36	321.22	322.35	1.13	0.88	0.83	321.47	321.52
DP21-2	569888.2	4814322.1	6-Jul-22	15:05	321.22	322.35	1.13	1.15	dry	321.20	dry
DP21-2	569888.2	4814322.1	14-Sep-22	10:54	321.22	322.35	1.13	1.58	dry	320.77	dry
DP21-2	569888.2	4814322.1	23-Mar-23	12:12	321.22	322.35	1.13	0.97	0.93	321.38	321.42
DP21-2	569888.2	4814322.1	11-Jul-23	11:31	321.22	322.35	1.13	1.14	dry	321.21	dry
DP21-2	569888.2	4814322.1	13-Dec-23	12:44	321.22	322.35	1.13	1.06	dry	321.29	dry
DP21-2	569888.2	4814322.1	14-May-24	12:05	321.22	322.35	1.13	0.76	0.72	321.59	321.63
DP21-2	569888.2	4814322.1	25-Jul-24	15:24	321.22	322.35	1.13	0.55	0.55	321.80	321.80
DP21-2	569888.2	4814322.1	20-Sep-24	15:41	321.22	322.35	1.13	1.01	dry	321.34	dry
DP21-2	569888.2	4814322.1	1-Nov-24	13:34	321.22	322.35	1.13	1.09	dry	321.27	dry
DP21-2	569888.2	4814322.1	5-May-25	9:39	321.22	322.35	1.13	0.79	0.73	321.57	321.62
DP21-2	569888.2	4814322.1	11-Nov-25	10:15	321.22	322.35	1.13	dry	dry	dry	dry
DP21-3	570055.1	4814690.3	12-Nov-21	11:05	322.96	323.97	1.01	1.02	0.87	322.95	323.10
DP21-3	570055.1	4814690.3	1-Jun-22	12:12	322.96	323.97	1.01	0.85	0.72	323.12	323.25
DP21-3	570055.1	4814690.3	6-Jul-22	16:18	322.96	323.97	1.01	1.14	dry	322.83	dry
DP21-3	570055.1	4814690.3	14-Sep-22	13:05	322.96	323.97	1.01	1.42	dry	322.55	dry
DP21-3	570055.1	4814690.3	23-Mar-23	13:42	322.96	323.97	1.01	0.84	0.81	323.13	323.17
DP21-3	570055.1	4814690.3	11-Jul-23	12:54	322.96	323.97	1.01	1.12	dry	322.85	dry
DP21-3	570055.1	4814690.3	13-Dec-23	11:09	322.96	323.97	1.01	1.15	dry	322.82	dry
DP21-3	570055.1	4814690.3	14-May-24	13:34	322.96	323.97	1.01	0.78	0.65	323.19	323.32
DP21-3	570055.1	4814690.3	25-Jul-24	16:33	322.96	323.97	1.01	0.65	0.55	323.32	323.42
DP21-3	570055.1	4814690.3	20-Sep-24	16:17	322.96	323.97	1.01	0.99	dry	322.98	dry
DP21-3	570055.1	4814690.3	1-Nov-24	14:22	322.96	323.97	1.01	1.11	dry	322.86	dry
DP21-3	570055.1	4814690.3	5-May-25	10:26	322.96	323.97	1.01	0.81	0.66	323.16	323.31
DP21-3	570055.1	4814690.3	11-Nov-25	12:10	322.96	323.97	1.01	1.43	dry	322.54	dry
DP21-4	570017.5	4814798.3	12-Nov-21	13:20	323.14	324.20	1.06	1.20	-	323.00	-
DP21-4	570017.5	4814798.3	5-Apr-22	12:48	323.14	324.20	1.06	0.86	0.85	323.34	323.35
DP21-4	570017.5	4814798.3	1-Jun-22	14:15	323.14	324.20	1.06	0.90	0.86	323.30	323.34
DP21-4	570017.5	4814798.3	6-Jul-22	17:13	323.14	324.20	1.06	1.07	dry	323.13	dry
DP21-4	570017.5	4814798.3	14-Sep-22	13:45	323.14	324.20	1.06	1.32	dry	322.88	dry
DP21-4	570017.5	4814798.3	23-Mar-23	14:19	323.14	324.20	1.06	0.82	0.84	323.39	323.37
DP21-4	570017.5	4814798.3	11-Jul-23	13:25	323.14	324.20	1.06	1.07	dry	323.14	dry
DP21-4	570017.5	4814798.3	13-Dec-23	11:28	323.14	324.20	1.06	1.08	dry	323.12	dry
DP21-4	570017.5	4814798.3	14-May-24	14:22	323.14	324.20	1.06	0.78	0.79	323.42	323.42
DP21-4	570017.5	4814798.3	25-Jul-24	16:49	323.14	324.20	1.06	0.66	0.67	323.54	323.53
DP21-4	570017.5	4814798.3	20-Sep-24	16:26	323.14	324.20	1.06	1.00	dry	323.20	dry
DP21-4	570017.5	4814798.3	1-Nov-24	14:33	323.14	324.20	1.06	1.12	dry	323.08	dry
DP21-4	570017.5	4814798.3	5-May-25	10:39	323.14	324.20	1.06	0.82	0.81	323.38	323.39
DP21-4	570017.5	4814798.3	11-Nov-25	12:45	323.14	324.20	1.06	1.41	dry	322.79	dry
SG21-1	569957.7	4813575.2	5-Apr-22	15:30	317.17	318.70	1.53	-	1.34	-	317.36
SG21-1	569957.7	4813575.2	1-Jun-22	16:00	317.17	318.70	1.53	-	1.40	-	317.30
SG21-1	569957.7	4813575.2	6-Jul-22	18:37	317.17	318.70	1.53	-	1.43	-	317.28
SG21-1	569957.7	4813575.2	14-Sep-22	19:37	317.17	317.17	0.00	-	0.09	-	317.26
SG21-1	569957.7	4813575.2	23-Mar-23	15:15	317.17	317.17	0.00	-	0.24	-	317.41
SG21-1	569957.7	4813575.2	11-Jul-23	14:37	317.17	317.95	0.78	-	0.62	-	317.33
SG21-1	569957.7	4813575.2	13-Dec-23	14:30	317.17	317.95	0.78	-	0.55	-	317.40
SG21-1	569957.7	4813575.2	14-May-24	15:35	317.17	317.95	0.78	-	0.59	-	317.36
SG21-1	569957.7	4813575.2	25-Jul-24	16:10	317.17	318.94	1.77	-	1.55	-	317.39
SG21-1	569957.7	4813575.2	20-Sep-24	17:15	317.17	318.94	1.77	-	1.56	-	317.38
SG21-1	569957.7	4813575.2	1-Nov-24	15:15	317.17	318.94	1.77	-	1.55	-	317.39
SG21-1	569957.7	4813575.2	5-May-25	12:00	317.17	318.94	1.77	-	1.50	-	317.44
SG21-1	569957.7	4813575.2	11-Nov-25	13:43	317.17	318.94	1.77	-	1.52	-	317.42
SG21-2	569165.7	4813265.7	5-Apr-22	14:25	312.31	313.53	1.22	-	0.92	-	312.61
SG21-2	569165.7	4813265.7	1-Jun-22	15:24	312.31	313.53	1.22	-	0.99	-	312.54
SG21-2	569165.7	4813265.7	6-Jul-22	19:20	312.31	313.53	1.22	-	1.02	-	312.51
SG21-2	569165.7	4813265.7	14-Sep-22	15:27	312.31	313.53	1.22	-	1.03	-	312.50
SG21-2	569165.7	4813265.7	23-Mar-23	15:45	312.31	313.53	1.22	-	0.86	-	312.67
SG21-2	569165.7	4813265.7	11-Jul-23	15:16	312.31	313.53	1.22	-	0.92	-	312.61
SG21-2	569165.7	4813265.7	13-Dec-23	15:08	312.31	313.53	1.22	-	0.97	-	312.56
SG21-2	569165.7	4813265.7	14-May-24	16:23	312.31	313.53	1.22	-	0.96	-	312.57
SG21-2	569165.7	4813265.7	25-Jul-24	12:15	312.31	313.53	1.22	-	0.98	-	312.55
SG21-2	569165.7	4813265.7	20-Sep-24	18:00	312.31	313.53	1.22	-	0.97	-	312.56
SG21-2	569165.7	4813265.7	1-Nov-24	16:09	312.31	313.53	1.22	-	0.98	-	312.55
SG21-2	569165.7	4813265.7	5-May-25	11:15	312.31	313.53	1.22	-	0.99	-	312.54
SG21-2	569165.7	4813265.7	11-Nov-25	14:35	312.31	313.53	1.22	-	0.99	-	312.54

Table 4
Streamflow Monitoring Results
Hydrogeological Assessment Level I and II Report
Proposed Anthony Aggregate Pit

Monitoring Station ID	5-Apr-22	1-Jun-22	6-Jul-22	14-Sep-22	23-Mar-23	11-Jul-23	13-Dec-23	14-May-24	25-Jul-24	20-Sep-24	1-Nov-24	5-May-25	11-Nov-25
Streamflow Rate (L/s)													
SG21-1 (Gilmor)	95.6	17.4	7.3	9.2	297.0	16.9	53.8	50.9	54.2	14.7	19.6	44.0	27.0
SG21-2(Brock)	197.8	66.6	40.5	34.6	483.0	73.8	91.5	84.0	104.5	33.0	63.8	83.0	63.0
Streamflow Elevation (masl)													
SG21-1 (Gilmor)	317.4	317.3	317.3	317.3	317.4	317.3	317.4	317.4	317.4	317.4	317.4	317.4	317.4
SG21-2(Brock)	312.6	312.5	312.5	312.5	312.7	312.6	312.6	312.6	312.6	312.6	312.6	312.5	312.5

Table 5
Summary of Groundwater Quality Results
Hydrogeological Assessment Level I and II Report
Proposed Anthony Aggregate Pit

Sample Location			DP21-01	DP21-02	DP21-03	DP21-04	MW21-01	MW21-02	MW21-03		MW21-04	MW21-05
Sample Date			19-Nov-21	19-Nov-21	19-Nov-21	19-Nov-21	10-Nov-21	10-Nov-21	12-Nov-21	12-Nov-21	10-Nov-21	10-Nov-21
Sample ID			DP21-01	DP21-02	DP21-03	DP21-04	MW21-01 (ANTH)	MW21-02 (ANTH)	MW21-03	FIELD DUPLICATE 1	MW21-04 (ANTH)	MW21-05 (ANTH)
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			BV	BV	BV	BV	BV	BV	BV	BV	BV	BV
Laboratory Work Order			C1Y2396	C1Y2396	C1Y2396	C1Y2396	C1X2744	C1X2744	C1X4546	C1X4546	C1X2744	C1X2744
Laboratory Sample ID			RHD453	RHD454	RHD455	RHD456	RFC805	RFC806	RFM446	RFM447	RFC804	RFC803
Sample Type	Units	ODWS								Field Duplicate		
General Chemistry												
Alkalinity, Bicarbonate (as CaCO3)	mg/L	n/v	340	470	490	280	210	240	210	210	220	290
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	1.4	1.8	2.5	2.1	2.8	3.0	1.8	1.9	3.0	3.4
Alkalinity, Total (as CaCO3)	mg/L	30-500[D]	340	470	490	280	210	250	220	210	220	290
Ammonia (as N)	mg/L	n/v	0.34	1.4	0.89	0.16	<0.050	<0.050	0.11	0.083	<0.050	<0.050
Anion Sum	me/L	n/v	7.47	15.5	11.5	7.30	5.70	6.12	5.86	5.82	6.02	7.74
Cation Sum	me/L	n/v	6.96	15.0	11.3	7.38	5.61	6.28	5.80	5.78	6.05	7.84
Chloride	mg/L	250[B]	13	35	59	37	25	13	26	26	27	40
Dissolved Organic Carbon (DOC)	mg/L	5[B]	**14[B]**	**55[B]**	**44[B]**	3.6	<0.40	<0.40	5.0	5.0	1.6	0.49
Electrical Conductivity, Lab	µmhos/cm	n/v	650	1,300	980	690	520	550	520	520	550	710
Hardness (as CaCO3)	mg/L	80-100[D]	**320[D]**	**720[D]**	**520[D]**	**340[D]**	**260[D]**	**300[D]**	**260[D]**	**260[D]**	**280[D]**	**350[D]**
Ion Balance	%	n/v	3.54	1.60	0.760	0.560	0.750	1.29	0.540	0.400	0.230	0.690
Langelier Index (at 20 C)	none	n/v	0.639	1.04	1.08	0.844	0.863	0.969	0.679	0.700	0.891	1.07
Langelier Index (at 4 C)	none	n/v	0.391	0.792	0.830	0.595	0.614	0.720	0.430	0.451	0.642	0.823
Nitrate (as N)	mg/L	10.0_d[A]	0.11	<0.10	<0.10	0.30	1.23	<0.10	<0.10	<0.10	0.38	1.16
Nitrate + Nitrite (as N)	mg/L	10.0_d[A]	0.13	<0.10	<0.10	0.32	1.23	<0.10	<0.10	<0.10	0.38	1.16
Nitrite (as N)	mg/L	1.0_d[A]	0.019	0.013	0.020	0.019	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Orthophosphate (as P)	mg/L	n/v	<0.010	<0.050 DB	<0.010	<0.010	0.019	<0.010	<0.020	<0.010	<0.010	<0.010
pH, lab	S.U.	6.5-8.5[D]	7.64	7.62	7.74	7.91	8.14	8.12	7.96	7.98	8.15	8.10
Saturation pH (at 20 C)	none	n/v	7.00	6.58	6.66	7.06	7.28	7.16	7.28	7.28	7.26	7.03
Saturation pH (at 4 C)	none	n/v	7.25	6.83	6.91	7.31	7.53	7.40	7.53	7.53	7.51	7.27
Sulfate	mg/L	500_h[B]	17	250	<5.0 DB	30	32	41	39	39	37	33
Total Dissolved Solids (Calculated)	mg/L	500[B]	370	**840[B]**	**570[B]**	380	300	320	310	310	310	400
BTEX xand PHC												
Benzene	µg/L	1.0[A]	-	-	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Toluene	µg/L	60[A] 24[B]	-	-	-	-	<0.20	<0.20	<0.20	<0.20	0.22	<0.20
Ethylbenzene	µg/L	140[A] 1.6[B]	-	-	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Xylene, m & p-	µg/L	n/v	-	-	-	-	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Xylene, o-	µg/L	n/v	-	-	-	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Xylenes, Total	µg/L	90[A]	-	-	-	-	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
PHC F1 (C6-C10 range)	µg/L	n/v	-	-	-	-	<25	<25	<25	<25	<25	<25
PHC F1 (C6-C10 range) minus BTEX	µg/L	n/v	-	-	-	-	<25	<25	<25	<25	<25	<25
PHC F2 (>C10-C16 range)	µg/L	n/v	-	-	-	-	<100	<100	<100	<100	<100	<100
PHC F3 (>C16-C34 range)	µg/L	n/v	-	-	-	-	<200	<200	<200	<200	<200	<200
PHC F4 (>C34-C50 range)	µg/L	n/v	-	-	-	-	<200	<200	<200	<200	<200	<200
Chromatogram to baseline at C50	none	n/v	-	-	-	-	YES	YES	YES	YES	YES	YES
Metals												
Aluminum	mg/L	0.1[D]	0.022	0.026	0.078	0.017	<0.0049	0.0058	<0.0049	<0.0049	<0.0049	<0.0049
Antimony	mg/L	0.006[A]	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Arsenic	mg/L	0.01[A]	0.0093	0.0014	0.0034	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Barium	mg/L	1[A]	0.23	0.32	0.18	0.17	0.048	0.10	0.088	0.089	0.075	0.053
Beryllium	mg/L	n/v	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Boron	mg/L	5[A]	0.094	0.026	0.028	0.017	<0.010	<0.010	0.013	0.013	0.012	0.013
Cadmium	mg/L	0.005[A]	<0.000090	<0.000090	<0.000090	0.00039	<0.000090	<0.000090	<0.000090	<0.000090	<0.000090	0.00017
Calcium	mg/L	n/v	82	190	130	85	64	76	65	64	65	90
Chromium	mg/L	0.05[A]	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt	mg/L	n/v	0.00061	0.00071	0.00076	0.0011	<0.00050	<0.00050	<0.00050	0.00050	<0.00050	<0.00050
Copper	mg/L	1[B]	0.0038	0.0011	0.029	0.0032	<0.00090	<0.00090	<0.00090	<0.00090	<0.00090	<0.00090
Iron	mg/L	0.3[B]	**12[B]**	**6.5[B]**	**5.7[B]**	**1.6[B]**	<0.10	0.30	<0.10	<0.10	<0.10	<0.10
Lead	mg/L	0.01[A]	<0.00050	<0.00050	0.0021	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium	mg/L	n/v	27	60	44	30	23	28	24	25	28	31
Manganese	mg/L	0.05[B]	**0.31[B]**	**0.30[B]**	**0.22[B]**	**0.25[B]**	0.0035	**0.076[B]**	0.034	0.033	0.017	0.0059
Molybdenum	mg/L	n/v	0.0010	0.0040	0.0014	0.00098	0.0013	0.0024	0.0053	0.0050	0.0038	0.0012
Nickel	mg/L	n/v	0.0027	0.0068	0.016	0.0040	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	<0.0010
Phosphorus	mg/L	n/v	<0.10	0.12	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Potassium	mg/L	n/v	0.71	0.68	0.47	1.1	1.1	1.0	1.5	1.5	1.5	1.6
Selenium	mg/L	0.05[A]	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Silicon	mg/L	n/v	4.6	5.1	4.5	3.3	3.7	6.6	4.7	4.7	4.1	3.5
Silver	mg/L	n/v	<0.000090	<0.000090	<0.000090	<0.000090	<0.000090	<0.000090	<0.000090	<0.000090	<0.000090	<0.000090
Sodium	mg/L	200_g[B] 20_g[C]	2.9	4.3	17	13	10	3.7	11	11	12	17
Strontium	mg/L	n/v	0.082	0.16	0.13	0.090	0.068	0.10	0.13	0.13	0.10	0.14
Thallium	mg/L	n/v	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Titanium	mg/L	n/v	<0.0050	<0.0050	0.0062	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Uranium	mg/L	0.02[A]	<0.00010	0.00072	0.00030	0.00031	0.00036	0.00080	0.0017	0.0017	0.0014	0.00032
Vanadium	mg/L	n/v	<0.00050	<0.00050	0.0099	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	mg/L	5[B]	**41[B]**	**88[B]**	**41[B]**	**9.5[B]**	0.063	0.0069	0.018	0.017	0.043	0.096

Notes:

ODWS	Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2006), in support of O.Reg 169/03 (January 1, 2018)
A	Schedule 2 - Chemical Standards (expressed as a maximum acceptable concentration)
B	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Aesthetic Objectives
C	ODWS Table 4 - Medical Officer of Health Reporting Limit
D	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Operational Guidelines
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
d	Where both nitrate and nitrite are present, the total of the two should not exceed 10 mg/L (as nitrogen).
g BC	The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
h	When sulfate levels exceed 500 mg/L, water may have a laxative effect on some people.
DB	Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Table 6
Summary of Surface Water Quality Results
Hydrogeological Assessment Level I and II Report
Proposed Anthony Aggregate Pit

Sample Location			SW21-01		SW21-02
Sample Date			8-Nov-21	8-Nov-21	8-Nov-21
Sample ID			SW21-01	FIELD DUP1	SW21-02
Sampling Company			STANTEC	STANTEC	STANTEC
Laboratory			BV	BV	BV
Laboratory Work Order			C1Y2396	C1Y2396	C1Y2396
Laboratory Sample ID			RHD457	RHD459	RHD458
Sample Type	Units	PWQO		Field Duplicate	
General Chemistry					
Alkalinity, Bicarbonate (as CaCO3)	mg/L	n/v	260	260	250
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	3.8	4.1	5.3
Alkalinity, Total (as CaCO3)	mg/L	$_{s16}$[A]	260	260	250
Ammonia (as N)	mg/L	n/v	<0.050	<0.050	<0.050
Chloride	mg/L	n/v	27	27	36
Electrical Conductivity, Lab	µmhos/cm	n/v	580	560	580
Hardness (as CaCO3)	mg/L	n/v	300	300	300
Langelier Index (at 20 C)	none	n/v	1.09	1.12	1.23
Langelier Index (at 4 C)	none	n/v	0.838	0.874	0.976
Nitrate (as N)	mg/L	n/v	0.15	0.15	0.18
Nitrite (as N)	mg/L	n/v	<0.010	<0.010	<0.010
Orthophosphate (as P)	mg/L	n/v	<0.010	<0.010	<0.010
pH, lab	S.U.	6.5-8.5[A]	8.20	8.23	8.35
Phosphorus, Total	mg/L	0.030_{s4}[C]	0.011	0.010	0.005
Saturation pH (at 20 C)	none	n/v	7.11	7.11	7.13
Saturation pH (at 4 C)	none	n/v	7.36	7.36	7.38
Sulfate	mg/L	n/v	10	10	23
Total Dissolved Solids (Calculated)	mg/L	n/v	320	320	350
Total Organic Carbon	mg/L	n/v	12	12	7.2
Turbidity, Lab	NTU	n/v	0.7	0.3	0.3
BTEX and PHC					
Benzene	µg/L	100_{b}[C]	<0.20	<0.20	<0.20
Toluene	µg/L	0.8[C]	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	8[C]	<0.20	<0.20	<0.20
Xylene, m & p-	µg/L	2_{s17}[B]	<0.40	<0.40	<0.40
Xylene, o-	µg/L	40_{b}[C]	<0.20	<0.20	<0.20
Xylenes, Total	µg/L	30_{s10}[B]	<0.40	<0.40	<0.40
PHC F1 (C6-C10 range)	µg/L	n/v	<25	<25	<25
PHC F1 (C6-C10 range) minus BTEX	µg/L	n/v	<25	<25	<25
PHC F2 (>C10-C16 range)	µg/L	n/v	<100	<100	<100
PHC F3 (>C16-C34 range)	µg/L	n/v	<200	<200	<200
PHC F4 (>C34-C50 range)	µg/L	n/v	<200	<200	<200
Chromatogram to baseline at C50	none	n/v	YES	YES	YES
Metals - Dissolved					
Calcium	mg/L	n/v	79	80	79
Magnesium	mg/L	n/v	24	25	25
Potassium	mg/L	n/v	1	2	2
Sodium	mg/L	n/v	14	14	20
Metals - Total					
Aluminum	mg/L	n/v	0.0067	0.0079	0.010
Antimony	mg/L	0.020[C]	<0.00050	<0.00050	<0.00050
Arsenic	mg/L	0.10[A] 0.0050[C]	<0.0010	<0.0010	<0.0010
Barium	mg/L	n/v	0.064	0.064	0.051
Beryllium	mg/L	1.1_{s3}[A]	<0.00040	<0.00040	<0.00040
Boron	mg/L	0.20_{a}[C]	<0.010	<0.010	<0.010
Cadmium	mg/L	0.00020[A] 0.00050_{s12}[C]	<0.000090	<0.000090	<0.000090
Calcium	mg/L	n/v	77	75	74
Chromium	mg/L	n/v	<0.0050	<0.0050	<0.0050
Cobalt	mg/L	0.00090[C]	<0.00050	<0.00050	<0.00050
Copper	mg/L	0.0050[A] 0.0050_{s13}[C]	<0.00090	<0.00090	<0.00090
Iron	mg/L	0.30[A]	<0.10	<0.10	<0.10
Lead	mg/L	0.025_{s14}[A] 0.0050_{s15}[C]	<0.00050	<0.00050	<0.00050
Magnesium	mg/L	n/v	25	24	25
Manganese	mg/L	n/v	0.025	0.024	0.023
Molybdenum	mg/L	0.040[C]	0.00067	0.00066	0.00070
Nickel	mg/L	0.025[A]	<0.0010	<0.0010	<0.0010
Potassium	mg/L	n/v	1.4	1.4	1.4
Selenium	mg/L	0.10[A]	<0.0020	<0.0020	<0.0020
Silicon	mg/L	n/v	4.7	4.6	3.9
Silver	mg/L	0.00010[A]	<0.000090	<0.000090	<0.000090
Sodium	mg/L	n/v	13	13	19
Strontium	mg/L	n/v	0.095	0.094	0.094
Thallium	mg/L	0.00030_{b}[C]	<0.000050	<0.000050	<0.000050
Titanium	mg/L	n/v	<0.0050	<0.0050	<0.0050
Tungsten	mg/L	0.030_{a}[C]	<0.0010	<0.0010	<0.0010
Uranium	mg/L	0.0050_{a}[C]	0.00052	0.00051	0.00049
Vanadium	mg/L	0.0060[C]	<0.00050	<0.00050	<0.00050
Zinc	mg/L	0.030[A] 0.020[C]	**0.032[AC]**	**0.033[AC]**	0.020
Zirconium	mg/L	0.0040_{a}[C]	<0.0010	<0.0010	<0.0010

Notes:

PWQO	Provincial Water Quality Objectives of the Ministry of Environment and Energy (MOEE, 1999)
A	PWQO Table 2
B	PWQO Table 2 - Calculated
C	PWQO Table 2 - Interim
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
a	This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.
b	This Interim PWQO is currently under development. The value is subject to change upon publication by MOE.
s3	The PWQO for beryllium is hardness dependent. If hardness <75 mg/L than PWQO is 0.011 mg/L. For hardness > 75 mg/L, PWQO is 1.1 mg/L.
s4	Applies to Phosphorus, total. PWQO is 0.03 mg/L for rivers and streams, 0.02 mg/L for lakes, and 0.01 mg/L for lakes naturally below this value.
s10	Use of the BC AWQG of 30 ug/L for the maximum acceptable concentration of the sum of all xylene isomers has been noted by MECP to be an acceptable approach.
s12	The interim PWQO for cadmium is hardness dependent. If hardness <100 mg/L than PWQO is 0.0001 mg/L. For hardness >100 mg/L, PWQO is 0.0005 mg/L.
s13	The interim PWQO for copper is hardness dependent. If hardness <20 mg/L than PWQO is 0.001 mg/L. For hardness >20 mg/L, PWQO is 0.005 mg/L.
s14	PWQO for lead is alkalinity dependent. For alkalinity <20 mg/L, PWQO is 0.005 mg/L. For alkalinity between 20-40 mg/L, PWQO is 0.01 mg/L. For alkalinity between 40-80 mg/L, PWQO is 0.02 mg/L. For alkalinity >80 mg/L, PWQO is 0.025 mg/L.
s15	Interim PWQO for lead is hardness dependent. For hardness <30 mg/L, interim PWQO is 0.001 mg/L. For hardness between 30-80 mg/L, interim PWQO is 0.003 mg/L. For hardness >80 mg/L, interim PWQO is 0.005 mg/L.
s16	Alkalinity should not be decreased by more than 25% of the natural concentration.
s17	The laboratory is unable to distinguish the m- and p-Xylene isomers, therefore where the PWQO standards for m-Xylene (2 ug/L) and p-Xylene (30 ug/L), the most stringent value of all Xylenes is used.

Table 7
Summary of Surface Catchment Details
Hydrogeological Assessment Report
Proposed Anthony Aggregate Pit

Catchment Area No.	Receiving Watercourse / Body	Pre-Development Catchment Area (ha)	Post-Development Catchment Area (ha)	Proposed Catchment Area Reduction (%)
CA-1	Internally Draining	4.9	3.5	29%
CA-2	Aberfoyle Creek (South Branch)	61.5	60.9	1%
CA-3a	Internally Draining	23.6	9.1	39%
CA-3b	Internally Draining		7.6	0%
CA-4	Aberfoyle Creek (North Branch)	88.6	87.6	1%

Wetland Areas		Size (ha)
WE-1a	Aberfoyle Creek (North Branch)	9.37
WE-1b	Closed Depression	1.88
WE-1c	Closed Depression	3.1
WE-1d	Aberfoyle Creek (South Branch)	8.83
WE-2	Closed Depression	0.36
WE-3	Closed Depression	0.05
WE-4	Closed Depression	0.21
WE-5	Closed Depression	0.093
WE-6	Closed Depression	0.063
WE-7	Closed Depression	0.08
WE-8	Closed Depression	0.07

Appendix C

Borehole Logs

Monitoring Well: MW21-01

Project:	Aberfoyle Tikal Pit Expansion	**Method:**	Sonic
Client:	CBM Aggregates	**Date started/completed:**	01-Nov-2021 / 02-Nov-2021
Location:	Aberfoyle, ON	**Ground surface elevation:**	322.27 m AMSL
Number:	160961457	**Top of casing elevation:**	323.05 m AMSL
Field investigator:	R. Baker	**Easting:**	569806
Contractor:	Insitu	**Northing:**	4814118

SUBSURFACE PROFILE				SAMPLE DETAILS			INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram / Description
				323.79				
0	0		Ground Surface	322.27				Above Ground Casing 0.77 m stick-up
			SAND and GRAVEL trace silt	0.00	1	GB	22" 23%	Cement Seal 0 to 0.3 m
5	2							
10	4				2	GB	50" 52%	
15								
20	6				3	GB	18" 19%	
25	8				4	GB	60" 100%	168 mm Diameter Borehole
30				313.13				Bentonite Grout 1 to 17.7 m
	10		SAND some silt and gravel	9.14	5	GB	60" 100%	
35					6	GB	55" 92%	
40	12		SAND and GRAVEL trace silt	11.58				51 mm Diameter Schedule 40 PVC riser
				309.16	7	GB	58" 97%	
45	14		SAND trace gravel and silt	13.11				
				307.64	8	GB	60" 100%	
50			SAND and GRAVEL trace silt	14.63				
	16				9	GB	48" 80%	
55					10	GB	55" 92%	Bentonite Chips 17.7 to 18.3 m
60	18				11	GB	48" 80%	No. 2 Silica Sand 18.3 to 23.8 m
65	20				12	GB	50" 83%	No. 10 Slot Schedule 40 PVC Screen 51 mm Diameter 18.9 to 20.4 m
70								
	22				13	GB	60" 100%	
75				298.50				
	24		End of Borehole	23.77				

Screen Interval: 18.90 - 20.42 m BGS
Sand Pack Interval: 18.29 - 23.77 m BGS
Well Seal Interval: 0.30 - 18.29 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
GB - grab sample
n/a - not available

Stantec

Drawn By/Checked By: RB/RD

STANTEC BOREHOLE AND WELL V2 160961457.306_BHLOGS.GPJ STANTEC - DATA TEMPLATE.GDT 9/12/25 DRSMITH

Monitoring Well: MW21-02

Project:	Aberfoyle Tikal Pit Expansion	**Method:**	Sonic
Client:	CBM Aggregates	**Date started/completed:**	02-Nov-2021 / 03-Nov-2021
Location:	Aberfoyle, ON	**Ground surface elevation:**	322.48 m AMSL
Number:	160961457	**Top of casing elevation:**	323.27 m AMSL
Field investigator:	R. Baker	**Easting:**	569747
Contractor:	Insitu	**Northing:**	4814230

SUBSURFACE PROFILE				SAMPLE DETAILS			INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram / Description
				324.00				
			Ground Surface	322.48				Above Ground Casing 0.83 m stick-up
0	0		SAND and GRAVEL trace silt	0.00				Bentonite Chips 0 to 0.6 m
					1	GB	48" 80%	
5					2	GB	36" 100%	
	2							
10					3	GB	48" 80%	
	4							
15				316.99	4	GB	60" 100%	
20	6		SAND trace silt	5.49	5	GB	60" 100%	168 mm Diameter Borehole
25					6	GB	60" 100%	Bentonite Grout 1 to 14.3 m
	8			313.95				
30			SAND and SILT	8.53	7	GB	60" 100%	51 mm Diameter Schedule 40 PVC riser
	10							
35					8	GB	60" 100%	
				310.90				
40	12		SAND grace gravel and silt	11.58	9	GB	50" 83%	
				309.37				
45			SAND and GRAVEL trace silt	13.11	10	GB	60" 100%	
	14			307.85				
50			Gravelly SAND trace silt	14.63	11	GB	48" 80%	Bentonite Chips 14.3 to 14.9 m; No. 2 Silica Sand 14.9 to 20.9 m
	16							
55					12	GB	60" 100%	
60	18				13	GB	60" 100%	No. 10 Slot Schedule 40 PVC Screen 51 mm Diameter 15.5 to 18.6 m
				303.28				
65	20		SAND and GRAVEL trace silt	19.20	14	GB	60" 100%	
				301.60				
70			End of Borehole	20.88				

Screen Interval: 15.54 - 18.59 m BGS
Sand Pack Interval: 14.94 - 20.88 m BGS
Well Seal Interval: 0.00 - 14.94 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
GB - grab sample
n/a - not available

Stantec

Drawn By/Checked By: RB/RD

STANTEC BOREHOLE AND WELL V2 160961457.306_BHLOGS.GPJ STANTEC - DATA TEMPLATE.GDT 9/12/25 DRSMITH

Monitoring Well: MW21-03

Project:	Aberfoyle Tikal Pit Expansion	**Method:**	Sonic
Client:	CBM Aggregates	**Date started/completed:**	03-Nov-2021 / 04-Nov-2021
Location:	Aberfoyle, ON	**Ground surface elevation:**	326.60 m AMSL
Number:	160961457	**Top of casing elevation:**	327.50 m AMSL
Field investigator:	R. Baker	**Easting:**	570228
Contractor:	Insitu	**Northing:**	4814460

SUBSURFACE PROFILE				SAMPLE DETAILS			INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram / Description
				328.12				
0	0		Ground Surface	326.60				Above Ground Casing 0.87 m stick-up
0	0		SAND and GRAVEL trace silt	0.00	1	GB	48" 133%	Bentonite Chips 0 to 0.6 m
5	2				2	GB	60" 100%	
10	4				3	GB	30" 50%	
15	6				4	GB	60" 100%	168 mm Diameter Borehole
20	8				5	GB	60" 50%	Bentonite Grout 1 to 12.5 m; 51 mm Diameter Schedule 40 PVC riser
25	10				6	GB	60" 100%	
30	12		SAND some silt	10.06	7	GB	60" 100%	
35	14				8	GB	60" 100%	Bentonite Chips 12.5 to 13.1 m
40	16		SAND trace gravel and silt	13.11	9	GB	60" 100%	No. 2 Silica Sand 13.1 to 23.8 m
45	18				10	GB	60" 100%	No. 10 Slot Schedule 40 PVC Screen 51 mm Diameter 13.7 to 16.8 m
50	20		SAND and SILT	16.15	11	GB	60" 100%	
55	22		SAND trace gravel and silt	17.68	12	GB	60" 100%	
60	24				13	GB	60" 100%	
65					14	GB	60" 100%	
70								
75			SAND and GRAVEL trace silt	22.25	15	GB	60" 100%	
			End of Borehole	23.77				

Screen Interval: 13.72 - 16.76 m BGS
Sand Pack Interval: 13.11 - 23.77 m BGS
Well Seal Interval: 0.00 - 13.11 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
GB - grab sample
n/a - not available

Stantec

Drawn By/Checked By: RB/RD

STANTEC BOREHOLE AND WELL V2 160961457.306_BHLOGS.GPJ STANTEC - DATA TEMPLATE.GDT 9/12/25 DRSMITH

Monitoring Well: MW21-04

Project:	Aberfoyle Tikal Pit Expansion	**Method:**	Sonic
Client:	CBM Aggregates	**Date started/completed:**	04-Nov-2021 / 05-Nov-2021
Location:	Aberfoyle, ON	**Ground surface elevation:**	323.85 m AMSL
Number:	160961457	**Top of casing elevation:**	324.62 m AMSL
Field investigator:	R. Baker	**Easting:**	569943
Contractor:	Insitu	**Northing:**	4814635

SUBSURFACE PROFILE				SAMPLE DETAILS			INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram / Description
				325.37				
			Ground Surface	323.85				Above Ground Casing 0.77 m stick-up
0	0		SAND and GRAVEL trace silt	0.00	1	GB	55" 92%	Bentonite Chips 0 to 0.6 m
5	2				2	GB	36" 75%	
10	4				3	GB	60" 100%	
15					4	GB	60" 100%	168 mm Diameter Borehole
				318.06				
20	6		SAND trace silt fining downward sequent to SAND and SILT	5.79	5	GB	60" 100%	
25	8				6	GB	60" 100%	51 mm Diameter Schedule 40 PVC riser
30	10				7	GB	60" 100%	Bentonite Grout 0.6 to 16.5 m
				313.49				
35	12		SAND trace gravel and silt	10.36	8	GB	55" 92%	
40					9	GB	55" 115%	
				310.44				
45	14		SAND and SILT	13.41	10	GB	55" 76%	
50	16				11	GB	60" 125%	
				307.39				
55	18		SAND trace silt coarsening downward sequence to GRAVEL, trace sand	16.46	12	GB	60" 83%	Bentonite Chips 16.5 to 17.1 m No. 2 Silica Sand 17.1 to 21.0 m
60					13	GB	60" 250%	
					14	GB	60" 100%	No. 10 Slot Schedule 40 PVC Screen 51 mm Diameter 17.7 to 20.7 m
65	20			303.73				
			Drillers only able to advance casing to 20.1 m BGS	20.12	15	GB	60" 167%	
70	22		End of Borehole	302.82 21.03				

Screen Interval: 17.68 - 20.73 m BGS
Sand Pack Interval: 17.07 - 21.03 m BGS
Well Seal Interval: 0.00 - 17.07 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
GB - grab sample
n/a - not available

Stantec

Drawn By/Checked By: RB/RD

STANTEC BOREHOLE AND WELL V2 160961457.306_BHLOGS.GPJ STANTEC - DATA TEMPLATE.GDT 9/12/25 DRSMITH

Monitoring Well: MW21-05

Project:	Aberfoyle Tikal Pit Expansion	**Method:**	Sonic
Client:	CBM Aggregates	**Date started/completed:**	08-Nov-2021
Location:	Aberfoyle, ON	**Ground surface elevation:**	326.53 m AMSL
Number:	160961457	**Top of casing elevation:**	327.37 m AMSL
Field investigator:	R. Baker	**Easting:**	570104
Contractor:	Insitu	**Northing:**	4814894

SUBSURFACE PROFILE				SAMPLE DETAILS			INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram / Description
				328.05				
			Ground Surface	326.53				Above Ground Casing 0.90 m stick-up
0	0		SAND and GRAVEL trace silt	0.00	1	GB	60" 100%	Cement Seal 0 to 0.3 m
5	2				2	GB	36" 100%	168 mm Diameter Borehole
10	4				3	GB	60" 100%	Bentonite Grout 1 to 4.8 m
15					4	GB	36" 60%	51 mm Diameter Schedule 40 PVC riser
20	6			319.52	5	GB	60" 100%	No. 2 Silica Sand 4.8 to 8.5 m
25	8		Silty SAND	7.01	6	GB	60" 100%	No. 10 Slot Schedule 40 PVC Screen 51 mm Diameter 5.2 to 8.2 m
30	10			316.47	7	GB	60" 100%	
35	12		SAND and GRAVEL trace silt	10.06	8	GB	60" 100%	
40					9	GB	60" 100%	
45	14				10	GB	60" 100%	Bentonite Grout 8.5 to 20.1 m
50	16				11	GB	60" 100%	
55					12	GB	60" 100%	
60	18				13	GB	60" 100%	
65	20			306.41	14	GB	36" 100%	
			End of Borehole	20.12				

Screen Interval: 5.18 - 8.23 m BGS
Sand Pack Interval: 4.57 - 8.53 m BGS
Well Seal Interval: 0.30 - 4.57 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
GB - grab sample
n/a - not available

Stantec

Drawn By/Checked By: RB/RD

STANTEC BOREHOLE AND WELL V2 160961457.306_BHLOGS.GPJ STANTEC - DATA TEMPLATE.GDT 9/12/25 DRSMITH

Appendix D

Soil Testing

Stantec

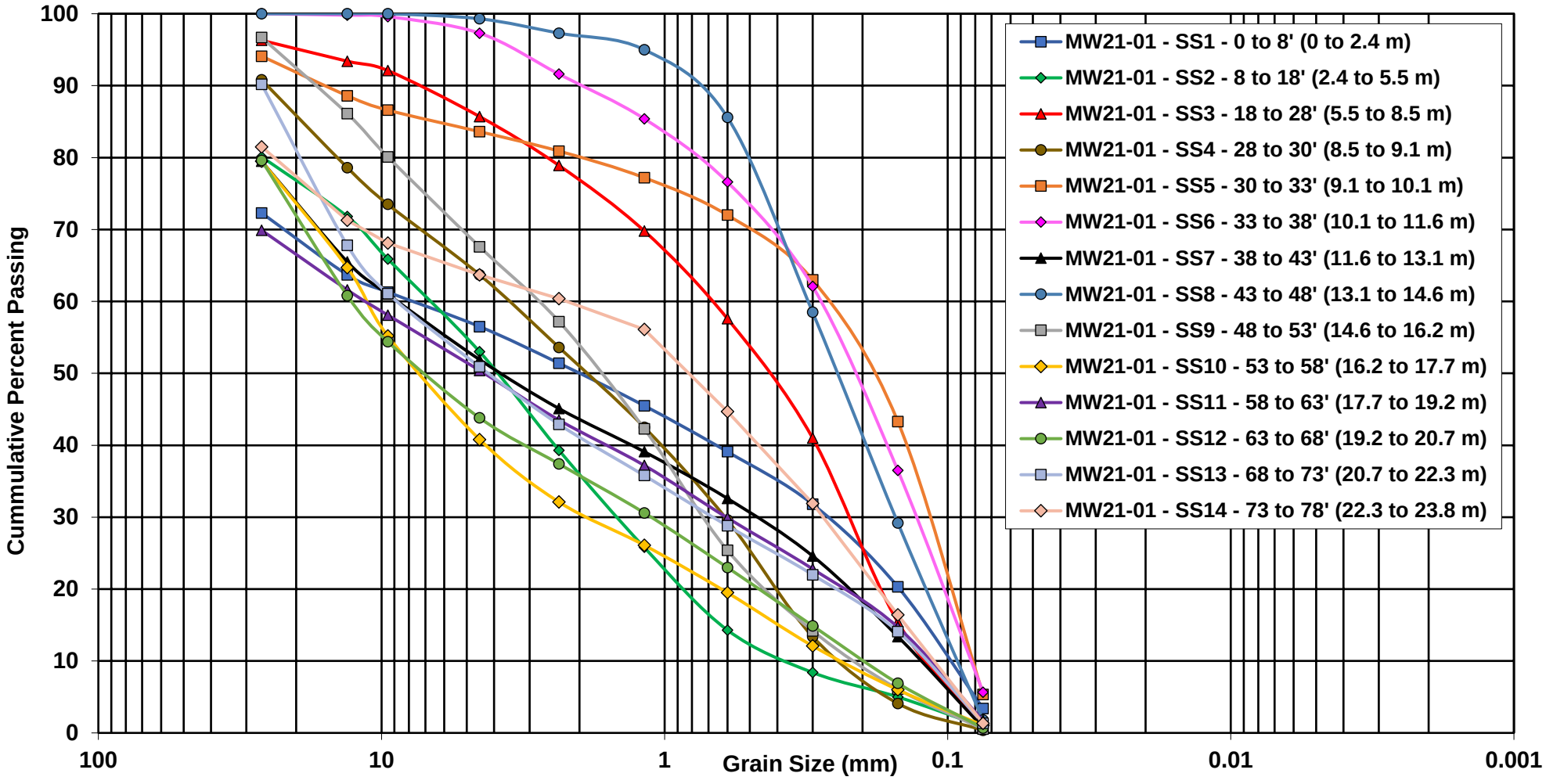
Project Name:	Anthony Pit	Project & Task No.:	160961457.202
Client:	CBM	Date Sampled:	November 5, 2021
General Contractor:	N/A	Proposed Use:	N/A
Inspector / Technician:	N/A	Material Type:	
Supplier:	N/A	Lab No.:	420-423
Sample Location:	**MW21-01**		

Run Depth (ft)		Sample ID	Field Description (optional)	Full FM Value	Sand Portion FM Value	Wash Loss (%)	Crushed Stone (%)	Stone to Sand Ratio		
Top (ft)	Bottom (ft)							Ratio	Stone	Sand
0	8	1		3.47	2.11	42.8	48.6	44:53	44	53
8	18	2		4.79	3.72	5.9	85.7	47:52	47	52
18	28	3		2.32	2.08	11.6	80.2	14:85	14	85
28	30	4		3.84	3.11	3.4	58.9	36:63	36	63
30	33	5		1.54	1.14	40.8	79.7	16:78	16	78
33	38	6		1.41	1.41	41.7	0.0	3:92	3	92
38	43	7		3.72	2.50	18.7	52.2	48:51	48	51
43	48	8		1.32	1.32	33.2	72.6	1:98	1	98
48	53	9		3.62	3.18	6.9	27.1	32:67	32	67
53	58	10		4.52	3.25	6.6	74.6	59:40	59	40
58	63	11		4.00	2.56	26.7	88.6	50:49	50	49
63	68	12		4.34	2.98	8.1	75.1	56:43	56	43
68	73	13		3.69	2.67	30.0	86.4	49:50	49	50
73	78	14		3.10	2.07	56.7	79.4	36:62	36	62

Grain Size Distribution Test Report (ISO 14688-1:2002)

MW21-01

FIGURE D1



Cobble Size	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	Gravel		**Sand**				

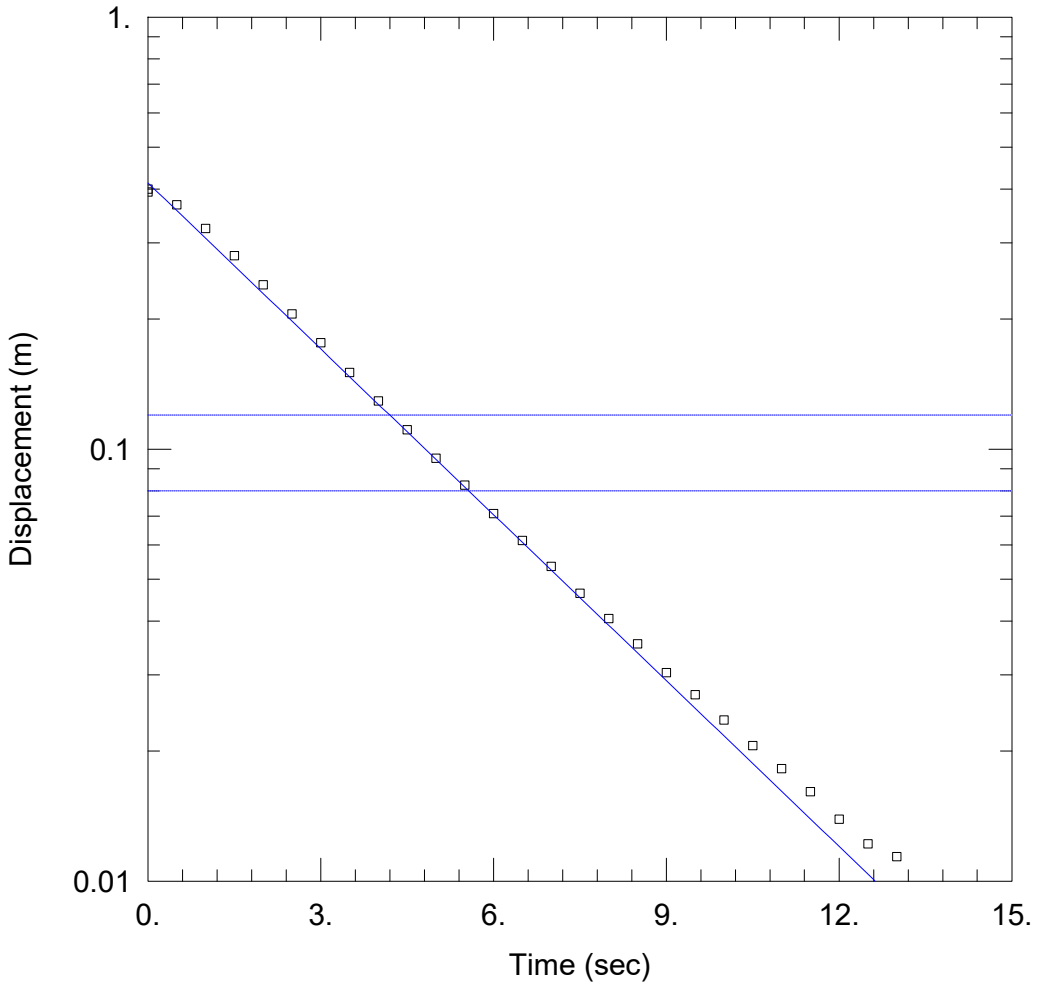
DATE: September 2022

PROJECT: 160961457

Stantec

prepared by: **RD**

CHK: **SMD**



MW21-01-RISINGHEAD TEST1

Data Set: \...\MW21-01_risinghead_test1_DG_JK.aqt
Date: 03/20/25 Time: 07:44:35

PROJECT INFORMATION

Company: Stantec
Client: CBM
Project: 160961457
Location: Ontario
Test Well: MW21-01
Test Date: May 4, 2023

AQUIFER DATA

Saturated Thickness: 18.85 m Anisotropy Ratio (Kz/Kr): 0.35

WELL DATA (MW21-01)

Initial Displacement: 0.4 m
Total Well Penetration Depth: 18.85 m
Casing Radius: 0.0254 m
Static Water Column Height: 18.85 m
Screen Length: 1.52 m
Well Radius: 0.084 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00025 m/sec
y0 = 0.4132 m

Stantec

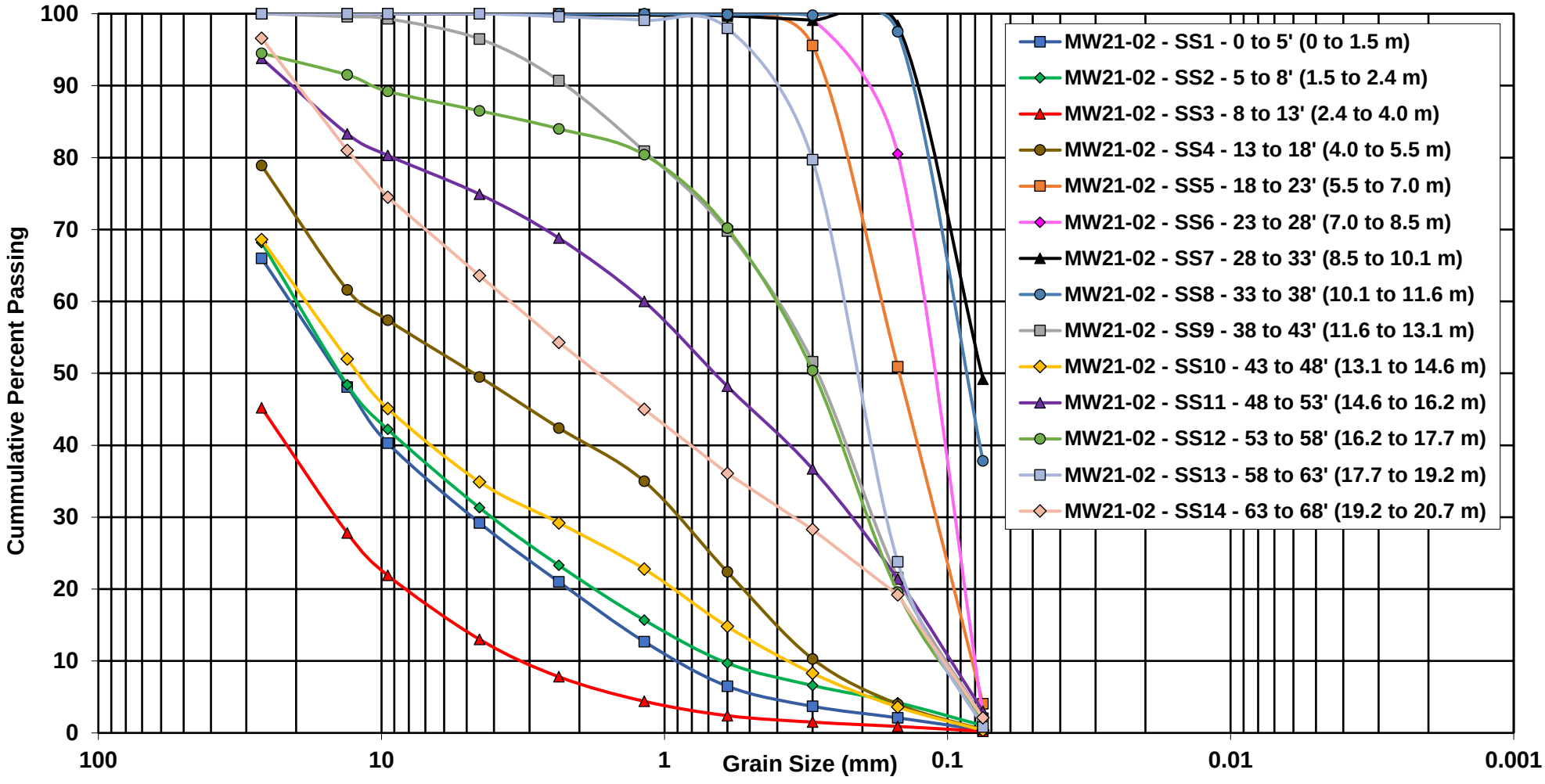
Project Name:	Anthony Pit	Project & Task No.:	160961457.202
Client:	CBM	Date Sampled:	November 5, 2021
General Contractor:	N/A	Proposed Use:	N/A
Inspector / Technician:	N/A	Material Type:	
Supplier:	N/A	Lab No.:	420-423
Sample Location:	**MW21-02**		

Run Depth (ft)		Sample ID	Field Description (optional)	Full FM Value	Sand Portion FM Value	Wash Loss (%)	Crushed Stone (%)	Stone to Sand Ratio		
Top	Bottom							Ratio	Stone	Sand
(ft)	(ft)									
0	5	1		6.01	4.13	7.1	75.0	71:29	71	29
5	8	2		5.62	3.78	9.7	65.2	69:30	69	30
8	13	3		7.25	4.56	1.2	97.3	87:13	87	13
13	18	4		4.54	3.20	6.2	73.6	51:49	51	49
18	23	5		0.54	0.54	28.9	0.0	0:96	0	96
23	28	6		0.20	0.20	61.2	0.0	0:98	0	98
28	33	7		0.03	0.03	79.0	0.0	0:51	0	51
33	38	8		0.03	0.03	47.7	0.0	0:62	0	62
38	43	9		1.79	1.78	15.3	61.6	4:95	4	95
43	48	10		5.14	3.40	7.1	68.2	65:35	65	35
48	53	11		2.66	2.11	23.7	81.9	25:72	25	72
53	58	12		1.93	1.61	13.0	57.1	14:85	14	85
58	63	13		1.00	1.00	5.8	0.0	0:99	0	99
63	68	14		3.08	2.49	60.6	88.3	36:62	36	62

Grain Size Distribution Test Report (ISO 14688-1:2002)

MW21-02

FIGURE D2



Cobble Size	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	Gravel		**Sand**				

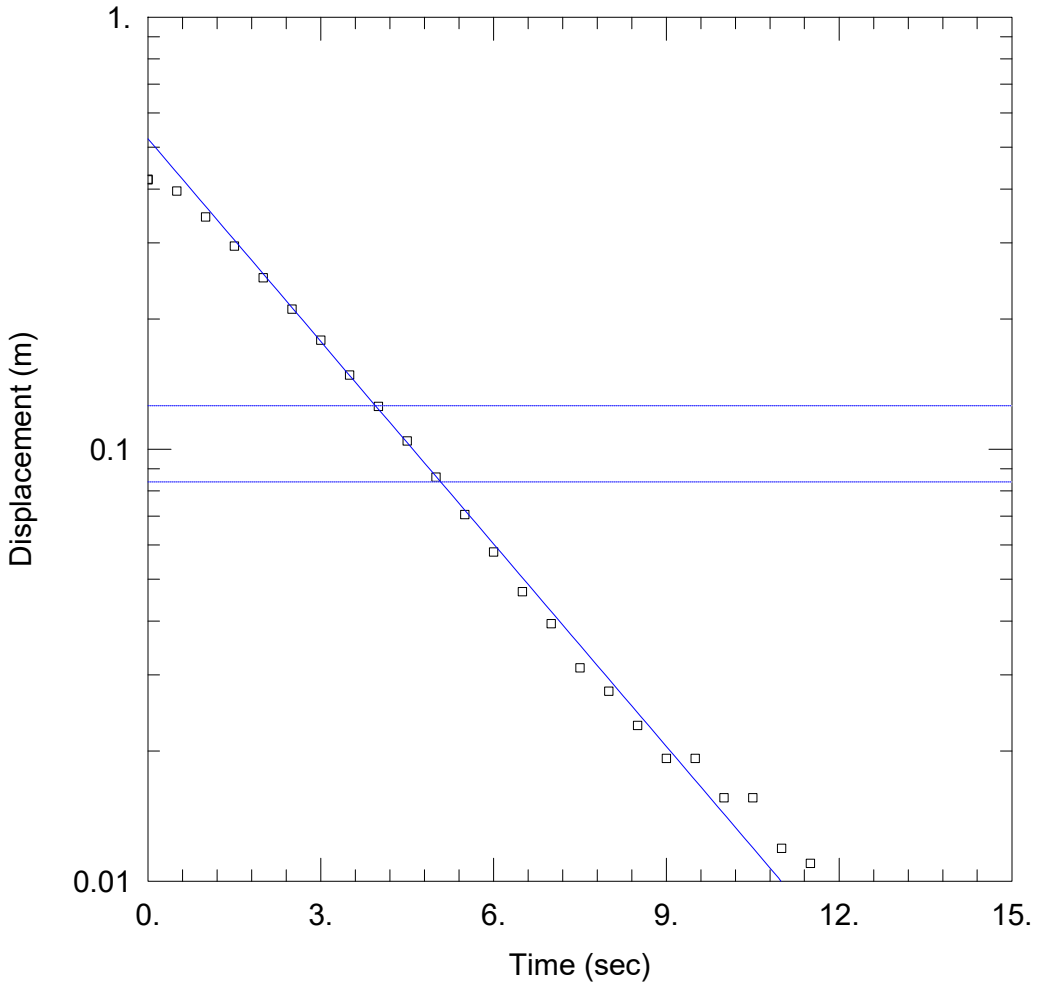
DATE: September 2022

PROJECT: 160961457

Stantec

prepared by: **RD**

CHK: **SMD**



MW21-02-RISINGHEAD TEST #1

Data Set: \...\MW21-02_risinghead_test1_DG_JK.aqt
Date: 03/20/25 Time: 08:59:52

PROJECT INFORMATION

Company: Stantec
Client: CBM
Project: 160961457
Location: Ontario
Test Well: MW21-02
Test Date: May 4, 2023

AQUIFER DATA

Saturated Thickness: 17.05 m Anisotropy Ratio (Kz/Kr): 0.35

WELL DATA (MW21-02)

Initial Displacement: 0.42 m
Total Well Penetration Depth: 17.05 m
Casing Radius: 0.0254 m
Static Water Column Height: 17.05 m
Screen Length: 3.05 m
Well Radius: 0.084 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00016 m/sec
y0 = 0.5229 m

Stantec

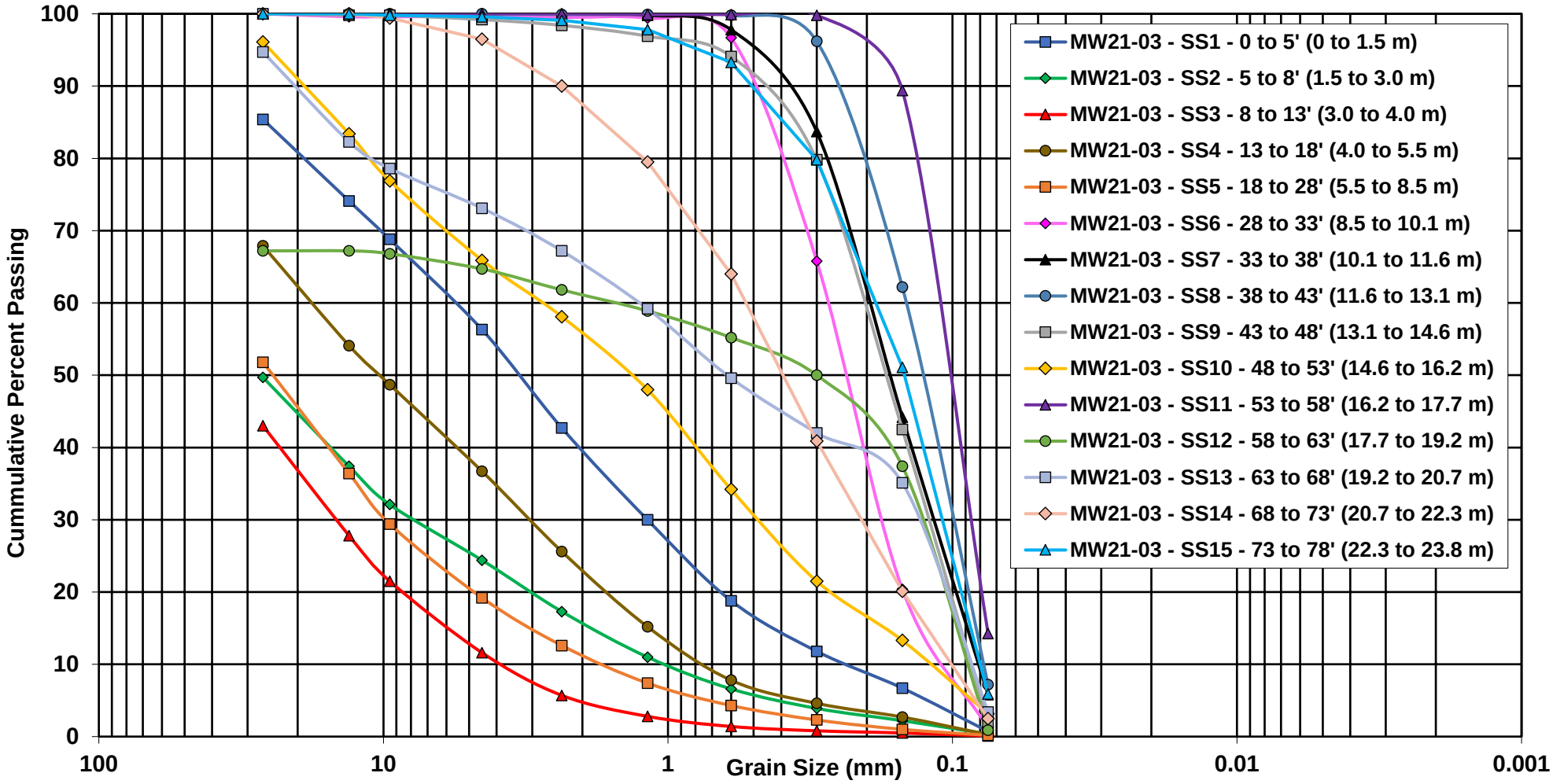
Project Name:	Anthony Pit	Project & Task No.:	160961457.202
Client:	CBM	Date Sampled:	November 5, 2021
General Contractor:	N/A	Proposed Use:	N/A
Inspector / Technician:	N/A	Material Type:	
Supplier:	N/A	Lab No.:	420-423
Sample Location:	**MW21-03**		

Run Depth (ft)		Sample ID	Field Description (optional)	Full FM Value	Sand Portion FM Value	Wash Loss (%)	Crushed Stone (%)	Stone to Sand Ratio		
Top	Bottom							Ratio	Stone	Sand
(ft)	(ft)									
0	5	1		4.39	3.48	26.4	81.4	44:56	44	56
5	10	2		6.46	4.07	9.3	86.5	76:24	76	24
10	13	3		7.66	4.93	1.3	81.8	88:12	88	12
13	18	4		5.78	4.11	8.3	81.8	63:36	63	36
18	28	5		6.75	4.37	0.8	44.4	81:19	81	19
28	33	6		1.18	1.17	9.0	0.0	0:98	0	98
33	38	7		0.75	0.75	17.7	0.0	0:94	0	94
38	43	8		0.42	0.42	18.8	0.0	0:93	0	93
43	48	9		0.86	0.86	48.8	50.0	1:97	1	97
48	53	10		3.22	2.69	23.8	44.8	34:63	34	63
53	58	11		0.11	0.11	45.8	0.0	0:86	0	86
58	63	12		2.60	1.29	83.2	92.2	36:64	35	64
63	68	13		2.37	1.81	74.1	29.2	27:70	27	70
68	73	14		1.99	1.98	61.1	33.7	4:94	4	94
73	78	15		0.78	0.78	46.7	0.0	0:94	0	94

Grain Size Distribution Test Report (ISO 14688-1:2002)

MW21-03

FIGURE D3



Cobble Size	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	Gravel		**Sand**				

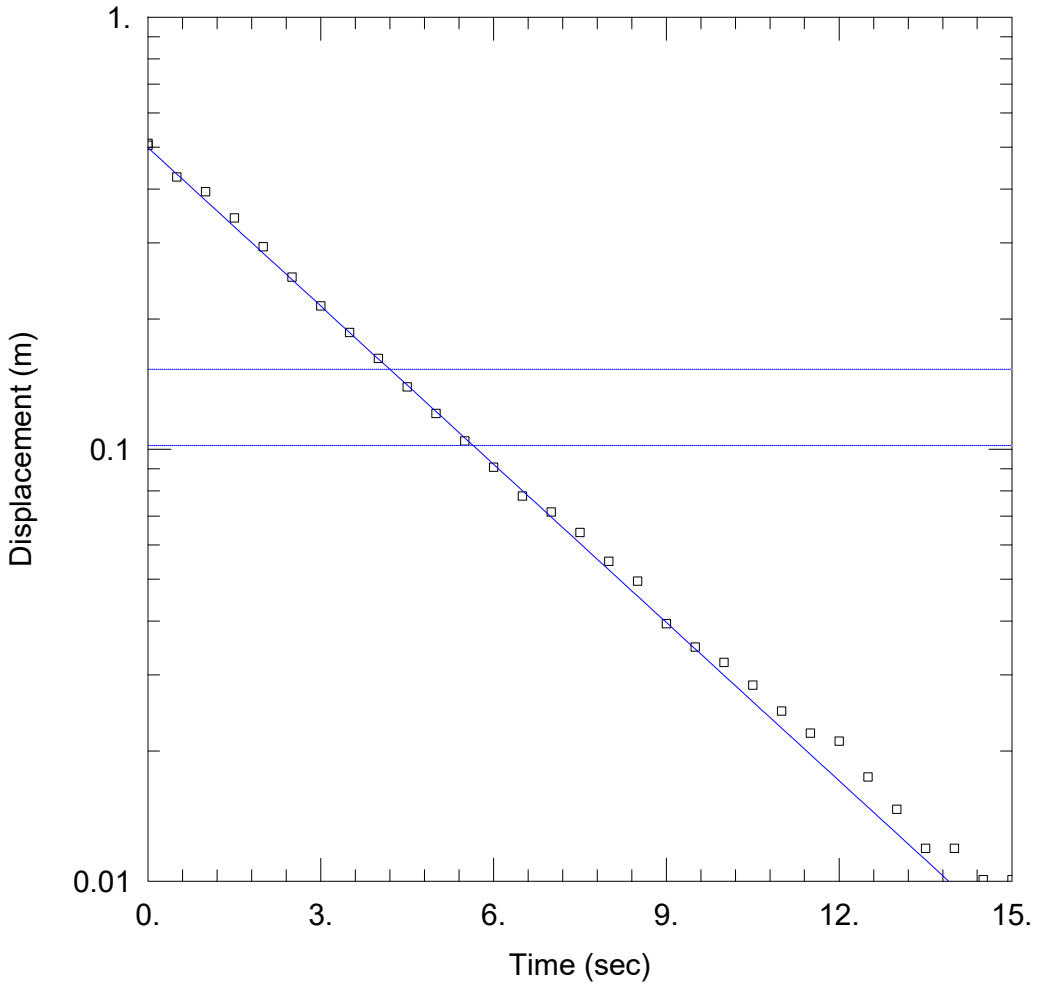
DATE: September 2022

PROJECT: 160961457

Stantec

prepared by: **RD**

CHK: **SMD**



MW21-03-RISINGHEAD TEST2

Data Set: \...\MW21-03_risinghead_test2_DG_JK.aqt
Date: 03/20/25 Time: 09:43:52

PROJECT INFORMATION

Company: Stantec
Client: CBM
Project: 160961457
Location: Ontario
Test Well: MW21-03
Test Date: May 4, 2023

AQUIFER DATA

Saturated Thickness: 12.72 m Anisotropy Ratio (Kz/Kr): 0.35

WELL DATA (MW21-03)

Initial Displacement: 0.51 m
Total Well Penetration Depth: 12.72 m
Casing Radius: 0.0254 m
Static Water Column Height: 12.72 m
Screen Length: 3.05 m
Well Radius: 0.084 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.00012 m/sec y0 = 0.4986 m

Stantec

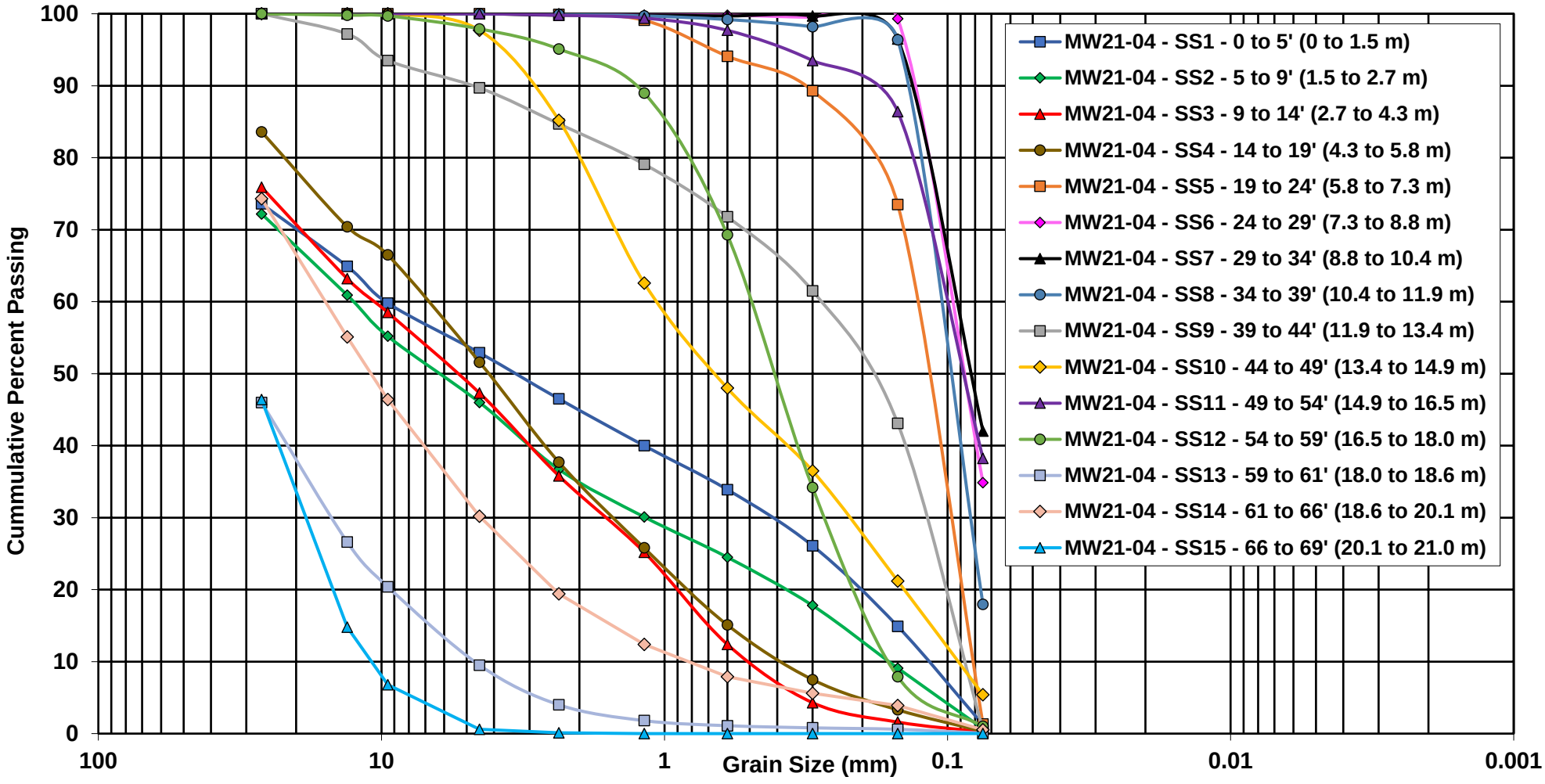
Project Name:	Anthony Pit	Project & Task No.:	160961457.202
Client:	CBM	Date Sampled:	November 5, 2021
General Contractor:	N/A	Proposed Use:	N/A
Inspector / Technician:	N/A	Material Type:	
Supplier:	N/A	Lab No.:	420-423
Sample Location:	**MW21-04**		

Run Depth (ft)		Sample ID	Field Description (optional)	Full FM Value	Sand Portion FM Value	Wash Loss (%)	Crushed Stone (%)	Stone to Sand Ratio		
Top	Bottom									
(ft)	(ft)							Ratio	Stone	Sand
0	5	1		3.75	2.42	29.1	75.1	47:52	47	52
5	9	2		3.63	3.37	11.9	50.7	54:45	54	45
9	14	3		4.08	3.79	2.6	55.1	53:47	53	47
14	19	4		4.09	3.77	29.9	38.1	48:51	48	51
19	24	5		0.44	0.44	60.5	0.0	0:99	0	99
24	29	6		0.02	0.02	90.8	0.0	0:65	0	65
29	34	7		0.04	0.04	43.3	0.0	0:58	0	58
34	39	8		0.07	0.07	95.5	0.0	0:82	0	82
39	44	9		1.40	1.31	88.1	93.3	10:89	10	89
44	49	10		2.43	2.43	97.5	50.0	2:92	2	92
49	54	11		0.23	0.23	75.6	0.0	0:62	0	62
54	59	12		2.06	2.04	2.8	69.0	2:97	2	97
59	61	13		4.49	4.12	1.1	100.0	91:9	91	9
61	66	14		4.41	3.97	9.2	100.0	70:30	70	30
66	69	15		4.52	4.07	9.2	97.5	99:1	99	1

Grain Size Distribution Test Report (ISO 14688-1:2002)

MW21-04

FIGURE D4



Cobble Size	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	Gravel		**Sand**				

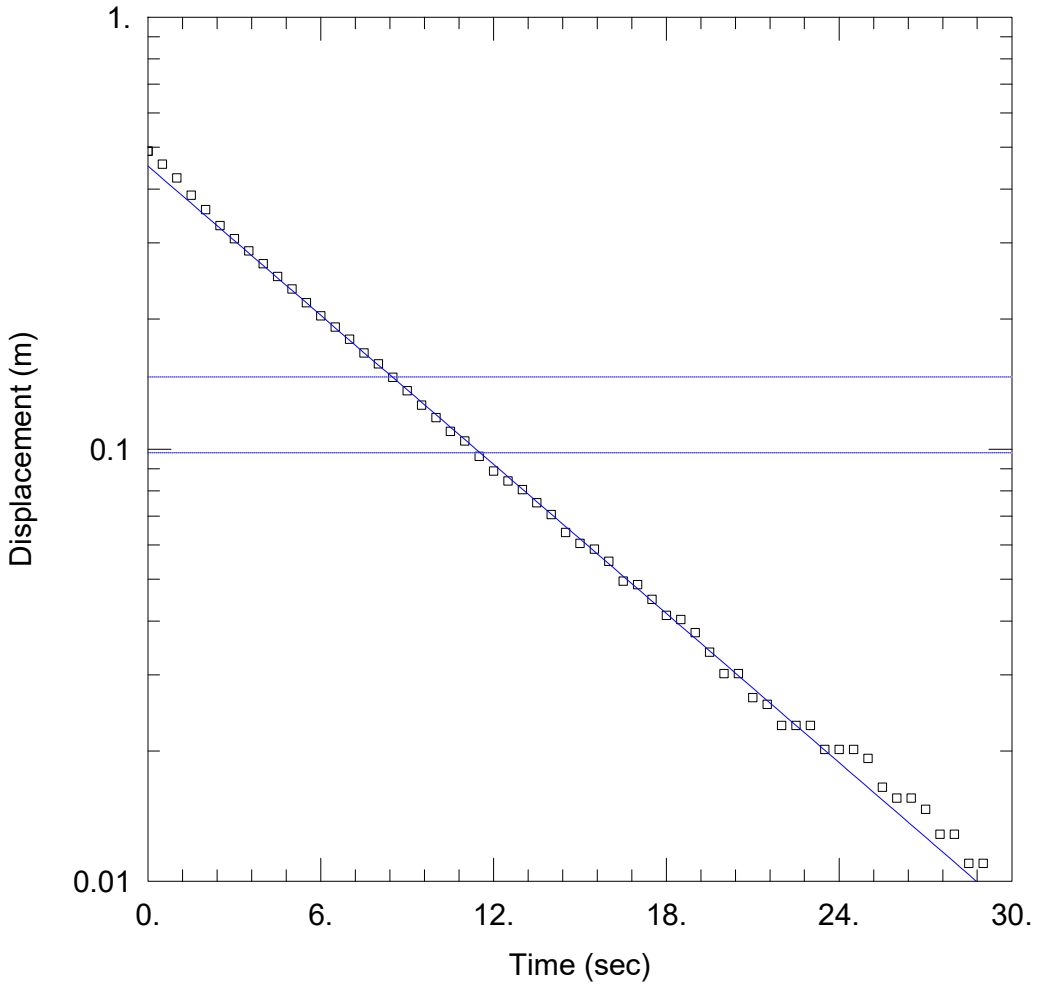
DATE: September 2022

PROJECT: 160961457

Stantec

prepared by: **RD**

CHK: **SMD**



MW21-04-RISINGHEAD TEST 3

Data Set: \...\MW21-04_risinghead_test3_DG_JK.aqt
Date: 03/20/25 Time: 10:08:58

PROJECT INFORMATION

Company: Stantec
Client: CBM
Project: 160961457
Location: Ontario
Test Well: MW21-04
Test Date: May 4, 2023

AQUIFER DATA

Saturated Thickness: 17.26 m Anisotropy Ratio (Kz/Kr): 0.35

WELL DATA (MW21-04)

Initial Displacement: 0.49 m
Total Well Penetration Depth: 17.26 m
Casing Radius: 0.0254 m
Static Water Column Height: 17.26 m
Screen Length: 3.05 m
Well Radius: 0.084 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 5.9E-5 m/sec
y0 = 0.4521 m

Stantec

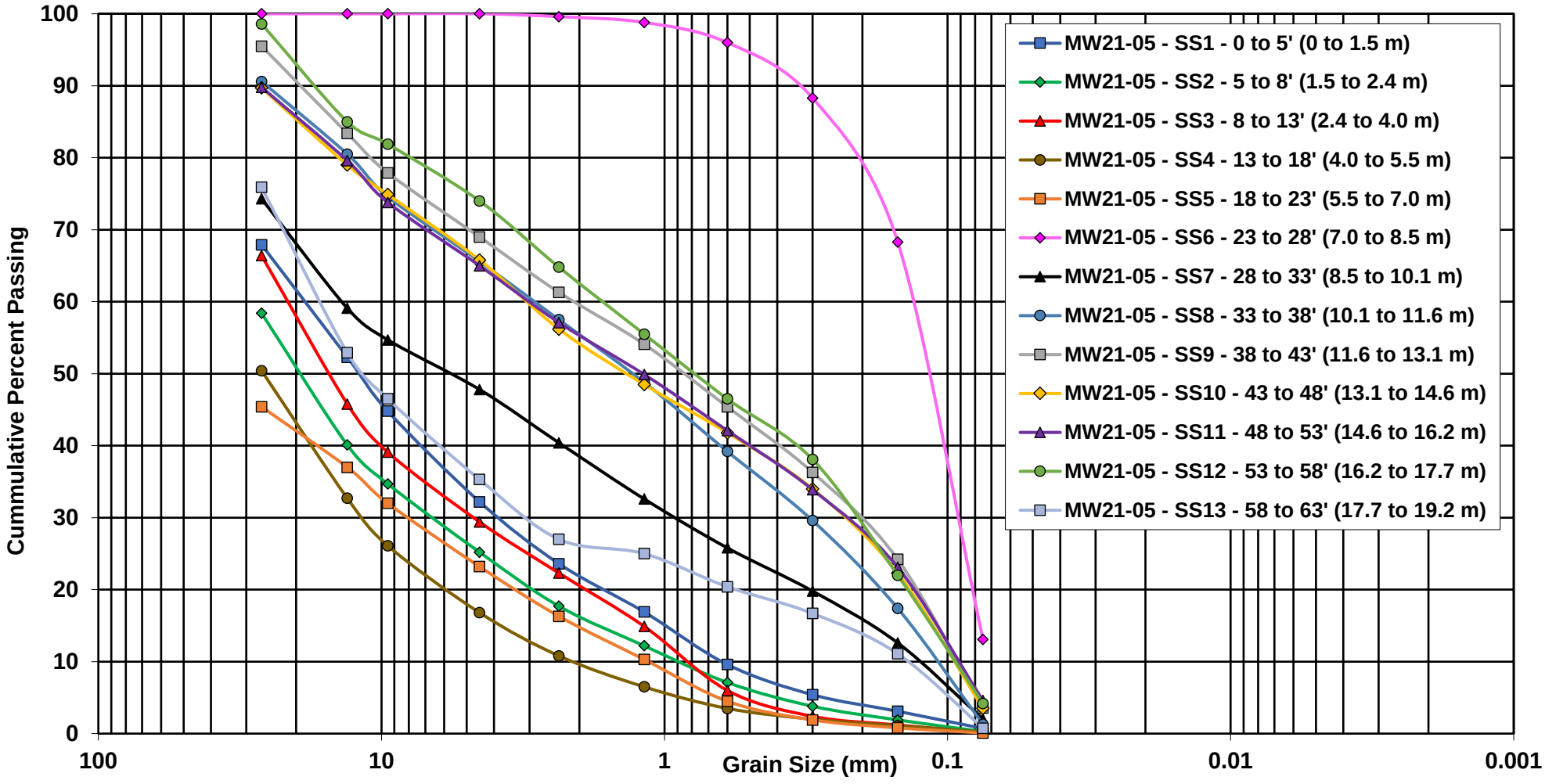
Project Name:	Anthony Pit	Project & Task No.:	160961457.202
Client:	CBM	Date Sampled:	November 5, 2021
General Contractor:	N/A	Proposed Use:	N/A
Inspector / Technician:	N/A	Material Type:	
Supplier:	N/A	Lab No.:	420-423
Sample Location:	**MW21-05**		

Run Depth (ft)		Sample ID	Field Description (optional)	Full FM Value	Sand Portion FM Value	Wash Loss (%)	Crushed Stone (%)	Stone to Sand Ratio		
Top (ft)	Bottom (ft)							Ratio	Stone	Sand
0	5	1		5.62	3.86	7.1	80.2	68:32	68	32
5	8	2		6.27	4.06	5.6	76.2	75:25	75	25
8	13	3		6.05	4.11	2.6	62.1	71:29	71	29
13	18	4		6.90	4.41	2.3	64.4	83:17	83	17
18	23	5		6.75	4.31	1.6	66.7	77:23	77	23
23	28	6		0.49	0.49	54.3	0.0	0:87	0	87
28	33	7		4.22	2.78	28.8	75.2	52:46	52	46
33	38	8		3.09	2.41	41.0	75.6	34:64	34	64
38	43	9		2.64	2.10	50.3	80.3	31:66	31	66
43	48	10		2.98	2.26	48.8	84.3	34:62	34	62
48	53	11		2.89	2.18	47.5	93.1	35:60	35	60
53	58	12		2.62	2.20	33.9	92.9	26:70	26	70
58	63	13		4.43	2.81	32.6	95.7	65:35	65	35

Grain Size Distribution Test Report (ISO 14688-1:2002)

MW21-05

FIGURE D5



Cobble Size	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	Gravel		Sand				

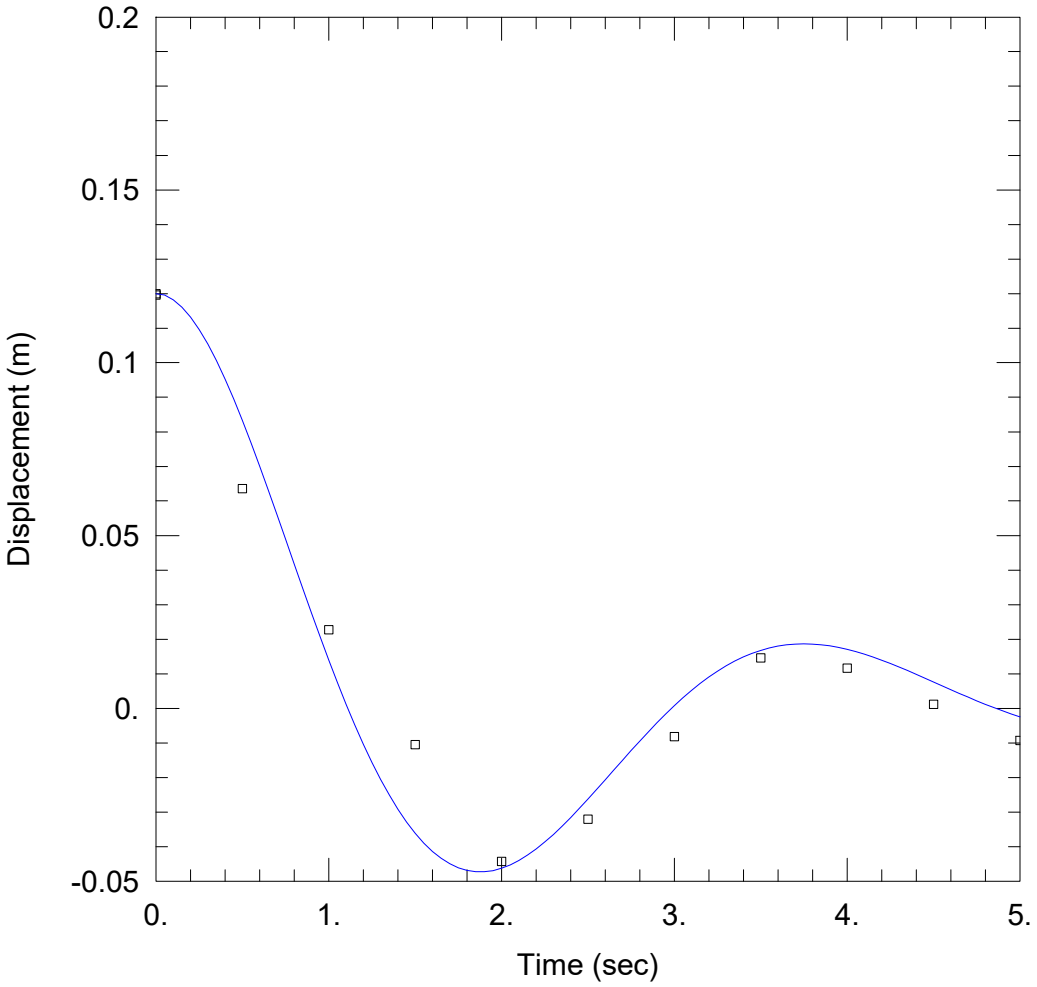
DATE: September 2022

PROJECT: 160961457

Stantec

prepared by: RD

CHK: SMD



MW21--05-RISINGHEAD TEST2

Data Set: \...\MW21-05_risinghead_test 2_DG_JK.aqt
Date: 03/20/25 Time: 10:56:03

PROJECT INFORMATION

Company: Stantec
Client: CBM
Project: 160961457
Location: Ontario
Test Well: MW21-05
Test Date: May 4, 2023

AQUIFER DATA

Saturated Thickness: 5.16 m Anisotropy Ratio (Kz/Kr): 0.5

WELL DATA (MW21-05)

Initial Displacement: 0.12 m
Total Well Penetration Depth: 5.16 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.16 m
Screen Length: 3.05 m
Well Radius: 0.084 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Springer-Gelhar

K = 0.0011 m/sec Le = 3.215 m

Appendix E

Water Quality Analytical Data

Your Project #: 160961457
Your C.O.C. #: 854554-01-01

Attention: Aaron Warkentin

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2021/11/18
Report #: R6907859
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1X2744
Received: 2021/11/11, 10:11

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	4	N/A	2021/11/17	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	4	N/A	2021/11/17	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	4	N/A	2021/11/18	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	4	N/A	2021/11/17	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	4	N/A	2021/11/16	CAM SOP-00446	SM 23 5310 B m
Petroleum Hydro. CCME F1 & BTEX in Water	4	N/A	2021/11/16	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (2)	4	2021/11/16	2021/11/17	CAM SOP-00316	CCME PHC-CWS m
Hardness (calculated as CaCO3)	4	N/A	2021/11/18	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	4	N/A	2021/11/17	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	4	N/A	2021/11/18		
Anion and Cation Sum	4	N/A	2021/11/18		
Total Ammonia-N	4	N/A	2021/11/16	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (3)	4	N/A	2021/11/17	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	4	2021/11/15	2021/11/17	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	4	N/A	2021/11/17	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	4	N/A	2021/11/18		Auto Calc
Sat. pH and Langelier Index (@ 4C)	4	N/A	2021/11/18		Auto Calc
Sulphate by Automated Colourimetry	4	N/A	2021/11/17	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	4	N/A	2021/11/18		Auto Calc

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Your Project #: 160961457
Your C.O.C. #: 854554-01-01

Attention: Aaron Warkentin

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2021/11/18
Report #: R6907859
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1X2744
Received: 2021/11/11, 10:11

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Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
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Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Bureau Veritas Laboratories conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Bureau Veritas
18 Nov 2021 17:26:13

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ronklin Gracian, Project Manager
Email: Ronklin.Gracian@bureauveritas.com
Phone# (905)817-5752

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RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RFC803		RFC804	RFC805			
Sampling Date		2021/11/10 10:30		2021/11/10 12:15	2021/11/10 14:40			
COC Number		854554-01-01		854554-01-01	854554-01-01			
	UNITS	MW21-05 (ANTH)	QC Batch	MW21-04 (ANTH)	MW21-01 (ANTH)	RDL	MDL	QC Batch
Calculated Parameters								
Anion Sum	me/L	7.74	7699718	6.02	5.70	N/A	N/A	7699718
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	290	7699719	220	210	1.0	0.20	7699719
Calculated TDS	mg/L	400	7699722	310	300	1.0	0.20	7699722
Carb. Alkalinity (calc. as CaCO3)	mg/L	3.4	7699719	3.0	2.8	1.0	0.20	7699719
Cation Sum	me/L	7.84	7699718	6.05	5.61	N/A	N/A	7699718
Hardness (CaCO3)	mg/L	350	7699717	280	260	1.0	1.0	7699717
Ion Balance (% Difference)	%	0.690	7699716	0.230	0.750	N/A	N/A	7699716
Langelier Index (@ 20C)	N/A	1.07	7699720	0.891	0.863			7699720
Langelier Index (@ 4C)	N/A	0.823	7699721	0.642	0.614			7699721
Saturation pH (@ 20C)	N/A	7.03	7699720	7.26	7.28			7699720
Saturation pH (@ 4C)	N/A	7.27	7699721	7.51	7.53			7699721
Inorganics								
Total Ammonia-N	mg/L	<0.050	7702408	<0.050	<0.050	0.050	0.0080	7702408
Conductivity	umho/cm	710	7701424	550	520	1.0	0.20	7701424
Dissolved Organic Carbon	mg/L	0.49	7700772	1.6	<0.40	0.40	0.070	7700772
Orthophosphate (P)	mg/L	<0.010	7701916	<0.010	0.019	0.010	0.0050	7701916
pH	pH	8.10	7701418	8.15	8.14			7701418
Dissolved Sulphate (SO4)	mg/L	33	7701922	37	32	1.0	0.10	7701922
Alkalinity (Total as CaCO3)	mg/L	290	7701443	220	210	1.0	0.20	7701443
Dissolved Chloride (Cl-)	mg/L	40	7701919	27	25	1.0	0.30	7701919
Nitrite (N)	mg/L	<0.010	7701041	<0.010	<0.010	0.010	0.0020	7701041
Nitrate (N)	mg/L	1.16	7701041	0.38	1.23	0.10	0.010	7701041
Nitrate + Nitrite (N)	mg/L	1.16	7701041	0.38	1.23	0.10	0.010	7701041
Metals								
Dissolved Aluminum (Al)	mg/L	<0.0049	7703516	<0.0049	<0.0049	0.0049	0.0049	7704461
Dissolved Antimony (Sb)	mg/L	<0.00050	7703516	<0.00050	<0.00050	0.00050	0.00050	7704461
Dissolved Arsenic (As)	mg/L	<0.0010	7703516	<0.0010	<0.0010	0.0010	0.0010	7704461
Dissolved Barium (Ba)	mg/L	0.053	7703516	0.075	0.048	0.0020	0.0020	7704461
Dissolved Beryllium (Be)	mg/L	<0.00040	7703516	<0.00040	<0.00040	0.00040	0.00040	7704461
Dissolved Boron (B)	mg/L	0.013	7703516	0.012	<0.010	0.010	0.010	7704461

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RFC803		RFC804	RFC805			
Sampling Date		2021/11/10 10:30		2021/11/10 12:15	2021/11/10 14:40			
COC Number		854554-01-01		854554-01-01	854554-01-01			
	UNITS	MW21-05 (ANTH)	QC Batch	MW21-04 (ANTH)	MW21-01 (ANTH)	RDL	MDL	QC Batch
Dissolved Cadmium (Cd)	mg/L	0.00017	7703516	<0.000090	<0.000090	0.000090	0.000090	7704461
Dissolved Calcium (Ca)	mg/L	90	7703516	65	64	0.20	0.20	7704461
Dissolved Chromium (Cr)	mg/L	<0.0050	7703516	<0.0050	<0.0050	0.0050	0.0050	7704461
Dissolved Cobalt (Co)	mg/L	<0.00050	7703516	<0.00050	<0.00050	0.00050	0.00050	7704461
Dissolved Copper (Cu)	mg/L	<0.00090	7703516	<0.00090	<0.00090	0.00090	0.00090	7704461
Dissolved Iron (Fe)	mg/L	<0.10	7703516	<0.10	<0.10	0.10	0.050	7704461
Dissolved Lead (Pb)	mg/L	<0.00050	7703516	<0.00050	<0.00050	0.00050	0.00050	7704461
Dissolved Magnesium (Mg)	mg/L	31	7703516	28	23	0.050	0.050	7704461
Dissolved Manganese (Mn)	mg/L	0.0059	7703516	0.017	0.0035	0.0020	0.0020	7704461
Dissolved Molybdenum (Mo)	mg/L	0.0012	7703516	0.0038	0.0013	0.00050	0.00050	7704461
Dissolved Nickel (Ni)	mg/L	<0.0010	7703516	0.0011	<0.0010	0.0010	0.0010	7704461
Dissolved Phosphorus (P)	mg/L	<0.10	7703516	<0.10	<0.10	0.10	0.050	7704461
Dissolved Potassium (K)	mg/L	1.6	7703516	1.5	1.1	0.20	0.20	7704461
Dissolved Selenium (Se)	mg/L	<0.0020	7703516	<0.0020	<0.0020	0.0020	0.0020	7704461
Dissolved Silicon (Si)	mg/L	3.5	7703516	4.1	3.7	0.050	0.050	7704461
Dissolved Silver (Ag)	mg/L	<0.000090	7703516	<0.000090	<0.000090	0.000090	0.000090	7704461
Dissolved Sodium (Na)	mg/L	17	7703516	12	10	0.10	0.10	7704461
Dissolved Strontium (Sr)	mg/L	0.14	7703516	0.10	0.068	0.0010	0.0010	7704461
Dissolved Thallium (Tl)	mg/L	<0.000050	7703516	<0.000050	<0.000050	0.000050	0.000050	7704461
Dissolved Titanium (Ti)	mg/L	<0.0050	7703516	<0.0050	<0.0050	0.0050	0.0050	7704461
Dissolved Uranium (U)	mg/L	0.00032	7703516	0.0014	0.00036	0.00010	0.00010	7704461
Dissolved Vanadium (V)	mg/L	<0.00050	7703516	<0.00050	<0.00050	0.00050	0.00050	7704461
Dissolved Zinc (Zn)	mg/L	0.096	7703516	0.043	0.063	0.0050	0.0050	7704461

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RFC805				RFC806			
Sampling Date		2021/11/10 14:40				2021/11/10 16:50			
COC Number		854554-01-01				854554-01-01			
	UNITS	MW21-01 (ANTH) Lab-Dup	RDL	MDL	QC Batch	MW21-02 (ANTH)	RDL	MDL	QC Batch
Calculated Parameters									
Anion Sum	me/L					6.12	N/A	N/A	7699718
Bicarb. Alkalinity (calc. as CaCO3)	mg/L					240	1.0	0.20	7699719
Calculated TDS	mg/L					320	1.0	0.20	7699722
Carb. Alkalinity (calc. as CaCO3)	mg/L					3.0	1.0	0.20	7699719
Cation Sum	me/L					6.28	N/A	N/A	7699718
Hardness (CaCO3)	mg/L					300	1.0	1.0	7699717
Ion Balance (% Difference)	%					1.29	N/A	N/A	7699716
Langelier Index (@ 20C)	N/A					0.969			7699720
Langelier Index (@ 4C)	N/A					0.720			7699721
Saturation pH (@ 20C)	N/A					7.16			7699720
Saturation pH (@ 4C)	N/A					7.40			7699721
Inorganics									
Total Ammonia-N	mg/L					<0.050	0.050	0.0080	7702408
Conductivity	umho/cm					550	1.0	0.20	7701424
Dissolved Organic Carbon	mg/L					<0.40	0.40	0.070	7700772
Orthophosphate (P)	mg/L	<0.010	0.010	0.0050	7701916	<0.010	0.010	0.0050	7701916
pH	pH					8.12			7701418
Dissolved Sulphate (SO4)	mg/L	32	1.0	0.10	7701922	41	1.0	0.10	7701922
Alkalinity (Total as CaCO3)	mg/L					250	1.0	0.20	7701443
Dissolved Chloride (Cl-)	mg/L	25	1.0	0.30	7701919	13	1.0	0.30	7701919
Nitrite (N)	mg/L					<0.010	0.010	0.0020	7701041
Nitrate (N)	mg/L					<0.10	0.10	0.010	7701041
Nitrate + Nitrite (N)	mg/L					<0.10	0.10	0.010	7701041
Metals									
Dissolved Aluminum (Al)	mg/L					0.0058	0.0049	0.0049	7704461
Dissolved Antimony (Sb)	mg/L					<0.00050	0.00050	0.00050	7704461
Dissolved Arsenic (As)	mg/L					0.0010	0.0010	0.0010	7704461
Dissolved Barium (Ba)	mg/L					0.10	0.0020	0.0020	7704461
Dissolved Beryllium (Be)	mg/L					<0.00040	0.00040	0.00040	7704461

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RFC805				RFC806			
Sampling Date		2021/11/10 14:40				2021/11/10 16:50			
COC Number		854554-01-01				854554-01-01			
	UNITS	MW21-01 (ANTH) Lab-Dup	RDL	MDL	QC Batch	MW21-02 (ANTH)	RDL	MDL	QC Batch
Dissolved Boron (B)	mg/L					<0.010	0.010	0.010	7704461
Dissolved Cadmium (Cd)	mg/L					<0.000090	0.000090	0.000090	7704461
Dissolved Calcium (Ca)	mg/L					76	0.20	0.20	7704461
Dissolved Chromium (Cr)	mg/L					<0.0050	0.0050	0.0050	7704461
Dissolved Cobalt (Co)	mg/L					<0.00050	0.00050	0.00050	7704461
Dissolved Copper (Cu)	mg/L					<0.00090	0.00090	0.00090	7704461
Dissolved Iron (Fe)	mg/L					0.30	0.10	0.050	7704461
Dissolved Lead (Pb)	mg/L					<0.00050	0.00050	0.00050	7704461
Dissolved Magnesium (Mg)	mg/L					28	0.050	0.050	7704461
Dissolved Manganese (Mn)	mg/L					0.076	0.0020	0.0020	7704461
Dissolved Molybdenum (Mo)	mg/L					0.0024	0.00050	0.00050	7704461
Dissolved Nickel (Ni)	mg/L					<0.0010	0.0010	0.0010	7704461
Dissolved Phosphorus (P)	mg/L					<0.10	0.10	0.050	7704461
Dissolved Potassium (K)	mg/L					1.0	0.20	0.20	7704461
Dissolved Selenium (Se)	mg/L					<0.0020	0.0020	0.0020	7704461
Dissolved Silicon (Si)	mg/L					6.6	0.050	0.050	7704461
Dissolved Silver (Ag)	mg/L					<0.000090	0.000090	0.000090	7704461
Dissolved Sodium (Na)	mg/L					3.7	0.10	0.10	7704461
Dissolved Strontium (Sr)	mg/L					0.10	0.0010	0.0010	7704461
Dissolved Thallium (Tl)	mg/L					<0.000050	0.000050	0.000050	7704461
Dissolved Titanium (Ti)	mg/L					<0.0050	0.0050	0.0050	7704461
Dissolved Uranium (U)	mg/L					0.00080	0.00010	0.00010	7704461
Dissolved Vanadium (V)	mg/L					<0.00050	0.00050	0.00050	7704461
Dissolved Zinc (Zn)	mg/L					0.0069	0.0050	0.0050	7704461

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RFC806			
Sampling Date		2021/11/10 16:50			
COC Number		854554-01-01			
	UNITS	**MW21-02 (ANTH) Lab-Dup**	**RDL**	**MDL**	**QC Batch**
Inorganics					
Conductivity	umho/cm	550	1.0	0.20	7701424
pH	pH	8.14			7701418
Alkalinity (Total as CaCO3)	mg/L	250	1.0	0.20	7701443

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 PHCS, BTEX/F1-F4 (WATER)

Bureau Veritas ID		RFC803	RFC804	RFC805	RFC806			
Sampling Date		2021/11/10 10:30	2021/11/10 12:15	2021/11/10 14:40	2021/11/10 16:50			
COC Number		854554-01-01	854554-01-01	854554-01-01	854554-01-01			
	UNITS	MW21-05 (ANTH)	MW21-04 (ANTH)	MW21-01 (ANTH)	MW21-02 (ANTH)	RDL	MDL	QC Batch
BTEX & F1 Hydrocarbons								
Benzene	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	0.040	7704420
Toluene	ug/L	<0.20	0.22	<0.20	<0.20	0.20	0.040	7704420
Ethylbenzene	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	0.040	7704420
o-Xylene	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	0.040	7704420
p+m-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	0.080	7704420
Total Xylenes	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	0.080	7704420
F1 (C6-C10)	ug/L	<25	<25	<25	<25	25	20	7704420
F1 (C6-C10) - BTEX	ug/L	<25	<25	<25	<25	25	20	7704420
F2-F4 Hydrocarbons								
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	<100	<100	100	50	7703732
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	<200	<200	200	70	7703732
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	<200	<200	200	50	7703732
Reached Baseline at C50	ug/L	Yes	Yes	Yes	Yes			7703732
Surrogate Recovery (%)								
1,4-Difluorobenzene	%	98	98	97	99			7704420
4-Bromofluorobenzene	%	84	83	82	79			7704420
D10-o-Xylene	%	95	97	95	95			7704420
D4-1,2-Dichloroethane	%	110	109	110	110			7704420
o-Terphenyl	%	102	100	101	100			7703732

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

TEST SUMMARY

Bureau Veritas ID: RFC803
Sample ID: MW21-05 (ANTH)
Matrix: Water

Collected: 2021/11/10
Shipped:
Received: 2021/11/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7701443	N/A	2021/11/17	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7699719	N/A	2021/11/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	7701919	N/A	2021/11/18	Avneet Kour Sudan
Conductivity	AT	7701424	N/A	2021/11/17	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7700772	N/A	2021/11/16	Julianna Castiglione
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7704420	N/A	2021/11/16	Joe Paino
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7703732	2021/11/16	2021/11/17	Dennis Ngondu
Hardness (calculated as CaCO3)		7699717	N/A	2021/11/18	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7703516	N/A	2021/11/17	Nan Raykha
Ion Balance (% Difference)	CALC	7699716	N/A	2021/11/18	Automated Statchk
Anion and Cation Sum	CALC	7699718	N/A	2021/11/18	Automated Statchk
Total Ammonia-N	LACH/NH4	7702408	N/A	2021/11/16	Viorica Rotaru
Nitrate & Nitrite as Nitrogen in Water	LACH	7701041	N/A	2021/11/17	Chandra Nandlal
pH	AT	7701418	2021/11/15	2021/11/17	Surinder Rai
Orthophosphate	KONE	7701916	N/A	2021/11/17	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7699720	N/A	2021/11/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7699721	N/A	2021/11/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7701922	N/A	2021/11/17	Avneet Kour Sudan
Total Dissolved Solids (TDS calc)	CALC	7699722	N/A	2021/11/18	Automated Statchk

Bureau Veritas ID: RFC804
Sample ID: MW21-04 (ANTH)
Matrix: Water

Collected: 2021/11/10
Shipped:
Received: 2021/11/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7701443	N/A	2021/11/17	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7699719	N/A	2021/11/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	7701919	N/A	2021/11/18	Avneet Kour Sudan
Conductivity	AT	7701424	N/A	2021/11/17	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7700772	N/A	2021/11/16	Julianna Castiglione
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7704420	N/A	2021/11/16	Joe Paino
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7703732	2021/11/16	2021/11/17	Dennis Ngondu
Hardness (calculated as CaCO3)		7699717	N/A	2021/11/18	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7704461	N/A	2021/11/17	Nan Raykha
Ion Balance (% Difference)	CALC	7699716	N/A	2021/11/18	Automated Statchk
Anion and Cation Sum	CALC	7699718	N/A	2021/11/18	Automated Statchk
Total Ammonia-N	LACH/NH4	7702408	N/A	2021/11/16	Viorica Rotaru
Nitrate & Nitrite as Nitrogen in Water	LACH	7701041	N/A	2021/11/17	Chandra Nandlal
pH	AT	7701418	2021/11/15	2021/11/17	Surinder Rai
Orthophosphate	KONE	7701916	N/A	2021/11/17	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7699720	N/A	2021/11/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7699721	N/A	2021/11/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7701922	N/A	2021/11/17	Avneet Kour Sudan
Total Dissolved Solids (TDS calc)	CALC	7699722	N/A	2021/11/18	Automated Statchk

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

TEST SUMMARY

Bureau Veritas ID: RFC805 **Collected:** 2021/11/10
Sample ID: MW21-01 (ANTH) **Shipped:**
Matrix: Water **Received:** 2021/11/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7701443	N/A	2021/11/17	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7699719	N/A	2021/11/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	7701919	N/A	2021/11/18	Avneet Kour Sudan
Conductivity	AT	7701424	N/A	2021/11/17	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7700772	N/A	2021/11/16	Julianna Castiglione
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7704420	N/A	2021/11/16	Joe Paino
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7703732	2021/11/16	2021/11/17	Dennis Ngondu
Hardness (calculated as CaCO3)		7699717	N/A	2021/11/18	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7704461	N/A	2021/11/17	Nan Raykha
Ion Balance (% Difference)	CALC	7699716	N/A	2021/11/18	Automated Statchk
Anion and Cation Sum	CALC	7699718	N/A	2021/11/18	Automated Statchk
Total Ammonia-N	LACH/NH4	7702408	N/A	2021/11/16	Viorica Rotaru
Nitrate & Nitrite as Nitrogen in Water	LACH	7701041	N/A	2021/11/17	Chandra Nandlal
pH	AT	7701418	2021/11/15	2021/11/17	Surinder Rai
Orthophosphate	KONE	7701916	N/A	2021/11/17	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7699720	N/A	2021/11/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7699721	N/A	2021/11/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7701922	N/A	2021/11/17	Avneet Kour Sudan
Total Dissolved Solids (TDS calc)	CALC	7699722	N/A	2021/11/18	Automated Statchk

Bureau Veritas ID: RFC805 Dup **Collected:** 2021/11/10
Sample ID: MW21-01 (ANTH) **Shipped:**
Matrix: Water **Received:** 2021/11/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	7701919	N/A	2021/11/18	Avneet Kour Sudan
Orthophosphate	KONE	7701916	N/A	2021/11/17	Avneet Kour Sudan
Sulphate by Automated Colourimetry	KONE	7701922	N/A	2021/11/17	Avneet Kour Sudan

Bureau Veritas ID: RFC806 **Collected:** 2021/11/10
Sample ID: MW21-02 (ANTH) **Shipped:**
Matrix: Water **Received:** 2021/11/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7701443	N/A	2021/11/17	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7699719	N/A	2021/11/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	7701919	N/A	2021/11/18	Avneet Kour Sudan
Conductivity	AT	7701424	N/A	2021/11/17	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7700772	N/A	2021/11/16	Julianna Castiglione
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7704420	N/A	2021/11/16	Joe Paino
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7703732	2021/11/16	2021/11/17	Dennis Ngondu
Hardness (calculated as CaCO3)		7699717	N/A	2021/11/18	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7704461	N/A	2021/11/17	Nan Raykha
Ion Balance (% Difference)	CALC	7699716	N/A	2021/11/18	Automated Statchk
Anion and Cation Sum	CALC	7699718	N/A	2021/11/18	Automated Statchk

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1X2744
Report Date: 2021/11/18

Stantec Consulting Ltd
Client Project #: 160961457
Sampler Initials: RB

TEST SUMMARY

Bureau Veritas ID: RFC806
Sample ID: MW21-02 (ANTH)
Matrix: Water

Collected: 2021/11/10
Shipped:
Received: 2021/11/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Ammonia-N	LACH/NH4	7702408	N/A	2021/11/16	Viorica Rotaru
Nitrate & Nitrite as Nitrogen in Water	LACH	7701041	N/A	2021/11/17	Chandra Nandlal
pH	AT	7701418	2021/11/15	2021/11/17	Surinder Rai
Orthophosphate	KONE	7701916	N/A	2021/11/17	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7699720	N/A	2021/11/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7699721	N/A	2021/11/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7701922	N/A	2021/11/17	Avneet Kour Sudan
Total Dissolved Solids (TDS calc)	CALC	7699722	N/A	2021/11/18	Automated Statchk

Bureau Veritas ID: RFC806 Dup
Sample ID: MW21-02 (ANTH)
Matrix: Water

Collected: 2021/11/10
Shipped:
Received: 2021/11/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7701443	N/A	2021/11/17	Surinder Rai
Conductivity	AT	7701424	N/A	2021/11/17	Surinder Rai
pH	AT	7701418	2021/11/15	2021/11/17	Surinder Rai

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	0.3°C

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7703732	o-Terphenyl	2021/11/16	102	60 - 130	104	60 - 130	103	%		
7704420	1,4-Difluorobenzene	2021/11/16	96	70 - 130	98	70 - 130	97	%		
7704420	4-Bromofluorobenzene	2021/11/16	105	70 - 130	104	70 - 130	81	%		
7704420	D10-o-Xylene	2021/11/16	84	70 - 130	89	70 - 130	92	%		
7704420	D4-1,2-Dichloroethane	2021/11/16	102	70 - 130	102	70 - 130	108	%		
7700772	Dissolved Organic Carbon	2021/11/16	90	80 - 120	94	80 - 120	<0.40	mg/L	3.3	20
7701041	Nitrate (N)	2021/11/17	98	80 - 120	97	80 - 120	<0.10	mg/L	NC	20
7701041	Nitrite (N)	2021/11/17	107	80 - 120	107	80 - 120	<0.010	mg/L	NC	20
7701418	pH	2021/11/17			102	98 - 103			0.20	N/A
7701424	Conductivity	2021/11/17			98	85 - 115	<1.0	umho/cm	0.89	25
7701443	Alkalinity (Total as CaCO3)	2021/11/17			97	85 - 115	<1.0	mg/L	0.60	20
7701916	Orthophosphate (P)	2021/11/17	119	75 - 125	101	80 - 120	<0.010	mg/L	NC	25
7701919	Dissolved Chloride (Cl-)	2021/11/18	NC	80 - 120	103	80 - 120	<1.0	mg/L	0.15	20
7701922	Dissolved Sulphate (SO4)	2021/11/17	NC	75 - 125	103	80 - 120	<1.0	mg/L	1.6	20
7702408	Total Ammonia-N	2021/11/16	98	75 - 125	100	80 - 120	<0.050	mg/L	NC	20
7703516	Dissolved Aluminum (Al)	2021/11/17	106	80 - 120	108	80 - 120	<0.0049	mg/L	NC	20
7703516	Dissolved Antimony (Sb)	2021/11/17	101	80 - 120	101	80 - 120	<0.00050	mg/L		
7703516	Dissolved Arsenic (As)	2021/11/17	97	80 - 120	97	80 - 120	<0.0010	mg/L		
7703516	Dissolved Barium (Ba)	2021/11/17	98	80 - 120	103	80 - 120	<0.0020	mg/L		
7703516	Dissolved Beryllium (Be)	2021/11/17	102	80 - 120	104	80 - 120	<0.00040	mg/L		
7703516	Dissolved Boron (B)	2021/11/17	99	80 - 120	98	80 - 120	<0.010	mg/L		
7703516	Dissolved Cadmium (Cd)	2021/11/17	98	80 - 120	99	80 - 120	<0.000090	mg/L		
7703516	Dissolved Calcium (Ca)	2021/11/17	103	80 - 120	105	80 - 120	<0.20	mg/L	NC	20
7703516	Dissolved Chromium (Cr)	2021/11/17	94	80 - 120	95	80 - 120	<0.0050	mg/L		
7703516	Dissolved Cobalt (Co)	2021/11/17	95	80 - 120	95	80 - 120	<0.00050	mg/L		
7703516	Dissolved Copper (Cu)	2021/11/17	99	80 - 120	100	80 - 120	<0.00090	mg/L		
7703516	Dissolved Iron (Fe)	2021/11/17	97	80 - 120	97	80 - 120	<0.10	mg/L		
7703516	Dissolved Lead (Pb)	2021/11/17	91	80 - 120	94	80 - 120	<0.00050	mg/L		
7703516	Dissolved Magnesium (Mg)	2021/11/17	99	80 - 120	99	80 - 120	<0.050	mg/L	NC	20
7703516	Dissolved Manganese (Mn)	2021/11/17	99	80 - 120	98	80 - 120	<0.0020	mg/L		
7703516	Dissolved Molybdenum (Mo)	2021/11/17	103	80 - 120	103	80 - 120	<0.00050	mg/L		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7703516	Dissolved Nickel (Ni)	2021/11/17	92	80 - 120	93	80 - 120	<0.0010	mg/L		
7703516	Dissolved Phosphorus (P)	2021/11/17	106	80 - 120	124 (1)	80 - 120	<0.10	mg/L		
7703516	Dissolved Potassium (K)	2021/11/17	103	80 - 120	104	80 - 120	<0.20	mg/L		
7703516	Dissolved Selenium (Se)	2021/11/17	98	80 - 120	99	80 - 120	<0.0020	mg/L		
7703516	Dissolved Silicon (Si)	2021/11/17	103	80 - 120	105	80 - 120	<0.050	mg/L		
7703516	Dissolved Silver (Ag)	2021/11/17	99	80 - 120	99	80 - 120	<0.000090	mg/L		
7703516	Dissolved Sodium (Na)	2021/11/17	98	80 - 120	99	80 - 120	<0.10	mg/L		
7703516	Dissolved Strontium (Sr)	2021/11/17	96	80 - 120	95	80 - 120	<0.0010	mg/L		
7703516	Dissolved Thallium (Tl)	2021/11/17	91	80 - 120	94	80 - 120	<0.000050	mg/L		
7703516	Dissolved Titanium (Ti)	2021/11/17	98	80 - 120	98	80 - 120	<0.0050	mg/L		
7703516	Dissolved Uranium (U)	2021/11/17	89	80 - 120	90	80 - 120	<0.00010	mg/L		
7703516	Dissolved Vanadium (V)	2021/11/17	96	80 - 120	98	80 - 120	<0.00050	mg/L		
7703516	Dissolved Zinc (Zn)	2021/11/17	97	80 - 120	95	80 - 120	<0.0050	mg/L		
7703732	F2 (C10-C16 Hydrocarbons)	2021/11/17	104	60 - 130	109	60 - 130	<100	ug/L	NC	30
7703732	F3 (C16-C34 Hydrocarbons)	2021/11/17	107	60 - 130	113	60 - 130	<200	ug/L	NC	30
7703732	F4 (C34-C50 Hydrocarbons)	2021/11/17	107	60 - 130	111	60 - 130	<200	ug/L	NC	30
7704420	Benzene	2021/11/16	101	50 - 140	105	50 - 140	<0.20	ug/L	NC	30
7704420	Ethylbenzene	2021/11/16	107	50 - 140	111	50 - 140	<0.20	ug/L	NC	30
7704420	F1 (C6-C10) - BTEX	2021/11/16					<25	ug/L	NC	30
7704420	F1 (C6-C10)	2021/11/16	91	60 - 140	94	60 - 140	<25	ug/L	NC	30
7704420	o-Xylene	2021/11/16	104	50 - 140	107	50 - 140	<0.20	ug/L	NC	30
7704420	p+m-Xylene	2021/11/16	110	50 - 140	112	50 - 140	<0.40	ug/L	NC	30
7704420	Toluene	2021/11/16	98	50 - 140	102	50 - 140	<0.20	ug/L	NC	30
7704420	Total Xylenes	2021/11/16					<0.40	ug/L	NC	30
7704461	Dissolved Aluminum (Al)	2021/11/17	106	80 - 120	105	80 - 120	<0.0049	mg/L		
7704461	Dissolved Antimony (Sb)	2021/11/17	105	80 - 120	102	80 - 120	<0.00050	mg/L	NC	20
7704461	Dissolved Arsenic (As)	2021/11/17	99	80 - 120	98	80 - 120	<0.0010	mg/L	0.20	20
7704461	Dissolved Barium (Ba)	2021/11/17	100	80 - 120	100	80 - 120	<0.0020	mg/L	0.16	20
7704461	Dissolved Beryllium (Be)	2021/11/17	102	80 - 120	102	80 - 120	<0.00040	mg/L	NC	20
7704461	Dissolved Boron (B)	2021/11/17	96	80 - 120	101	80 - 120	<0.010	mg/L	0.18	20
7704461	Dissolved Cadmium (Cd)	2021/11/17	101	80 - 120	99	80 - 120	<0.000090	mg/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7704461	Dissolved Calcium (Ca)	2021/11/17	NC	80 - 120	103	80 - 120	<0.20	mg/L		
7704461	Dissolved Chromium (Cr)	2021/11/17	96	80 - 120	94	80 - 120	<0.0050	mg/L	NC	20
7704461	Dissolved Cobalt (Co)	2021/11/17	95	80 - 120	94	80 - 120	<0.00050	mg/L	NC	20
7704461	Dissolved Copper (Cu)	2021/11/17	103	80 - 120	100	80 - 120	<0.00090	mg/L	NC	20
7704461	Dissolved Iron (Fe)	2021/11/17	98	80 - 120	97	80 - 120	<0.10	mg/L		
7704461	Dissolved Lead (Pb)	2021/11/17	93	80 - 120	94	80 - 120	<0.00050	mg/L	NC	20
7704461	Dissolved Magnesium (Mg)	2021/11/17	NC	80 - 120	98	80 - 120	<0.050	mg/L		
7704461	Dissolved Manganese (Mn)	2021/11/17	100	80 - 120	99	80 - 120	<0.0020	mg/L		
7704461	Dissolved Molybdenum (Mo)	2021/11/17	107	80 - 120	104	80 - 120	<0.00050	mg/L	2.1	20
7704461	Dissolved Nickel (Ni)	2021/11/17	93	80 - 120	93	80 - 120	<0.0010	mg/L	NC	20
7704461	Dissolved Phosphorus (P)	2021/11/17	107	80 - 120	120	80 - 120	<0.10	mg/L		
7704461	Dissolved Potassium (K)	2021/11/17	103	80 - 120	101	80 - 120	<0.20	mg/L		
7704461	Dissolved Selenium (Se)	2021/11/17	100	80 - 120	99	80 - 120	<0.0020	mg/L	NC	20
7704461	Dissolved Silicon (Si)	2021/11/17	105	80 - 120	103	80 - 120	<0.050	mg/L		
7704461	Dissolved Silver (Ag)	2021/11/17	93	80 - 120	101	80 - 120	<0.000090	mg/L	NC	20
7704461	Dissolved Sodium (Na)	2021/11/17	NC	80 - 120	97	80 - 120	<0.10	mg/L	0.71	20
7704461	Dissolved Strontium (Sr)	2021/11/17	NC	80 - 120	96	80 - 120	<0.0010	mg/L		
7704461	Dissolved Thallium (Tl)	2021/11/17	93	80 - 120	95	80 - 120	<0.000050	mg/L	NC	20
7704461	Dissolved Titanium (Ti)	2021/11/17	100	80 - 120	99	80 - 120	<0.0050	mg/L		
7704461	Dissolved Uranium (U)	2021/11/17	91	80 - 120	93	80 - 120	<0.00010	mg/L	5.9	20
7704461	Dissolved Vanadium (V)	2021/11/17	98	80 - 120	96	80 - 120	<0.00050	mg/L	NC	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7704461	Dissolved Zinc (Zn)	2021/11/17	96	80 - 120	95	80 - 120	<0.0050	mg/L	NC	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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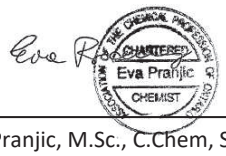
Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Bureau Veritas Laboratories
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel (905) 817-5700 Toll-free 800-563-6266 Fax (905) 817-577/ www.bvna.com

STANTEC CHAIN

Page 1 of 1

11-Nov-21 10:11
Ronklin Gracian
C1X2744
SDT ENV 1436
C#854554-01-01

INVOICE INFORMATION:		REPORT INFORMATION(if differs from invoice):		PROJECT INFORMATION:	
Company Name:	#9197 Stantec Consulting Ltd	Company Name:		Quotation #:	C01624
Contact Name:	Accounts Payable	Contact Name:	Aaron Warkentin	Task #:	
Address:	300 Hagey Blvd Suite 100 Waterloo ON N2L 0A4	Address:		Project #:	160961457
				Profit Centre:	1609
Phone:	(519) 579-4410 Fax: (519) 579-6733	Phone:	(519) 575-4129 Fax: (519) 579-4239	Site #:	
Email:	SAPinvoices@Stantec.com	Email:	Aaron.Warkentin@stantec.com	Sampled By:	Rachel Baker

Order #: 154
Manager: Ronklin Gracian

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)
- ☐ Table 1 ☐ Res/Park ☐ Medium/Fine
- ☐ Table 2 ☐ Ind/Comm ☐ Coarse
- ☐ Table 3 ☐ Agri/Other ☐ For RSC
- ☐ Table ___

Other Regulations
- ☐ CCME ☐ Sanitary Sewer Bylaw
- ☐ Reg 558 ☐ Storm Sewer Bylaw
- ☐ MISA Municipality ___
- ☐ PWQO ☐ Reg 406 Table ___
- ☒ Other ODWS

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ___

Turnaround Time (TAT) Required
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): (Metals) / Hg / Cr VI	ANALYSIS REQUESTED (PLEASE BE SPECIFIC): RCAp - Comprehensive	O Reg 153 PHCs, BTEX/F1-F4	# of Bottles	Comments
1		MW21-05(ANTH)	Nov 10	10:30		Y	✓	✓	8	Dissolved metals, field filtered
2		MW21-04 (ANTH)	Nov 10	12:15		Y	✓	✓	8	"
3		MW21-01 (ANTH)	Nov 10	14:40		Y	✓	✓	8	"
4		MW21-02 (ANTH)	Nov 10	16:50		Y	✓	✓	8	"
5										
6										
7										
8										
9										
10										

REC'D IN WATERLOO

[redacted] ture/Print)	Date: (YY/MM/DD)	Time	[redacted] (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
	21/11/11	10:10	Sarah Webster	2021/11/11	10:11	
				21/11/11	14:55	

Laboratory Use Only
Time Sensitive | Temperature (°C) on Rece: 0/0/1 | Custody Seal Present / Intact: Yes / No

* UNDER ... ING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

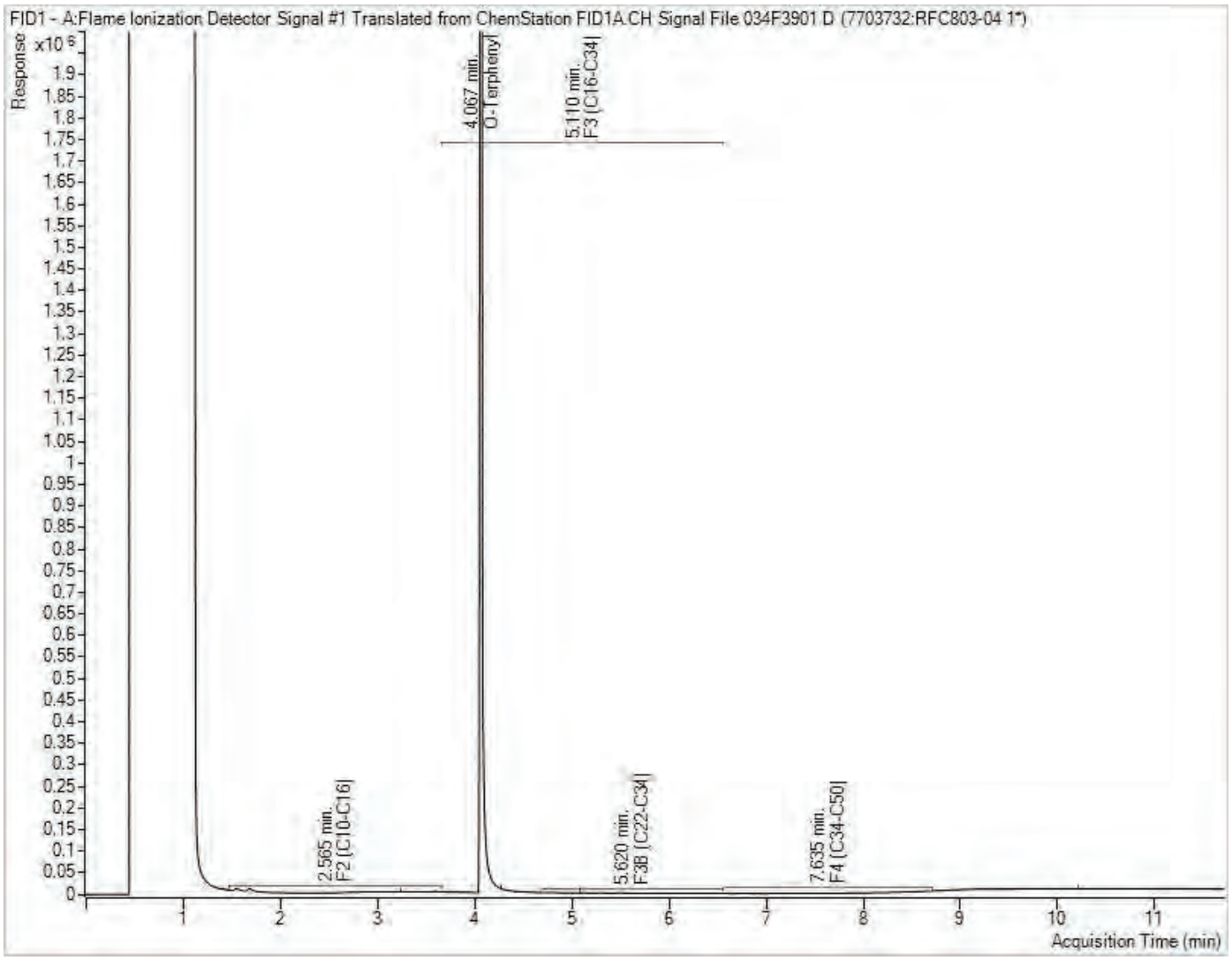
White: Bureau Veritas Yellow: Client

ON ICE.

Bureau Veritas Canada (2019) Inc.

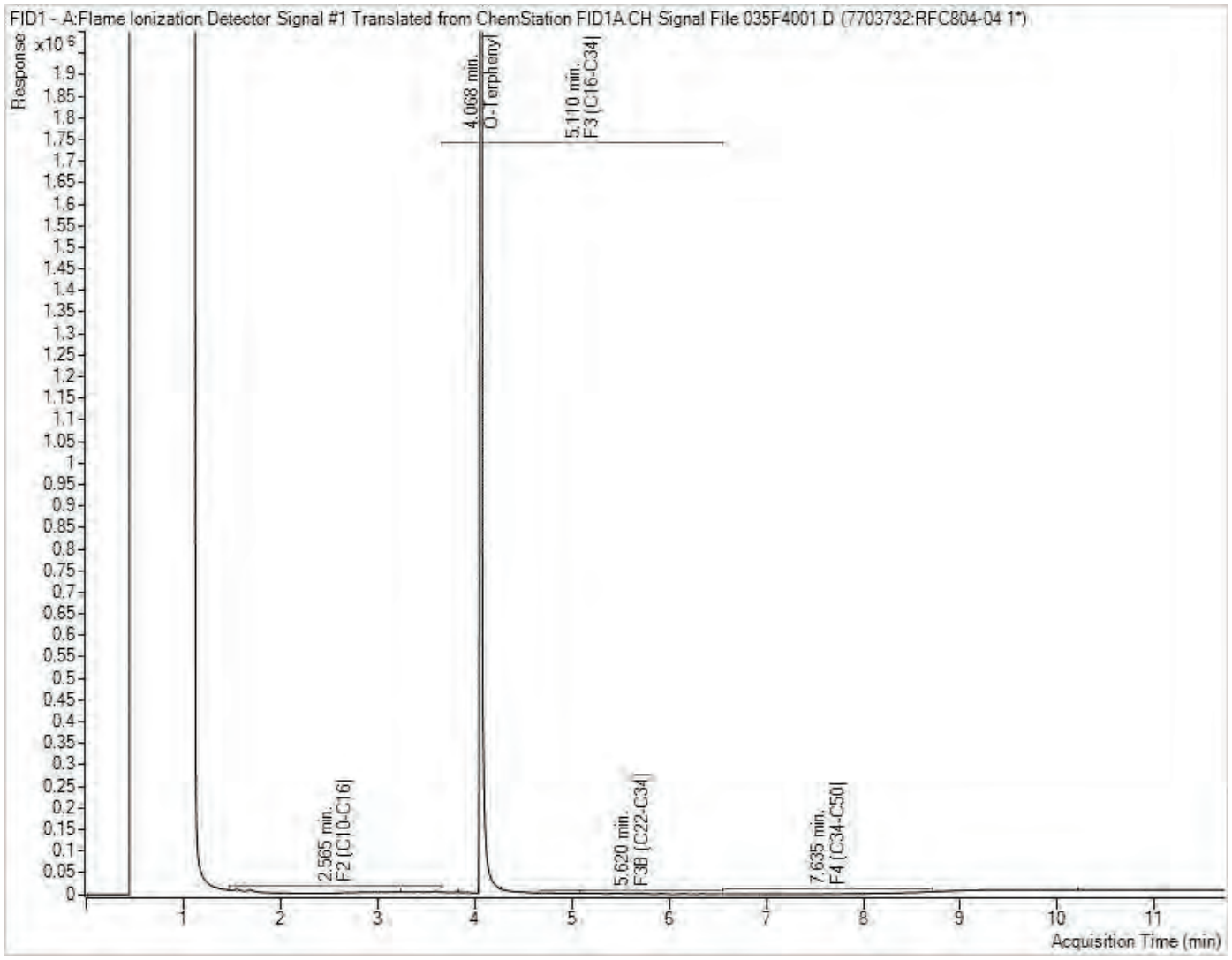
420455 0/0/3

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



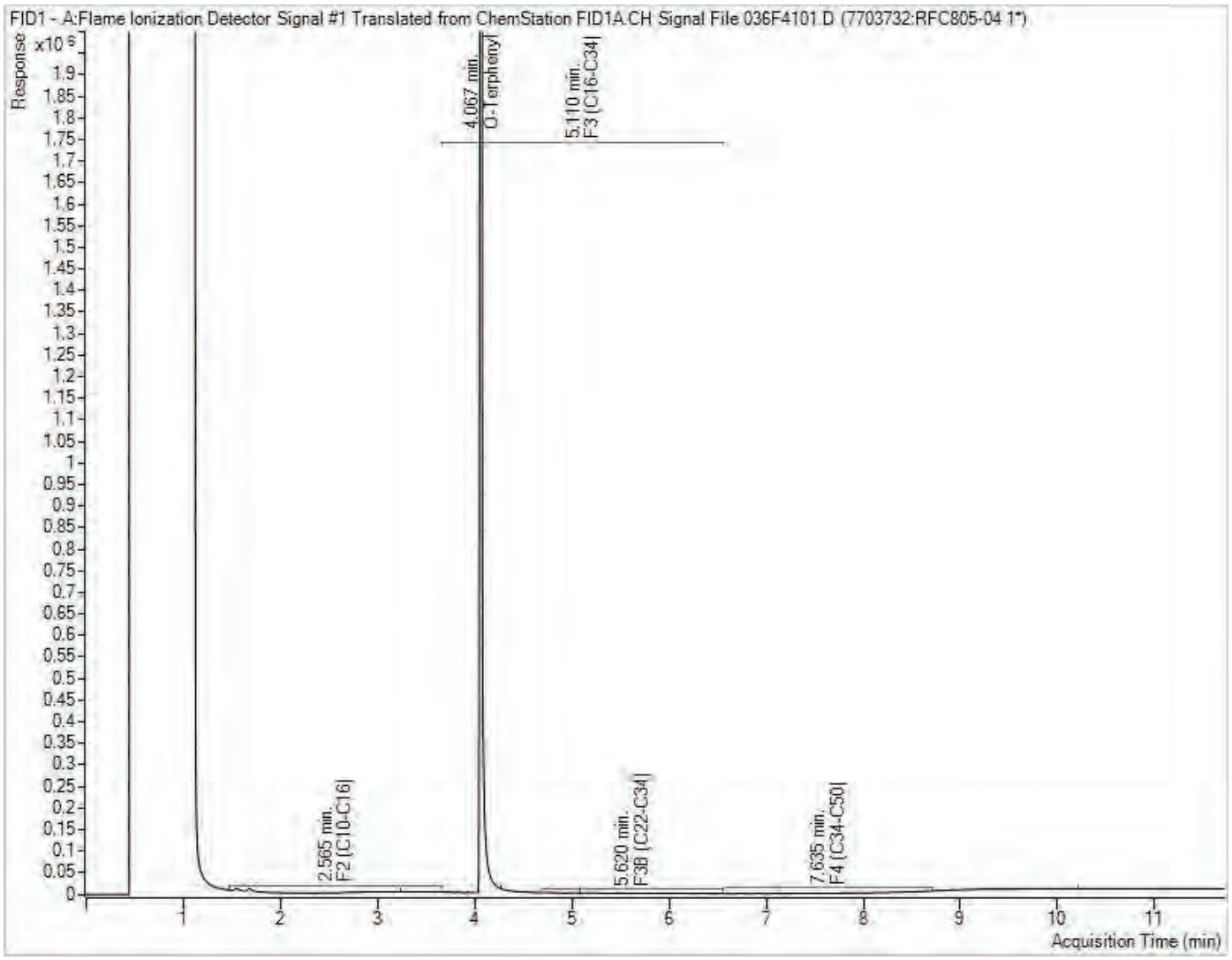
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



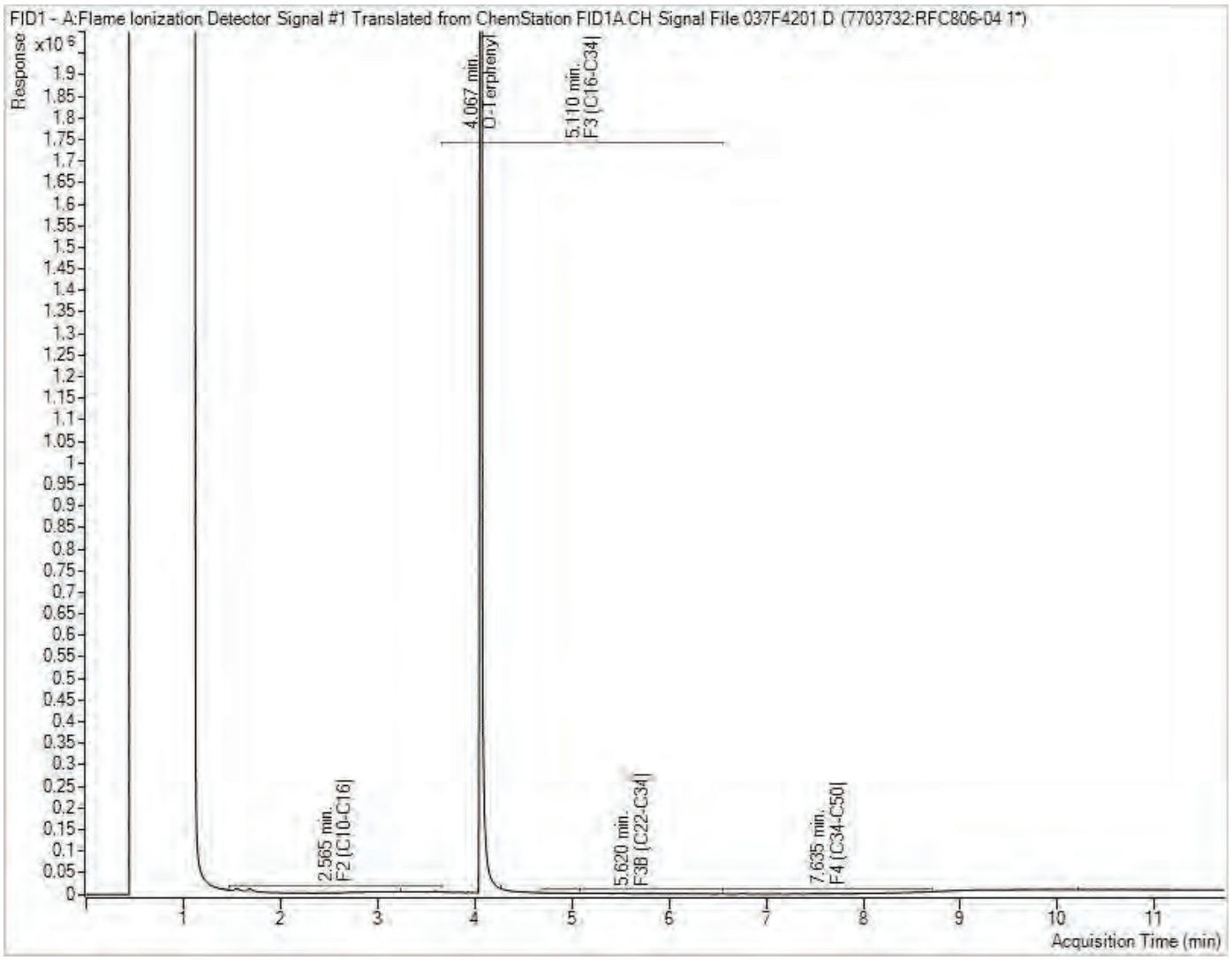
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 160961457
Your C.O.C. #: 854554-02-01

Attention: Aaron Warkentin

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2021/12/10
Report #: R6914261
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1X4546
Received: 2021/11/12, 16:05

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	2	N/A	2021/11/16	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	2	N/A	2021/11/17	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	2	N/A	2021/11/17	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	2	N/A	2021/11/16	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	2	N/A	2021/11/16	CAM SOP-00446	SM 23 5310 B m
Petroleum Hydro. CCME F1 & BTEX in Water	2	N/A	2021/11/17	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (2)	2	2021/11/17	2021/11/17	CAM SOP-00316	CCME PHC-CWS m
Hardness (calculated as CaCO3)	2	N/A	2021/12/08	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	2	N/A	2021/11/18	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	2	N/A	2021/12/08		
Anion and Cation Sum	2	N/A	2021/12/08		
Total Ammonia-N	2	N/A	2021/11/16	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (3)	2	N/A	2021/11/17	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	2	2021/11/16	2021/11/16	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	2	N/A	2021/11/17	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	2	N/A	2021/12/08		Auto Calc
Sat. pH and Langelier Index (@ 4C)	2	N/A	2021/12/08		Auto Calc
Sulphate by Automated Colourimetry	2	N/A	2021/11/17	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	2	N/A	2021/12/08		Auto Calc

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Your Project #: 160961457
Your C.O.C. #: 854554-02-01

Attention: Aaron Warkentin

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2021/12/10
Report #: R6914261
Version: 2 - Final

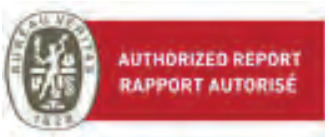
CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1X4546
Received: 2021/11/12, 16:05

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Bureau Veritas Laboratories conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key



Bureau Veritas
10 Dec 2021 13:12:03

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ronklin Gracian, Project Manager
Email: Ronklin.Gracian@bureauveritas.com
Phone# (905)817-5752

==========

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas Job #: C1X4546
Report Date: 2021/12/10

Stantec Consulting Ltd
Client Project #: 160961457
Sampler Initials: RD

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RFM446				RFM447			
Sampling Date		2021/11/12 13:40				2021/11/12 13:40			
COC Number		854554-02-01				854554-02-01			
	UNITS	MW21-03	RDL	MDL	QC Batch	FIELD DUPLICATE 1	RDL	MDL	QC Batch
Calculated Parameters									
Anion Sum	me/L	5.86	N/A	N/A	7699109	5.82	N/A	N/A	7699109
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	210	1.0	0.20	7699110	210	1.0	0.20	7699110
Calculated TDS	mg/L	310	1.0	0.20	7699113	310	1.0	0.20	7699113
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.8	1.0	0.20	7699110	1.9	1.0	0.20	7699110
Cation Sum	me/L	5.80	N/A	N/A	7699109	5.78	N/A	N/A	7699109
Hardness (CaCO3)	mg/L	260	1.0	1.0	7699066	260	1.0	1.0	7699066
Ion Balance (% Difference)	%	0.540	N/A	N/A	7699067	0.400	N/A	N/A	7699067
Langelier Index (@ 20C)	N/A	0.679			7699111	0.700			7699111
Langelier Index (@ 4C)	N/A	0.430			7699112	0.451			7699112
Saturation pH (@ 20C)	N/A	7.28			7699111	7.28			7699111
Saturation pH (@ 4C)	N/A	7.53			7699112	7.53			7699112
Inorganics									
Total Ammonia-N	mg/L	0.11	0.050	0.0080	7701514	0.083	0.050	0.0080	7701514
Conductivity	umho/cm	520	1.0	0.20	7703068	520	1.0	0.20	7703068
Dissolved Organic Carbon	mg/L	5.0	0.40	0.070	7701390	5.0	0.40	0.070	7701764
Orthophosphate (P)	mg/L	<0.020	0.020	0.010	7704598	<0.010	0.010	0.0050	7704598
pH	pH	7.96			7703073	7.98			7703073
Dissolved Sulphate (SO4)	mg/L	39	1.0	0.10	7704594	39	1.0	0.10	7704594
Alkalinity (Total as CaCO3)	mg/L	220	1.0	0.20	7703049	210	1.0	0.20	7703049
Dissolved Chloride (Cl-)	mg/L	26	1.0	0.30	7704589	26	1.0	0.30	7704589
Nitrite (N)	mg/L	<0.010	0.010	0.0020	7703282	<0.010	0.010	0.0020	7703282
Nitrate (N)	mg/L	<0.10	0.10	0.010	7703282	<0.10	0.10	0.010	7703282
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	0.010	7703282	<0.10	0.10	0.010	7703282
Metals									
Dissolved Aluminum (Al)	mg/L	<0.0049	0.0049	0.0049	7703706	<0.0049	0.0049	0.0049	7703706
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	0.00050	7703706	<0.00050	0.00050	0.00050	7703706
Dissolved Arsenic (As)	mg/L	<0.0010	0.0010	0.0010	7703706	<0.0010	0.0010	0.0010	7703706
Dissolved Barium (Ba)	mg/L	0.088	0.0020	0.0020	7703706	0.089	0.0020	0.0020	7703706
Dissolved Beryllium (Be)	mg/L	<0.00040	0.00040	0.00040	7703706	<0.00040	0.00040	0.00040	7703706
Dissolved Boron (B)	mg/L	0.013	0.010	0.010	7703706	0.013	0.010	0.010	7703706

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1X4546
Report Date: 2021/12/10

Stantec Consulting Ltd
Client Project #: 160961457
Sampler Initials: RD

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RFM446				RFM447			
Sampling Date		2021/11/12 13:40				2021/11/12 13:40			
COC Number		854554-02-01				854554-02-01			
	UNITS	MW21-03	RDL	MDL	QC Batch	FIELD DUPLICATE 1	RDL	MDL	QC Batch
Dissolved Cadmium (Cd)	mg/L	<0.000090	0.000090	0.000090	7703706	<0.000090	0.000090	0.000090	7703706
Dissolved Calcium (Ca)	mg/L	65	0.20	0.20	7703706	64	0.20	0.20	7703706
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	0.0050	7703706	<0.0050	0.0050	0.0050	7703706
Dissolved Cobalt (Co)	mg/L	<0.00050	0.00050	0.00050	7703706	0.00050	0.00050	0.00050	7703706
Dissolved Copper (Cu)	mg/L	<0.00090	0.00090	0.00090	7703706	<0.00090	0.00090	0.00090	7703706
Dissolved Iron (Fe)	mg/L	<0.10	0.10	0.050	7703706	<0.10	0.10	0.050	7703706
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	0.00050	7703706	<0.00050	0.00050	0.00050	7703706
Dissolved Magnesium (Mg)	mg/L	24	0.050	0.050	7703706	25	0.050	0.050	7703706
Dissolved Manganese (Mn)	mg/L	0.034	0.0020	0.0020	7703706	0.033	0.0020	0.0020	7703706
Dissolved Molybdenum (Mo)	mg/L	0.0053	0.00050	0.00050	7703706	0.0050	0.00050	0.00050	7703706
Dissolved Nickel (Ni)	mg/L	<0.0010	0.0010	0.0010	7703706	<0.0010	0.0010	0.0010	7703706
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	0.050	7703706	<0.10	0.10	0.050	7703706
Dissolved Potassium (K)	mg/L	1.5	0.20	0.20	7703706	1.5	0.20	0.20	7703706
Dissolved Selenium (Se)	mg/L	<0.0020	0.0020	0.0020	7703706	<0.0020	0.0020	0.0020	7703706
Dissolved Silicon (Si)	mg/L	4.7	0.050	0.050	7703706	4.7	0.050	0.050	7703706
Dissolved Silver (Ag)	mg/L	<0.000090	0.000090	0.000090	7703706	<0.000090	0.000090	0.000090	7703706
Dissolved Sodium (Na)	mg/L	11	0.10	0.10	7703706	11	0.10	0.10	7703706
Dissolved Strontium (Sr)	mg/L	0.13	0.0010	0.0010	7703706	0.13	0.0010	0.0010	7703706
Dissolved Thallium (Tl)	mg/L	<0.000050	0.000050	0.000050	7703706	<0.000050	0.000050	0.000050	7703706
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	0.0050	7703706	<0.0050	0.0050	0.0050	7703706
Dissolved Uranium (U)	mg/L	0.0017	0.00010	0.00010	7703706	0.0017	0.00010	0.00010	7703706
Dissolved Vanadium (V)	mg/L	<0.00050	0.00050	0.00050	7703706	<0.00050	0.00050	0.00050	7703706
Dissolved Zinc (Zn)	mg/L	0.018	0.0050	0.0050	7703706	0.017	0.0050	0.0050	7703706

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RFM447			
Sampling Date		2021/11/12 13:40			
COC Number		854554-02-01			
	UNITS	FIELD DUPLICATE 1 Lab-Dup	RDL	MDL	QC Batch
Inorganics					
Dissolved Organic Carbon	mg/L	5.1	0.40	0.070	7701764
Orthophosphate (P)	mg/L	<0.010	0.010	0.0050	7704598
Dissolved Sulphate (SO4)	mg/L	38	1.0	0.10	7704594
Dissolved Chloride (Cl-)	mg/L	26	1.0	0.30	7704589

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 PHCS, BTEX/F1-F4 (WATER)

Bureau Veritas ID		RFM446	RFM447			
Sampling Date		2021/11/12 13:40	2021/11/12 13:40			
COC Number		854554-02-01	854554-02-01			
	UNITS	MW21-03	FIELD DUPLICATE 1	RDL	MDL	QC Batch
BTEX & F1 Hydrocarbons						
Benzene	ug/L	<0.20	<0.20	0.20	0.040	7707042
Toluene	ug/L	<0.20	<0.20	0.20	0.040	7707042
Ethylbenzene	ug/L	<0.20	<0.20	0.20	0.040	7707042
o-Xylene	ug/L	<0.20	<0.20	0.20	0.040	7707042
p+m-Xylene	ug/L	<0.40	<0.40	0.40	0.080	7707042
Total Xylenes	ug/L	<0.40	<0.40	0.40	0.080	7707042
F1 (C6-C10)	ug/L	<25	<25	25	20	7707042
F1 (C6-C10) - BTEX	ug/L	<25	<25	25	20	7707042
F2-F4 Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	100	50	7705024
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	200	70	7705024
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	200	50	7705024
Reached Baseline at C50	ug/L	Yes	Yes			7705024
Surrogate Recovery (%)						
1,4-Difluorobenzene	%	106	98			7707042
4-Bromofluorobenzene	%	102	91			7707042
D10-o-Xylene	%	96	93			7707042
D4-1,2-Dichloroethane	%	108	90			7707042
o-Terphenyl	%	97	97			7705024

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

TEST SUMMARY

Bureau Veritas ID: RFM446
Sample ID: MW21-03
Matrix: Water

Collected: 2021/11/12
Shipped:
Received: 2021/11/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7703049	N/A	2021/11/16	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7699110	N/A	2021/11/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	7704589	N/A	2021/11/17	Avneet Kour Sudan
Conductivity	AT	7703068	N/A	2021/11/16	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7701390	N/A	2021/11/16	Julianna Castiglione
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7707042	N/A	2021/11/17	Joe Paino
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7705024	2021/11/17	2021/11/17	Jeevaraj Jeevaratrnam
Hardness (calculated as CaCO3)		7699066	N/A	2021/12/08	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7703706	N/A	2021/11/18	Azita Fazaeli
Ion Balance (% Difference)	CALC	7699067	N/A	2021/12/08	Automated Statchk
Anion and Cation Sum	CALC	7699109	N/A	2021/12/08	Automated Statchk
Total Ammonia-N	LACH/NH4	7701514	N/A	2021/11/16	Viorica Rotaru
Nitrate & Nitrite as Nitrogen in Water	LACH	7703282	N/A	2021/11/17	Chandra Nandlal
pH	AT	7703073	2021/11/16	2021/11/16	Surinder Rai
Orthophosphate	KONE	7704598	N/A	2021/11/17	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7699111	N/A	2021/12/08	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7699112	N/A	2021/12/08	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7704594	N/A	2021/11/17	Avneet Kour Sudan
Total Dissolved Solids (TDS calc)	CALC	7699113	N/A	2021/12/08	Automated Statchk

Bureau Veritas ID: RFM447
Sample ID: FIELD DUPLICATE 1
Matrix: Water

Collected: 2021/11/12
Shipped:
Received: 2021/11/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7703049	N/A	2021/11/16	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7699110	N/A	2021/11/17	Automated Statchk
Chloride by Automated Colourimetry	KONE	7704589	N/A	2021/11/17	Avneet Kour Sudan
Conductivity	AT	7703068	N/A	2021/11/16	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7701764	N/A	2021/11/16	Julianna Castiglione
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7707042	N/A	2021/11/17	Joe Paino
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7705024	2021/11/17	2021/11/17	Jeevaraj Jeevaratrnam
Hardness (calculated as CaCO3)		7699066	N/A	2021/12/08	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7703706	N/A	2021/11/18	Azita Fazaeli
Ion Balance (% Difference)	CALC	7699067	N/A	2021/12/08	Automated Statchk
Anion and Cation Sum	CALC	7699109	N/A	2021/12/08	Automated Statchk
Total Ammonia-N	LACH/NH4	7701514	N/A	2021/11/16	Viorica Rotaru
Nitrate & Nitrite as Nitrogen in Water	LACH	7703282	N/A	2021/11/17	Chandra Nandlal
pH	AT	7703073	2021/11/16	2021/11/16	Surinder Rai
Orthophosphate	KONE	7704598	N/A	2021/11/17	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7699111	N/A	2021/12/08	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7699112	N/A	2021/12/08	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7704594	N/A	2021/11/17	Avneet Kour Sudan
Total Dissolved Solids (TDS calc)	CALC	7699113	N/A	2021/12/08	Automated Statchk

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1X4546
Report Date: 2021/12/10

Stantec Consulting Ltd
Client Project #: 160961457
Sampler Initials: RD

TEST SUMMARY

Bureau Veritas ID: RFM447 Dup
Sample ID: FIELD DUPLICATE 1
Matrix: Water

Collected: 2021/11/12
Shipped:
Received: 2021/11/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	7704589	N/A	2021/11/17	Avneet Kour Sudan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7701764	N/A	2021/11/16	Julianna Castiglione
Orthophosphate	KONE	7704598	N/A	2021/11/17	Avneet Kour Sudan
Sulphate by Automated Colourimetry	KONE	7704594	N/A	2021/11/17	Avneet Kour Sudan

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.0°C

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7705024	o-Terphenyl	2021/11/17	96	60 - 130	99	60 - 130	97	%		
7707042	1,4-Difluorobenzene	2021/11/17	90	70 - 130	95	70 - 130	104	%		
7707042	4-Bromofluorobenzene	2021/11/17	106	70 - 130	105	70 - 130	91	%		
7707042	D10-o-Xylene	2021/11/17	87	70 - 130	100	70 - 130	100	%		
7707042	D4-1,2-Dichloroethane	2021/11/17	75	70 - 130	81	70 - 130	94	%		
7701390	Dissolved Organic Carbon	2021/11/16	94	80 - 120	96	80 - 120	<0.40	mg/L	NC	20
7701514	Total Ammonia-N	2021/11/16	99	75 - 125	100	80 - 120	<0.050	mg/L	NC	20
7701764	Dissolved Organic Carbon	2021/11/16	95	80 - 120	97	80 - 120	<0.40	mg/L	0.16	20
7703049	Alkalinity (Total as CaCO3)	2021/11/16			97	85 - 115	<1.0	mg/L	0.76	20
7703068	Conductivity	2021/11/16			99	85 - 115	<1.0	umho/cm	0.75	25
7703073	pH	2021/11/16			102	98 - 103			0.27	N/A
7703282	Nitrate (N)	2021/11/17	97	80 - 120	99	80 - 120	<0.10	mg/L	NC	20
7703282	Nitrite (N)	2021/11/17	106	80 - 120	108	80 - 120	<0.010	mg/L	NC	20
7703706	Dissolved Aluminum (Al)	2021/11/18	99	80 - 120	102	80 - 120	<0.0049	mg/L	NC	20
7703706	Dissolved Antimony (Sb)	2021/11/18	100	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20
7703706	Dissolved Arsenic (As)	2021/11/18	98	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20
7703706	Dissolved Barium (Ba)	2021/11/18	96	80 - 120	99	80 - 120	<0.0020	mg/L	1.2	20
7703706	Dissolved Beryllium (Be)	2021/11/18	101	80 - 120	99	80 - 120	<0.00040	mg/L	NC	20
7703706	Dissolved Boron (B)	2021/11/18	93	80 - 120	98	80 - 120	<0.010	mg/L	2.6	20
7703706	Dissolved Cadmium (Cd)	2021/11/18	97	80 - 120	97	80 - 120	<0.000090	mg/L	0.12	20
7703706	Dissolved Calcium (Ca)	2021/11/18	NC	80 - 120	100	80 - 120	<0.20	mg/L	0.93	20
7703706	Dissolved Chromium (Cr)	2021/11/18	96	80 - 120	97	80 - 120	<0.0050	mg/L	NC	20
7703706	Dissolved Cobalt (Co)	2021/11/18	96	80 - 120	98	80 - 120	<0.00050	mg/L	5.8	20
7703706	Dissolved Copper (Cu)	2021/11/18	95	80 - 120	97	80 - 120	<0.00090	mg/L	0.88	20
7703706	Dissolved Iron (Fe)	2021/11/18	98	80 - 120	99	80 - 120	<0.10	mg/L	NC	20
7703706	Dissolved Lead (Pb)	2021/11/18	95	80 - 120	95	80 - 120	<0.00050	mg/L	NC	20
7703706	Dissolved Magnesium (Mg)	2021/11/18	NC	80 - 120	98	80 - 120	<0.050	mg/L	1.4	20
7703706	Dissolved Manganese (Mn)	2021/11/18	97	80 - 120	100	80 - 120	<0.0020	mg/L	3.9	20
7703706	Dissolved Molybdenum (Mo)	2021/11/18	101	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20
7703706	Dissolved Nickel (Ni)	2021/11/18	95	80 - 120	97	80 - 120	<0.0010	mg/L	3.0	20
7703706	Dissolved Phosphorus (P)	2021/11/18	100	80 - 120	109	80 - 120	<0.10	mg/L	NC	20

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7703706	Dissolved Potassium (K)	2021/11/18	96	80 - 120	99	80 - 120	<0.20	mg/L	3.8	20
7703706	Dissolved Selenium (Se)	2021/11/18	98	80 - 120	99	80 - 120	<0.0020	mg/L	NC	20
7703706	Dissolved Silicon (Si)	2021/11/18	97	80 - 120	100	80 - 120	<0.050	mg/L	0.72	20
7703706	Dissolved Silver (Ag)	2021/11/18	97	80 - 120	98	80 - 120	<0.000090	mg/L	NC	20
7703706	Dissolved Sodium (Na)	2021/11/18	94	80 - 120	99	80 - 120	<0.10	mg/L	0.40	20
7703706	Dissolved Strontium (Sr)	2021/11/18	NC	80 - 120	98	80 - 120	<0.0010	mg/L	1.1	20
7703706	Dissolved Thallium (Tl)	2021/11/18	97	80 - 120	96	80 - 120	<0.000050	mg/L	3.8	20
7703706	Dissolved Titanium (Ti)	2021/11/18	98	80 - 120	98	80 - 120	<0.0050	mg/L	NC	20
7703706	Dissolved Uranium (U)	2021/11/18	96	80 - 120	94	80 - 120	<0.00010	mg/L	13	20
7703706	Dissolved Vanadium (V)	2021/11/18	97	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20
7703706	Dissolved Zinc (Zn)	2021/11/18	NC	80 - 120	96	80 - 120	<0.0050	mg/L	0.34	20
7704589	Dissolved Chloride (Cl-)	2021/11/17	NC	80 - 120	104	80 - 120	<1.0	mg/L	1.4	20
7704594	Dissolved Sulphate (SO4)	2021/11/17	NC	75 - 125	104	80 - 120	<1.0	mg/L	1.7	20
7704598	Orthophosphate (P)	2021/11/17	98	75 - 125	102	80 - 120	<0.010	mg/L	NC	25
7705024	F2 (C10-C16 Hydrocarbons)	2021/11/17	92	60 - 130	103	60 - 130	<100	ug/L	NC	30
7705024	F3 (C16-C34 Hydrocarbons)	2021/11/17	92	60 - 130	113	60 - 130	<200	ug/L	NC	30
7705024	F4 (C34-C50 Hydrocarbons)	2021/11/17	94	60 - 130	117	60 - 130	<200	ug/L	NC	30
7707042	Benzene	2021/11/17	97	50 - 140	98	50 - 140	<0.20	ug/L	NC	30
7707042	Ethylbenzene	2021/11/17	115	50 - 140	116	50 - 140	<0.20	ug/L	9.9	30
7707042	F1 (C6-C10) - BTEX	2021/11/17					<25	ug/L	NC	30
7707042	F1 (C6-C10)	2021/11/17	95	60 - 140	96	60 - 140	<25	ug/L	NC	30
7707042	o-Xylene	2021/11/17	111	50 - 140	107	50 - 140	<0.20	ug/L	NC	30
7707042	p+m-Xylene	2021/11/17	108	50 - 140	109	50 - 140	<0.40	ug/L	NC	30
7707042	Toluene	2021/11/17	92	50 - 140	99	50 - 140	<0.20	ug/L	NC	30

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7707042	Total Xylenes	2021/11/17					<0.40	ug/L	NC	30

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

[redacted]

Anastassia Hamanov, Scientific Specialist

[redacted]

Brad Newman, B.Sc., C.Chem., Scientific Service Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

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Bureau Veritas Laboratories
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Page 1 of 1

STANTEC CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:		REPORT INFORMATION(if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#9197 Stantec Consulting Ltd	Company Name:		Quotation #:	C01624	Bureau Veritas Job #:	Bottle Order #:
Contact Name:	Accounts Payable	Contact Name:	Aaron Warkentin	Task #:			854554
Address:	300 Hagey Blvd Suite 100 Waterloo ON N2L 0A4	Address:		Project #:	160961457	COC #:	Project Manager:
Phone:	(519) 579-4410 Fax: (519) 579-6733	Phone:	(519) 575-4129 Fax: (519) 579-4239	Profit Centre:	1609	C#854554-02-01	Ronklin Gracian
Email:	SAPinvoices@Stantec.com	Email:	Aaron.Warkentin@stantec.com	Site #:			
				Sampled By:			

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)
- ☐ Table 1 ☐ Res/Park ☐ Medium/Fine
- ☐ Table 2 ☐ Ind/Comm ☐ Coarse
- ☐ Table 3 ☐ Agri/Other ☐ For RSC
- ☐ Table ___

Other Regulations
- ☐ CCME ☐ Sanitary Sewer Bylaw
- ☐ Reg 558 ☐ Storm Sewer Bylaw
- ☐ MISA Municipality ___
- ☐ PWQO ☐ Reg 406 Table ___
- ☒ Other OWS

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ___

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	RCAp - Comprehensive	O Reg 153 PHCs, BTEX/F1-F4	# of Bottles	Comments
1		MW21-03	Nov 12/21	1340	GW	Y	X	X	8	
2		FIELD DUPLICATE 1	Nov 12/21	1340	GW	Y	X	X	8	
3										
4										
5										
6										
7										
8										
9										
10										

REC'D IN WATERLOO

12-Nov-21 16:05
Ronklin Gracian
C1X4546

[redacted] Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Recei	Custody Seal Present	Yes	No
	21/11/12	1603	[redacted] Sarah Labonte	2021/11/12	16:05			7.1 2.1 9	Intact		
			LA SINGH	2021/11/12	18:18						

...ORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT ...ARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ...TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

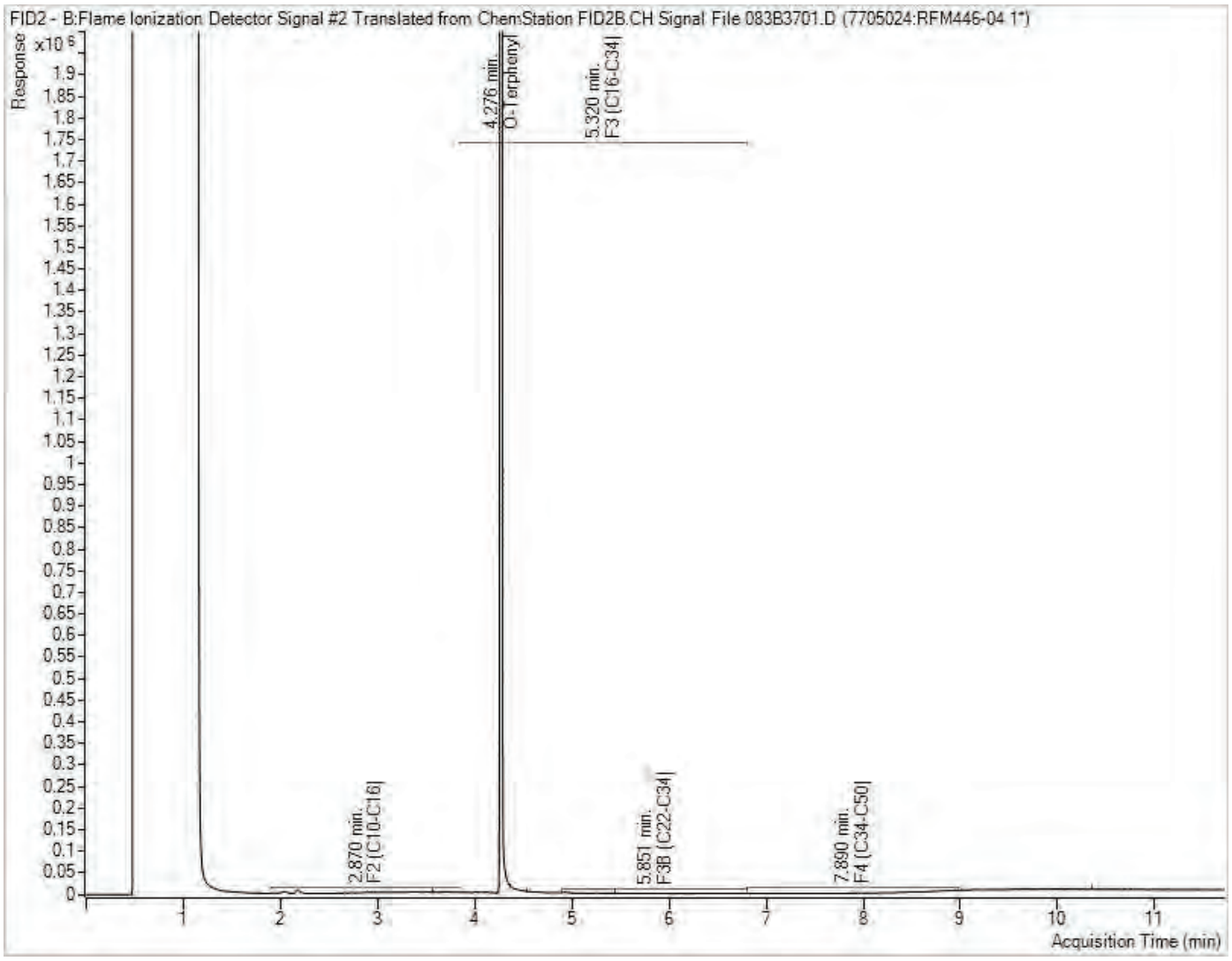
** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

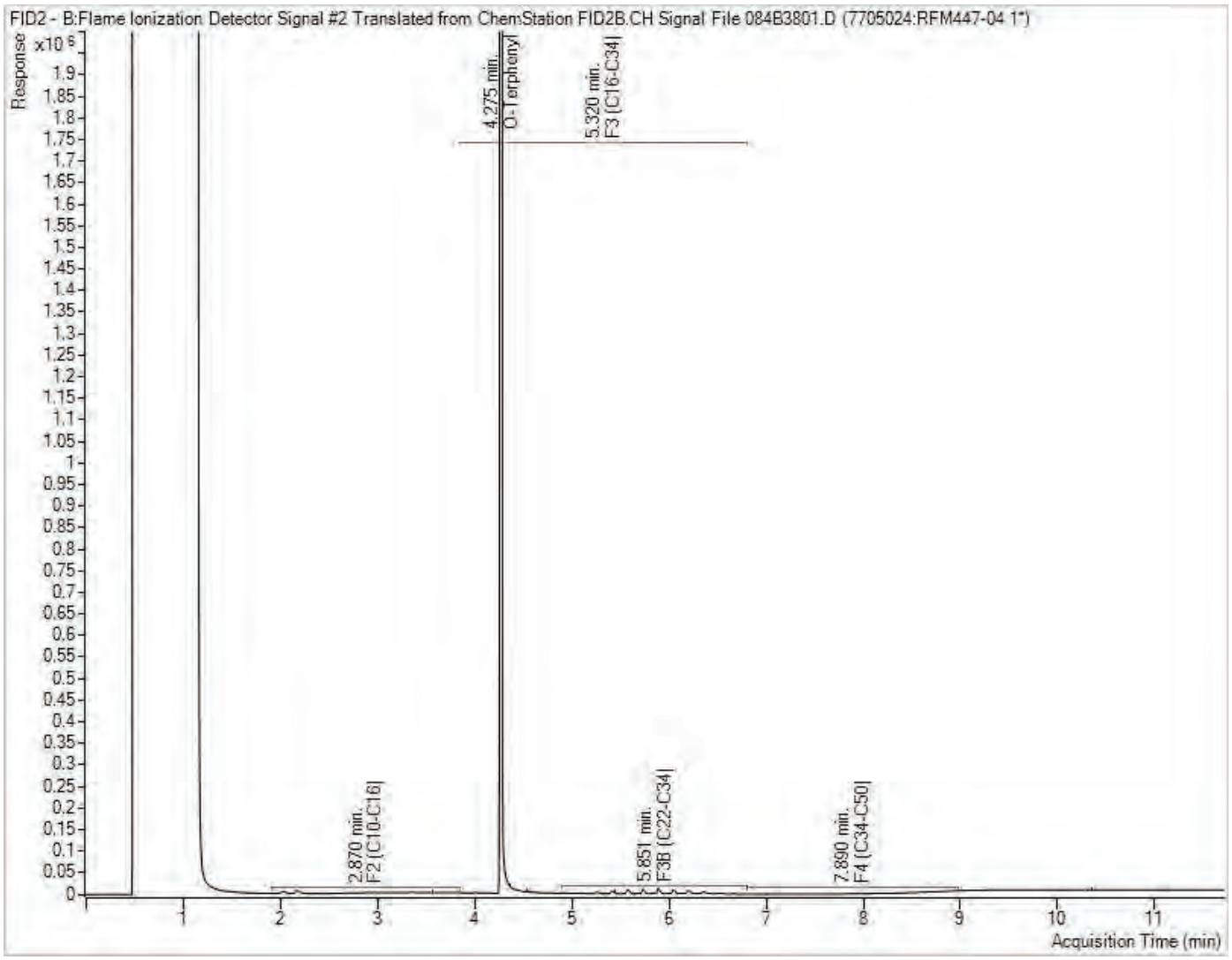
Bureau Veritas Canada (2019) Inc.

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 160961457
Site Location: TIKAL
Your C.O.C. #: N/A

Attention: Aaron Warkentin

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2022/02/10
Report #: R6999730
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C1Y2396
Received: 2021/11/19, 16:23

Sample Matrix: Water
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	7	N/A	2021/11/29	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	7	N/A	2022/01/04	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	6	N/A	2021/11/26	CAM SOP-00463	SM 23 4500-Cl E m
Chloride by Automated Colourimetry	1	N/A	2021/11/29	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	7	N/A	2021/11/29	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	4	N/A	2021/11/26	CAM SOP-00446	SM 23 5310 B m
Petroleum Hydro. CCME F1 & BTEX in Water	1	N/A	2021/11/29	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydro. CCME F1 & BTEX in Water	2	N/A	2021/11/30	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (2)	3	2021/11/26	2021/11/27	CAM SOP-00316	CCME PHC-CWS m
Hardness (calculated as CaCO3)	4	N/A	2022/01/11	CAM SOP 00102/00408/00447	SM 2340 B
Hardness (calculated as CaCO3)	3	N/A	2022/01/26	CAM SOP 00102/00408/00447	SM 2340 B
Lab Filtered Metals Analysis by ICP	3	2022/01/26	2022/01/26	CAM SOP-00408	EPA 6010D m
Dissolved Metals by ICPMS	4	N/A	2022/01/07	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	3	N/A	2022/01/26	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	4	N/A	2022/01/11		
Anion and Cation Sum	4	N/A	2022/01/11		
Total Ammonia-N	7	N/A	2021/11/27	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (3)	7	N/A	2021/11/26	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	7	2021/11/28	2021/11/29	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	7	N/A	2021/11/29	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	4	N/A	2022/01/11		Auto Calc
Sat. pH and Langelier Index (@ 20C)	3	N/A	2022/01/26		Auto Calc
Sat. pH and Langelier Index (@ 4C)	4	N/A	2022/01/11		Auto Calc
Sat. pH and Langelier Index (@ 4C)	3	N/A	2022/01/26		Auto Calc
Sulphate by Automated Colourimetry	6	N/A	2021/11/26	CAM SOP-00464	EPA 375.4 m
Sulphate by Automated Colourimetry	1	N/A	2021/11/29	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	4	N/A	2022/01/11		Auto Calc
Total Dissolved Solids (TDS calc)	3	N/A	2022/01/26		Auto Calc

Your Project #: 160961457
Site Location: TIKAL
Your C.O.C. #: N/A

Attention: Aaron Warkentin

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2022/02/10
Report #: R6999730
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C1Y2396
Received: 2021/11/19, 16:23

Sample Matrix: Water
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Organic Carbon (TOC) (4)	3	N/A	2022/02/02	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric)	3	2022/02/02	2022/02/02	CAM SOP-00407	SM 23 4500 P B H m
Turbidity	3	N/A	2022/01/28	CAM SOP-00417	SM 23 2130 B m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Bureau Veritas conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(4) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Your Project #: 160961457
Site Location: TIKAL
Your C.O.C. #: N/A

Attention: Aaron Warkentin

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2022/02/10
Report #: R6999730
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C1Y2396
Received: 2021/11/19, 16:23

Encryption Key [redacted]

Ronklin Gracian
Project Manager
10 Feb 2022 17:44:36

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ronklin Gracian, Project Manager
Email: Ronklin.Gracian@bureauveritas.com
Phone# (905)817-5752
==========
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RHD453			RHD454			RHD454		
Sampling Date		2021/11/19 09:00			2021/11/19 08:43			2021/11/19 08:43		
COC Number		N/A			N/A			N/A		
	UNITS	DP21-01	RDL	QC Batch	DP21-02	RDL	QC Batch	DP21-02 Lab-Dup	RDL	QC Batch
Calculated Parameters										
Anion Sum	me/L	7.47	N/A	7724815	15.5	N/A	7724816			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	340	1.0	7724811	470	1.0	7724811			
Calculated TDS	mg/L	370	1.0	7724807	840	1.0	7724807			
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.4	1.0	7724811	1.8	1.0	7724811			
Cation Sum	me/L	6.96	N/A	7724815	15.0	N/A	7724816			
Hardness (CaCO3)	mg/L	320	1.0	7724528	720	1.0	7724528			
Ion Balance (% Difference)	%	3.54	N/A	7724814	1.60	N/A	7724814			
Langelier Index (@ 20C)	N/A	0.639		7724806	1.04		7724806			
Langelier Index (@ 4C)	N/A	0.391		7724808	0.792		7724808			
Saturation pH (@ 20C)	N/A	7.00		7724806	6.58		7724806			
Saturation pH (@ 4C)	N/A	7.25		7724808	6.83		7724808			
Inorganics										
Total Ammonia-N	mg/L	0.34	0.050	7748274	1.4	0.050	7748274			
Conductivity	umho/cm	650	1.0	7716064	1300	1.0	7716064	1300	1.0	7716064
Dissolved Organic Carbon	mg/L	14	0.40	7727106	55	0.40	7727106			
Orthophosphate (P)	mg/L	<0.010	0.010	7725617	<0.050 (1)	0.050	7725617			
pH	pH	7.64		7751116	7.62		7751116	7.61		7751116
Dissolved Sulphate (SO4)	mg/L	17	1.0	7725015	250	2.0	7725015			
Alkalinity (Total as CaCO3)	mg/L	340	1.0	7716090	470	1.0	7716090			
Dissolved Chloride (Cl-)	mg/L	13	1.0	7725026	35	1.0	7725026			
Nitrite (N)	mg/L	0.019	0.010	7748877	0.013	0.010	7748877			
Nitrate (N)	mg/L	0.11	0.10	7748877	<0.10	0.10	7748877			
Nitrate + Nitrite (N)	mg/L	0.13	0.10	7748877	<0.10	0.10	7748877			
Metals										
Dissolved Aluminum (Al)	mg/L	0.022	0.0049	7767702	0.026	0.0049	7767702			
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	7767702	<0.00050	0.00050	7767702			
Dissolved Arsenic (As)	mg/L	0.0093	0.0010	7767702	0.0014	0.0010	7767702			
Dissolved Barium (Ba)	mg/L	0.23	0.0020	7767702	0.32	0.0020	7767702			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RHD453			RHD454			RHD454		
Sampling Date		2021/11/19 09:00			2021/11/19 08:43			2021/11/19 08:43		
COC Number		N/A			N/A			N/A		
	UNITS	DP21-01	RDL	QC Batch	DP21-02	RDL	QC Batch	DP21-02 Lab-Dup	RDL	QC Batch
Dissolved Beryllium (Be)	mg/L	<0.00040	0.00040	7767702	<0.00040	0.00040	7767702			
Dissolved Boron (B)	mg/L	0.094	0.010	7767702	0.026	0.010	7767702			
Dissolved Cadmium (Cd)	mg/L	<0.000090	0.000090	7767702	<0.000090	0.000090	7767702			
Dissolved Calcium (Ca)	mg/L	82	0.20	7767702	190	0.20	7767702			
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	7767702	<0.0050	0.0050	7767702			
Dissolved Cobalt (Co)	mg/L	0.00061	0.00050	7767702	0.00071	0.00050	7767702			
Dissolved Copper (Cu)	mg/L	0.0038	0.00090	7767702	0.0011	0.00090	7767702			
Dissolved Iron (Fe)	mg/L	12	0.10	7767702	6.5	0.10	7767702			
Dissolved Lead (Pb)	mg/L	<0.00050	0.00050	7767702	<0.00050	0.00050	7767702			
Dissolved Magnesium (Mg)	mg/L	27	0.050	7767702	60	0.050	7767702			
Dissolved Manganese (Mn)	mg/L	0.31	0.0020	7767702	0.30	0.0020	7767702			
Dissolved Molybdenum (Mo)	mg/L	0.0010	0.00050	7767702	0.0040	0.00050	7767702			
Dissolved Nickel (Ni)	mg/L	0.0027	0.0010	7767702	0.0068	0.0010	7767702			
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	7767702	0.12	0.10	7767702			
Dissolved Potassium (K)	mg/L	0.71	0.20	7767702	0.68	0.20	7767702			
Dissolved Selenium (Se)	mg/L	<0.0020	0.0020	7767702	<0.0020	0.0020	7767702			
Dissolved Silicon (Si)	mg/L	4.6	0.050	7767702	5.1	0.050	7767702			
Dissolved Silver (Ag)	mg/L	<0.000090	0.000090	7767702	<0.000090	0.000090	7767702			
Dissolved Sodium (Na)	mg/L	2.9	0.10	7767702	4.3	0.10	7767702			
Dissolved Strontium (Sr)	mg/L	0.082	0.0010	7767702	0.16	0.0010	7767702			
Dissolved Thallium (Tl)	mg/L	<0.000050	0.000050	7767702	<0.000050	0.000050	7767702			
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	7767702	<0.0050	0.0050	7767702			
Dissolved Uranium (U)	mg/L	<0.00010	0.00010	7767702	0.00072	0.00010	7767702			
Dissolved Vanadium (V)	mg/L	<0.00050	0.00050	7767702	<0.00050	0.00050	7767702			
Dissolved Zinc (Zn)	mg/L	41	0.025	7767702	88	0.050	7767702			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RHD455		RHD456		
Sampling Date		2021/11/19 08:22		2021/11/19 08:07		
COC Number		N/A		N/A		
	UNITS	DP21-03	RDL	DP21-04	RDL	QC Batch
Calculated Parameters						
Anion Sum	me/L	11.5	N/A	7.30	N/A	7724816
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	490	1.0	280	1.0	7724811
Calculated TDS	mg/L	570	1.0	380	1.0	7724807
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.5	1.0	2.1	1.0	7724811
Cation Sum	me/L	11.3	N/A	7.38	N/A	7724816
Hardness (CaCO3)	mg/L	520	1.0	340	1.0	7724528
Ion Balance (% Difference)	%	0.760	N/A	0.560	N/A	7724814
Langelier Index (@ 20C)	N/A	1.08		0.844		7724806
Langelier Index (@ 4C)	N/A	0.830		0.595		7724808
Saturation pH (@ 20C)	N/A	6.66		7.06		7724806
Saturation pH (@ 4C)	N/A	6.91		7.31		7724808
Inorganics						
Total Ammonia-N	mg/L	0.89	0.050	0.16	0.050	7748274
Conductivity	umho/cm	980	1.0	690	1.0	7716064
Dissolved Organic Carbon	mg/L	44	0.40	3.6	0.40	7727106
Orthophosphate (P)	mg/L	<0.010	0.010	<0.010	0.010	7725617
pH	pH	7.74		7.91		7751116
Dissolved Sulphate (SO4)	mg/L	<5.0 (1)	5.0	30	1.0	7725015
Alkalinity (Total as CaCO3)	mg/L	490	1.0	280	1.0	7716090
Dissolved Chloride (Cl-)	mg/L	59	1.0	37	1.0	7725026
Nitrite (N)	mg/L	0.020	0.010	0.019	0.010	7748877
Nitrate (N)	mg/L	<0.10	0.10	0.30	0.10	7748877
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	0.32	0.10	7748877
Metals						
Dissolved Aluminum (Al)	mg/L	0.078	0.0049	0.017	0.0049	7767702
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	<0.00050	0.00050	7767702
Dissolved Arsenic (As)	mg/L	0.0034	0.0010	<0.0010	0.0010	7767702
Dissolved Barium (Ba)	mg/L	0.18	0.0020	0.17	0.0020	7767702
Dissolved Beryllium (Be)	mg/L	<0.00040	0.00040	<0.00040	0.00040	7767702

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

RCAP - COMPREHENSIVE (WATER)

Bureau Veritas ID		RHD455		RHD456		
Sampling Date		2021/11/19 08:22		2021/11/19 08:07		
COC Number		N/A		N/A		
	UNITS	DP21-03	RDL	DP21-04	RDL	QC Batch
Dissolved Boron (B)	mg/L	0.028	0.010	0.017	0.010	7767702
Dissolved Cadmium (Cd)	mg/L	<0.000090	0.000090	0.00039	0.000090	7767702
Dissolved Calcium (Ca)	mg/L	130	0.20	85	0.20	7767702
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	<0.0050	0.0050	7767702
Dissolved Cobalt (Co)	mg/L	0.00076	0.00050	0.0011	0.00050	7767702
Dissolved Copper (Cu)	mg/L	0.029	0.00090	0.0032	0.00090	7767702
Dissolved Iron (Fe)	mg/L	5.7	0.10	1.6	0.10	7767702
Dissolved Lead (Pb)	mg/L	0.0021	0.00050	<0.00050	0.00050	7767702
Dissolved Magnesium (Mg)	mg/L	44	0.050	30	0.050	7767702
Dissolved Manganese (Mn)	mg/L	0.22	0.0020	0.25	0.0020	7767702
Dissolved Molybdenum (Mo)	mg/L	0.0014	0.00050	0.00098	0.00050	7767702
Dissolved Nickel (Ni)	mg/L	0.016	0.0010	0.0040	0.0010	7767702
Dissolved Phosphorus (P)	mg/L	0.11	0.10	<0.10	0.10	7767702
Dissolved Potassium (K)	mg/L	0.47	0.20	1.1	0.20	7767702
Dissolved Selenium (Se)	mg/L	<0.0020	0.0020	<0.0020	0.0020	7767702
Dissolved Silicon (Si)	mg/L	4.5	0.050	3.3	0.050	7767702
Dissolved Silver (Ag)	mg/L	<0.000090	0.000090	<0.000090	0.000090	7767702
Dissolved Sodium (Na)	mg/L	17	0.10	13	0.10	7767702
Dissolved Strontium (Sr)	mg/L	0.13	0.0010	0.090	0.0010	7767702
Dissolved Thallium (Tl)	mg/L	<0.000050	0.000050	<0.000050	0.000050	7767702
Dissolved Titanium (Ti)	mg/L	0.0062	0.0010	<0.0050	0.0050	7767702
Dissolved Uranium (U)	mg/L	0.00030	0.00010	0.00031	0.00010	7767702
Dissolved Vanadium (V)	mg/L	0.0099	0.00050	<0.00050	0.00050	7767702
Dissolved Zinc (Zn)	mg/L	41	0.025	9.5	0.0050	7767702

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

RCAP - SURFACE WATER (WATER)

Bureau Veritas ID		RHD457		RHD458			RHD458		
Sampling Date		2021/11/08 13:00		2021/11/08 14:00			2021/11/08 14:00		
COC Number		N/A		N/A			N/A		
	UNITS	SW21-01	QC Batch	SW21-02	RDL	QC Batch	SW21-02 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	260	7724811	250	1.0	7724811			
Calculated TDS	mg/L	320	7724807	350	1.0	7724807			
Carb. Alkalinity (calc. as CaCO3)	mg/L	3.8	7724811	5.3	1.0	7724811			
Hardness (CaCO3)	mg/L	300	7724528	300	1.0	7724528			
Langelier Index (@ 20C)	N/A	1.09	7724806	1.23		7724806			
Langelier Index (@ 4C)	N/A	0.838	7724808	0.976		7724808			
Saturation pH (@ 20C)	N/A	7.11	7724806	7.13		7724806			
Saturation pH (@ 4C)	N/A	7.36	7724808	7.38		7724808			
Inorganics									
Total Ammonia-N	mg/L	<0.050	7748274	<0.050	0.050	7748274			
Conductivity	umho/cm	580	7716064	580	1.0	7716064			
Orthophosphate (P)	mg/L	<0.010	7725617	<0.010	0.010	7725667			
pH	pH	8.20	7751116	8.35		7751116			
Dissolved Sulphate (SO4)	mg/L	10	7725015	23	1.0	7725678			
Turbidity	NTU	0.7	7799231	0.3	0.1	7799231			
Alkalinity (Total as CaCO3)	mg/L	260	7716090	250	1.0	7716090			
Dissolved Chloride (Cl-)	mg/L	27	7725026	36	1.0	7722104			
Nitrite (N)	mg/L	<0.010	7748877	<0.010	0.010	7748877			
Nitrate (N)	mg/L	0.15	7748877	0.18	0.10	7748877			
Metals									
Dissolved Calcium (Ca)	mg/L	79	7799018	79	0.05	7799018			
Dissolved Magnesium (Mg)	mg/L	24	7799018	25	0.05	7799018			
Dissolved Potassium (K)	mg/L	1	7799018	2	1	7799018			
Dissolved Sodium (Na)	mg/L	14	7799018	20	0.5	7799018			
Total Aluminum (Al)	mg/L	0.0067	7800742	0.010	0.0049	7800742	0.010	0.0049	7800742
Total Antimony (Sb)	mg/L	<0.00050	7800742	<0.00050	0.00050	7800742	<0.00050	0.00050	7800742
Total Arsenic (As)	mg/L	<0.0010	7800742	<0.0010	0.0010	7800742	<0.0010	0.0010	7800742
Total Barium (Ba)	mg/L	0.064	7800742	0.051	0.0020	7800742	0.051	0.0020	7800742
Total Beryllium (Be)	mg/L	<0.00040	7800742	<0.00040	0.00040	7800742	<0.00040	0.00040	7800742
Total Boron (B)	mg/L	<0.010	7800742	<0.010	0.010	7800742	0.010	0.010	7800742

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

RCAP - SURFACE WATER (WATER)

Bureau Veritas ID		RHD457		RHD458			RHD458		
Sampling Date		2021/11/08 13:00		2021/11/08 14:00			2021/11/08 14:00		
COC Number		N/A		N/A			N/A		
	UNITS	SW21-01	QC Batch	SW21-02	RDL	QC Batch	SW21-02 Lab-Dup	RDL	QC Batch
Total Cadmium (Cd)	mg/L	<0.000090	7800742	<0.000090	0.000090	7800742	<0.000090	0.000090	7800742
Total Calcium (Ca)	mg/L	77	7800742	74	0.20	7800742	75	0.20	7800742
Total Chromium (Cr)	mg/L	<0.0050	7800742	<0.0050	0.0050	7800742	<0.0050	0.0050	7800742
Total Cobalt (Co)	mg/L	<0.00050	7800742	<0.00050	0.00050	7800742	<0.00050	0.00050	7800742
Total Copper (Cu)	mg/L	<0.00090	7800742	<0.00090	0.00090	7800742	<0.00090	0.00090	7800742
Total Iron (Fe)	mg/L	<0.10	7800742	<0.10	0.10	7800742	<0.10	0.10	7800742
Total Lead (Pb)	mg/L	<0.00050	7800742	<0.00050	0.00050	7800742	<0.00050	0.00050	7800742
Total Magnesium (Mg)	mg/L	25	7800742	25	0.050	7800742	26	0.050	7800742
Total Manganese (Mn)	mg/L	0.025	7800742	0.023	0.0020	7800742	0.024	0.0020	7800742
Total Molybdenum (Mo)	mg/L	0.00067	7800742	0.00070	0.00050	7800742	0.00067	0.00050	7800742
Total Nickel (Ni)	mg/L	<0.0010	7800742	<0.0010	0.0010	7800742	<0.0010	0.0010	7800742
Total Potassium (K)	mg/L	1.4	7800742	1.4	0.20	7800742	1.4	0.20	7800742
Total Selenium (Se)	mg/L	<0.0020	7800742	<0.0020	0.0020	7800742	<0.0020	0.0020	7800742
Total Silicon (Si)	mg/L	4.7	7800742	3.9	0.050	7800742	4.0	0.050	7800742
Total Silver (Ag)	mg/L	<0.000090	7800742	<0.000090	0.000090	7800742	<0.000090	0.000090	7800742
Total Sodium (Na)	mg/L	13	7800742	19	0.10	7800742	19	0.10	7800742
Total Strontium (Sr)	mg/L	0.095	7800742	0.094	0.0010	7800742	0.095	0.0010	7800742
Total Thallium (Tl)	mg/L	<0.000050	7800742	<0.000050	0.000050	7800742	<0.000050	0.000050	7800742
Total Titanium (Ti)	mg/L	<0.0050	7800742	<0.0050	0.0050	7800742	<0.0050	0.0050	7800742
Total Tungsten (W)	mg/L	<0.0010	7800742	<0.0010	0.0010	7800742	<0.0010	0.0010	7800742
Total Uranium (U)	mg/L	0.00052	7800742	0.00049	0.00010	7800742	0.00047	0.00010	7800742
Total Vanadium (V)	mg/L	<0.00050	7800742	<0.00050	0.00050	7800742	<0.00050	0.00050	7800742
Total Zinc (Zn)	mg/L	0.032	7800742	0.020	0.0050	7800742	0.020	0.0050	7800742
Total Zirconium (Zr)	mg/L	<0.0010	7800742	<0.0010	0.0010	7800742	<0.0010	0.0010	7800742

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

RCAP - SURFACE WATER (WATER)

Bureau Veritas ID		RHD459		
Sampling Date		2021/11/08 17:00		
COC Number		N/A		
	UNITS	FIELD DUP1	RDL	QC Batch
Calculated Parameters				
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	260	1.0	7724811
Calculated TDS	mg/L	320	1.0	7724807
Carb. Alkalinity (calc. as CaCO3)	mg/L	4.1	1.0	7724811
Hardness (CaCO3)	mg/L	300	1.0	7724528
Langelier Index (@ 20C)	N/A	1.12		7724806
Langelier Index (@ 4C)	N/A	0.874		7724808
Saturation pH (@ 20C)	N/A	7.11		7724806
Saturation pH (@ 4C)	N/A	7.36		7724808
Inorganics				
Total Ammonia-N	mg/L	<0.050	0.050	7748274
Conductivity	umho/cm	560	1.0	7716064
Orthophosphate (P)	mg/L	<0.010	0.010	7725617
pH	pH	8.23		7751116
Dissolved Sulphate (SO4)	mg/L	10	1.0	7725015
Turbidity	NTU	0.3	0.1	7799231
Alkalinity (Total as CaCO3)	mg/L	260	1.0	7716090
Dissolved Chloride (Cl-)	mg/L	27	1.0	7725026
Nitrite (N)	mg/L	<0.010	0.010	7748877
Nitrate (N)	mg/L	0.15	0.10	7748877
Metals				
Dissolved Calcium (Ca)	mg/L	80	0.05	7799018
Dissolved Magnesium (Mg)	mg/L	25	0.05	7799018
Dissolved Potassium (K)	mg/L	2	1	7799018
Dissolved Sodium (Na)	mg/L	14	0.5	7799018
Total Aluminum (Al)	mg/L	0.0079	0.0049	7800742
Total Antimony (Sb)	mg/L	<0.00050	0.00050	7800742
Total Arsenic (As)	mg/L	<0.0010	0.0010	7800742
Total Barium (Ba)	mg/L	0.064	0.0020	7800742
Total Beryllium (Be)	mg/L	<0.00040	0.00040	7800742
Total Boron (B)	mg/L	<0.010	0.010	7800742
Total Cadmium (Cd)	mg/L	<0.000090	0.000090	7800742

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QC Batch = Quality Control Batch

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RCAP - SURFACE WATER (WATER)

Bureau Veritas ID		RHD459		
Sampling Date		2021/11/08 17:00		
COC Number		N/A		
	UNITS	FIELD DUP1	RDL	QC Batch
Total Calcium (Ca)	mg/L	75	0.20	7800742
Total Chromium (Cr)	mg/L	<0.0050	0.0050	7800742
Total Cobalt (Co)	mg/L	<0.00050	0.00050	7800742
Total Copper (Cu)	mg/L	<0.00090	0.00090	7800742
Total Iron (Fe)	mg/L	<0.10	0.10	7800742
Total Lead (Pb)	mg/L	<0.00050	0.00050	7800742
Total Magnesium (Mg)	mg/L	24	0.050	7800742
Total Manganese (Mn)	mg/L	0.024	0.0020	7800742
Total Molybdenum (Mo)	mg/L	0.00066	0.00050	7800742
Total Nickel (Ni)	mg/L	<0.0010	0.0010	7800742
Total Potassium (K)	mg/L	1.4	0.20	7800742
Total Selenium (Se)	mg/L	<0.0020	0.0020	7800742
Total Silicon (Si)	mg/L	4.6	0.050	7800742
Total Silver (Ag)	mg/L	<0.000090	0.000090	7800742
Total Sodium (Na)	mg/L	13	0.10	7800742
Total Strontium (Sr)	mg/L	0.094	0.0010	7800742
Total Thallium (Tl)	mg/L	<0.000050	0.000050	7800742
Total Titanium (Ti)	mg/L	<0.0050	0.0050	7800742
Total Tungsten (W)	mg/L	<0.0010	0.0010	7800742
Total Uranium (U)	mg/L	0.00051	0.00010	7800742
Total Vanadium (V)	mg/L	<0.00050	0.00050	7800742
Total Zinc (Zn)	mg/L	0.033	0.0050	7800742
Total Zirconium (Zr)	mg/L	<0.0010	0.0010	7800742

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		RHD457	RHD458	RHD459		
Sampling Date		2021/11/08 13:00	2021/11/08 14:00	2021/11/08 17:00		
COC Number		N/A	N/A	N/A		
	UNITS	SW21-01	SW21-02	FIELD DUP1	RDL	QC Batch
Inorganics						
Total Organic Carbon (TOC)	mg/L	12	7.2	12	0.40	7812398
Total Phosphorus	mg/L	0.011	0.005	0.010	0.004	7812399

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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O.REG 153 PHCS, BTEX/F1-F4 (WATER)

Bureau Veritas ID		RHD457	RHD458	RHD458	RHD459		
Sampling Date		2021/11/08 13:00	2021/11/08 14:00	2021/11/08 14:00	2021/11/08 17:00		
COC Number		N/A	N/A	N/A	N/A		
	UNITS	SW21-01	SW21-02	SW21-02 Lab-Dup	FIELD DUP1	RDL	QC Batch
BTEX & F1 Hydrocarbons							
Benzene	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	7732216
Toluene	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	7732216
Ethylbenzene	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	7732216
o-Xylene	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	7732216
p+m-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	7732216
Total Xylenes	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	7732216
F1 (C6-C10)	ug/L	<25	<25	<25	<25	25	7732216
F1 (C6-C10) - BTEX	ug/L	<25	<25	<25	<25	25	7732216
F2-F4 Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	<100	<100	100	7736282
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	<200	<200	200	7736282
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	<200	<200	200	7736282
Reached Baseline at C50	ug/L	Yes	Yes	Yes	Yes		7736282
Surrogate Recovery (%)							
1,4-Difluorobenzene	%	107	103	103	104		7732216
4-Bromofluorobenzene	%	101	84	85	96		7732216
D10-o-Xylene	%	109	104	104	102		7732216
D4-1,2-Dichloroethane	%	107	114	111	110		7732216
o-Terphenyl	%	85	85	88	83		7736282

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Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

TEST SUMMARY

Bureau Veritas ID: RHD453
Sample ID: DP21-01
Matrix: Water

Collected: 2021/11/19
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7716090	N/A	2021/11/29	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7724811	N/A	2022/01/04	Automated Statchk
Chloride by Automated Colourimetry	KONE	7725026	N/A	2021/11/26	Alina Dobreanu
Conductivity	AT	7716064	N/A	2021/11/29	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7727106	N/A	2021/11/26	Julianna Castiglione
Hardness (calculated as CaCO3)		7724528	N/A	2022/01/11	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7767702	N/A	2022/01/07	Nan Raykha
Ion Balance (% Difference)	CALC	7724814	N/A	2022/01/11	Automated Statchk
Anion and Cation Sum	CALC	7724815	N/A	2022/01/11	Automated Statchk
Total Ammonia-N	LACH/NH4	7748274	N/A	2021/11/27	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7748877	N/A	2021/11/26	Chandra Nandlal
pH	AT	7751116	2021/11/28	2021/11/29	Surinder Rai
Orthophosphate	KONE	7725617	N/A	2021/11/29	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7724806	N/A	2022/01/11	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7724808	N/A	2022/01/11	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7725015	N/A	2021/11/26	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	7724807	N/A	2022/01/11	Automated Statchk

Bureau Veritas ID: RHD454
Sample ID: DP21-02
Matrix: Water

Collected: 2021/11/19
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7716090	N/A	2021/11/29	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7724811	N/A	2022/01/04	Automated Statchk
Chloride by Automated Colourimetry	KONE	7725026	N/A	2021/11/26	Alina Dobreanu
Conductivity	AT	7716064	N/A	2021/11/29	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7727106	N/A	2021/11/26	Julianna Castiglione
Hardness (calculated as CaCO3)		7724528	N/A	2022/01/11	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7767702	N/A	2022/01/07	Nan Raykha
Ion Balance (% Difference)	CALC	7724814	N/A	2022/01/11	Automated Statchk
Anion and Cation Sum	CALC	7724816	N/A	2022/01/11	Automated Statchk
Total Ammonia-N	LACH/NH4	7748274	N/A	2021/11/27	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7748877	N/A	2021/11/26	Chandra Nandlal
pH	AT	7751116	2021/11/28	2021/11/29	Surinder Rai
Orthophosphate	KONE	7725617	N/A	2021/11/29	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7724806	N/A	2022/01/11	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7724808	N/A	2022/01/11	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7725015	N/A	2021/11/26	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	7724807	N/A	2022/01/11	Automated Statchk

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

TEST SUMMARY

Bureau Veritas ID: RHD454 Dup
Sample ID: DP21-02
Matrix: Water

Collected: 2021/11/19
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity	AT	7716064	N/A	2021/11/29	Surinder Rai
pH	AT	7751116	2021/11/28	2021/11/29	Surinder Rai

Bureau Veritas ID: RHD455
Sample ID: DP21-03
Matrix: Water

Collected: 2021/11/19
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7716090	N/A	2021/11/29	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7724811	N/A	2022/01/04	Automated Statchk
Chloride by Automated Colourimetry	KONE	7725026	N/A	2021/11/26	Alina Dobreanu
Conductivity	AT	7716064	N/A	2021/11/29	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7727106	N/A	2021/11/26	Julianna Castiglione
Hardness (calculated as CaCO3)		7724528	N/A	2022/01/11	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7767702	N/A	2022/01/07	Nan Raykha
Ion Balance (% Difference)	CALC	7724814	N/A	2022/01/11	Automated Statchk
Anion and Cation Sum	CALC	7724816	N/A	2022/01/11	Automated Statchk
Total Ammonia-N	LACH/NH4	7748274	N/A	2021/11/27	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7748877	N/A	2021/11/26	Chandra Nandlal
pH	AT	7751116	2021/11/28	2021/11/29	Surinder Rai
Orthophosphate	KONE	7725617	N/A	2021/11/29	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7724806	N/A	2022/01/11	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7724808	N/A	2022/01/11	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7725015	N/A	2021/11/26	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	7724807	N/A	2022/01/11	Automated Statchk

Bureau Veritas ID: RHD456
Sample ID: DP21-04
Matrix: Water

Collected: 2021/11/19
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7716090	N/A	2021/11/29	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7724811	N/A	2022/01/04	Automated Statchk
Chloride by Automated Colourimetry	KONE	7725026	N/A	2021/11/26	Alina Dobreanu
Conductivity	AT	7716064	N/A	2021/11/29	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7727106	N/A	2021/11/26	Julianna Castiglione
Hardness (calculated as CaCO3)		7724528	N/A	2022/01/11	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7767702	N/A	2022/01/07	Nan Raykha
Ion Balance (% Difference)	CALC	7724814	N/A	2022/01/11	Automated Statchk
Anion and Cation Sum	CALC	7724816	N/A	2022/01/11	Automated Statchk
Total Ammonia-N	LACH/NH4	7748274	N/A	2021/11/27	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7748877	N/A	2021/11/26	Chandra Nandlal
pH	AT	7751116	2021/11/28	2021/11/29	Surinder Rai
Orthophosphate	KONE	7725617	N/A	2021/11/29	Avneet Kour Sudan

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

TEST SUMMARY

Bureau Veritas ID: RHD456
Sample ID: DP21-04
Matrix: Water

Collected: 2021/11/19
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sat. pH and Langelier Index (@ 20C)	CALC	7724806	N/A	2022/01/11	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7724808	N/A	2022/01/11	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7725015	N/A	2021/11/26	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	7724807	N/A	2022/01/11	Automated Statchk

Bureau Veritas ID: RHD457
Sample ID: SW21-01
Matrix: Water

Collected: 2021/11/08
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7716090	N/A	2021/11/29	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7724811	N/A	2022/01/04	Automated Statchk
Chloride by Automated Colourimetry	KONE	7725026	N/A	2021/11/26	Alina Dobreanu
Conductivity	AT	7716064	N/A	2021/11/29	Surinder Rai
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7732216	N/A	2021/11/30	Haibin Wu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7736282	2021/11/26	2021/11/27	Suleeqa Nurr
Hardness (calculated as CaCO3)		7724528	N/A	2022/01/26	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	7799018	2022/01/26	2022/01/26	Suban Kanapathippllai
Total Metals Analysis by ICPMS	ICP/MS	7800742	N/A	2022/01/26	Azita Fazaeli
Total Ammonia-N	LACH/NH4	7748274	N/A	2021/11/27	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7748877	N/A	2021/11/26	Chandra Nandlal
pH	AT	7751116	2021/11/28	2021/11/29	Surinder Rai
Orthophosphate	KONE	7725617	N/A	2021/11/29	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7724806	N/A	2022/01/26	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7724808	N/A	2022/01/26	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7725015	N/A	2021/11/26	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	7724807	N/A	2022/01/26	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	7812398	N/A	2022/02/02	Anna-Kay Gooden
Total Phosphorus (Colourimetric)	LACH/P	7812399	2022/02/02	2022/02/02	Shivani Shivani
Turbidity	AT	7799231	N/A	2022/01/28	Neil Dassanayake

Bureau Veritas ID: RHD458
Sample ID: SW21-02
Matrix: Water

Collected: 2021/11/08
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7716090	N/A	2021/11/29	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7724811	N/A	2022/01/04	Automated Statchk
Chloride by Automated Colourimetry	KONE	7722104	N/A	2021/11/29	Alina Dobreanu
Conductivity	AT	7716064	N/A	2021/11/29	Surinder Rai
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7732216	N/A	2021/11/29	Haibin Wu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7736282	2021/11/26	2021/11/27	Suleeqa Nurr
Hardness (calculated as CaCO3)		7724528	N/A	2022/01/26	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	7799018	2022/01/26	2022/01/26	Suban Kanapathippllai

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Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

TEST SUMMARY

Bureau Veritas ID: RHD458
Sample ID: SW21-02
Matrix: Water

Collected: 2021/11/08
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Metals Analysis by ICPMS	ICP/MS	7800742	N/A	2022/01/26	Azita Fazaeli
Total Ammonia-N	LACH/NH4	7748274	N/A	2021/11/27	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7748877	N/A	2021/11/26	Chandra Nandlal
pH	AT	7751116	2021/11/28	2021/11/29	Surinder Rai
Orthophosphate	KONE	7725667	N/A	2021/11/29	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7724806	N/A	2022/01/26	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7724808	N/A	2022/01/26	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7725678	N/A	2021/11/29	Avneet Kour Sudan
Total Dissolved Solids (TDS calc)	CALC	7724807	N/A	2022/01/26	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	7812398	N/A	2022/02/02	Anna-Kay Gooden
Total Phosphorus (Colourimetric)	LACH/P	7812399	2022/02/02	2022/02/02	Shivani Shivani
Turbidity	AT	7799231	N/A	2022/01/28	Neil Dassanayake

Bureau Veritas ID: RHD458 Dup
Sample ID: SW21-02
Matrix: Water

Collected: 2021/11/08
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7732216	N/A	2021/11/29	Haibin Wu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7736282	2021/11/26	2021/11/27	Suleeqa Nurr
Total Metals Analysis by ICPMS	ICP/MS	7800742	N/A	2022/01/26	Azita Fazaeli

Bureau Veritas ID: RHD459
Sample ID: FIELD DUP1
Matrix: Water

Collected: 2021/11/08
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7716090	N/A	2021/11/29	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7724811	N/A	2022/01/04	Automated Statchk
Chloride by Automated Colourimetry	KONE	7725026	N/A	2021/11/26	Alina Dobreanu
Conductivity	AT	7716064	N/A	2021/11/29	Surinder Rai
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7732216	N/A	2021/11/30	Haibin Wu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7736282	2021/11/26	2021/11/27	Suleeqa Nurr
Hardness (calculated as CaCO3)		7724528	N/A	2022/01/26	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	7799018	2022/01/26	2022/01/26	Suban Kanapathippllai
Total Metals Analysis by ICPMS	ICP/MS	7800742	N/A	2022/01/26	Azita Fazaeli
Total Ammonia-N	LACH/NH4	7748274	N/A	2021/11/27	Amanpreet Sappal
Nitrate & Nitrite as Nitrogen in Water	LACH	7748877	N/A	2021/11/26	Chandra Nandlal
pH	AT	7751116	2021/11/28	2021/11/29	Surinder Rai
Orthophosphate	KONE	7725617	N/A	2021/11/29	Avneet Kour Sudan
Sat. pH and Langelier Index (@ 20C)	CALC	7724806	N/A	2022/01/26	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7724808	N/A	2022/01/26	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7725015	N/A	2021/11/26	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	7724807	N/A	2022/01/26	Automated Statchk

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

TEST SUMMARY

Bureau Veritas ID: RHD459
Sample ID: FIELD DUP1
Matrix: Water

Collected: 2021/11/08
Shipped:
Received: 2021/11/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Organic Carbon (TOC)	TOCV/NDIR	7812398	N/A	2022/02/02	Anna-Kay Gooden
Total Phosphorus (Colourimetric)	LACH/P	7812399	2022/02/02	2022/02/02	Shivani Shivani
Turbidity	AT	7799231	N/A	2022/01/28	Neil Dassanayake

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Turbidity, Metals, TOC and total phosphorus analyzed past hold time for samples SW21-01, SW21-02 and Field DUP1 with client's consent.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7732216	1,4-Difluorobenzene	2021/11/29	98	70 - 130	97	70 - 130	103	%				
7732216	4-Bromofluorobenzene	2021/11/29	102	70 - 130	108	70 - 130	96	%				
7732216	D10-o-Xylene	2021/11/29	92	70 - 130	100	70 - 130	102	%				
7732216	D4-1,2-Dichloroethane	2021/11/29	100	70 - 130	95	70 - 130	107	%				
7736282	o-Terphenyl	2021/11/26	95	60 - 130	80	60 - 130	87	%				
7716064	Conductivity	2021/11/29			100	85 - 115	<1.0	umho/cm	0.38	25		
7716090	Alkalinity (Total as CaCO3)	2021/11/29			94	85 - 115	<1.0	mg/L				
7722104	Dissolved Chloride (Cl-)	2021/11/29	115	80 - 120	103	80 - 120	<1.0	mg/L	4.1	20		
7725015	Dissolved Sulphate (SO4)	2021/11/26			106	80 - 120	<1.0	mg/L				
7725026	Dissolved Chloride (Cl-)	2021/11/26			102	80 - 120	<1.0	mg/L				
7725617	Orthophosphate (P)	2021/11/29	NC	75 - 125	101	80 - 120	<0.010	mg/L	1.0	25		
7725667	Orthophosphate (P)	2021/11/29	120	75 - 125	101	80 - 120	<0.010	mg/L	4.9	25		
7725678	Dissolved Sulphate (SO4)	2021/11/29	133 (1)	75 - 125	105	80 - 120	<1.0	mg/L	NC	20		
7727106	Dissolved Organic Carbon	2021/11/26	97	80 - 120	95	80 - 120	<0.40	mg/L	1.2	20		
7732216	Benzene	2021/11/29	113	50 - 140	104	50 - 140	<0.20	ug/L	NC	30		
7732216	Ethylbenzene	2021/11/29	119	50 - 140	110	50 - 140	<0.20	ug/L	NC	30		
7732216	F1 (C6-C10) - BTEX	2021/11/29					<25	ug/L	NC	30		
7732216	F1 (C6-C10)	2021/11/29	95	60 - 140	89	60 - 140	<25	ug/L	NC	30		
7732216	o-Xylene	2021/11/29	117	50 - 140	107	50 - 140	<0.20	ug/L	NC	30		
7732216	p+m-Xylene	2021/11/29	117	50 - 140	108	50 - 140	<0.40	ug/L	NC	30		
7732216	Toluene	2021/11/29	108	50 - 140	97	50 - 140	<0.20	ug/L	NC	30		
7732216	Total Xylenes	2021/11/29					<0.40	ug/L	NC	30		
7736282	F2 (C10-C16 Hydrocarbons)	2021/11/27	116	60 - 130	101	60 - 130	<100	ug/L	NC	30		
7736282	F3 (C16-C34 Hydrocarbons)	2021/11/27	119	60 - 130	105	60 - 130	<200	ug/L	NC	30		
7736282	F4 (C34-C50 Hydrocarbons)	2021/11/27	123	60 - 130	105	60 - 130	<200	ug/L	NC	30		
7748274	Total Ammonia-N	2021/11/27	94	75 - 125	98	80 - 120	<0.050	mg/L	1.2	20		
7748877	Nitrate (N)	2021/11/26	96	80 - 120	103	80 - 120	<0.10	mg/L	NC	20		
7748877	Nitrite (N)	2021/11/26	102	80 - 120	107	80 - 120	<0.010	mg/L	NC	20		
7751116	pH	2021/11/29			101	98 - 103			0.096	N/A		
7767702	Dissolved Aluminum (Al)	2022/01/07	106	80 - 120	101	80 - 120	<0.0049	mg/L	NC	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7767702	Dissolved Antimony (Sb)	2022/01/07	NC	80 - 120	101	80 - 120	<0.00050	mg/L	1.4	20		
7767702	Dissolved Arsenic (As)	2022/01/07	NC	80 - 120	100	80 - 120	<0.0010	mg/L	0.96	20		
7767702	Dissolved Barium (Ba)	2022/01/07	107	80 - 120	101	80 - 120	<0.0020	mg/L	2.0	20		
7767702	Dissolved Beryllium (Be)	2022/01/07	114	80 - 120	96	80 - 120	<0.00040	mg/L	NC	20		
7767702	Dissolved Boron (B)	2022/01/07	104	80 - 120	91	80 - 120	<0.010	mg/L	0.039	20		
7767702	Dissolved Cadmium (Cd)	2022/01/07	105	80 - 120	100	80 - 120	<0.000090	mg/L	NC	20		
7767702	Dissolved Calcium (Ca)	2022/01/07	NC	80 - 120	101	80 - 120	<0.20	mg/L	1.0	20		
7767702	Dissolved Chromium (Cr)	2022/01/07	98	80 - 120	95	80 - 120	<0.0050	mg/L	NC	20		
7767702	Dissolved Cobalt (Co)	2022/01/07	100	80 - 120	99	80 - 120	<0.00050	mg/L	1.1	20		
7767702	Dissolved Copper (Cu)	2022/01/07	106	80 - 120	102	80 - 120	<0.00090	mg/L	1.9	20		
7767702	Dissolved Iron (Fe)	2022/01/07	104	80 - 120	101	80 - 120	<0.10	mg/L	NC	20		
7767702	Dissolved Lead (Pb)	2022/01/07	98	80 - 120	95	80 - 120	<0.00050	mg/L	NC	20		
7767702	Dissolved Magnesium (Mg)	2022/01/07	102	80 - 120	102	80 - 120	<0.050	mg/L	0.00026	20		
7767702	Dissolved Manganese (Mn)	2022/01/07	103	80 - 120	99	80 - 120	<0.0020	mg/L	4.9	20		
7767702	Dissolved Molybdenum (Mo)	2022/01/07	108	80 - 120	102	80 - 120	<0.00050	mg/L	1.4	20		
7767702	Dissolved Nickel (Ni)	2022/01/07	96	80 - 120	95	80 - 120	<0.0010	mg/L	1.2	20		
7767702	Dissolved Phosphorus (P)	2022/01/07	116	80 - 120	120	80 - 120	<0.10	mg/L	NC	20		
7767702	Dissolved Potassium (K)	2022/01/07	107	80 - 120	103	80 - 120	<0.20	mg/L	0.90	20		
7767702	Dissolved Selenium (Se)	2022/01/07	103	80 - 120	97	80 - 120	<0.0020	mg/L	NC	20		
7767702	Dissolved Silicon (Si)	2022/01/07	102	80 - 120	99	80 - 120	<0.050	mg/L	0.29	20		
7767702	Dissolved Silver (Ag)	2022/01/07	104	80 - 120	101	80 - 120	<0.000090	mg/L	NC	20		
7767702	Dissolved Sodium (Na)	2022/01/07	103	80 - 120	101	80 - 120	<0.10	mg/L	1.4	20		
7767702	Dissolved Strontium (Sr)	2022/01/07	100	80 - 120	97	80 - 120	<0.0010	mg/L	2.4	20		
7767702	Dissolved Thallium (Tl)	2022/01/07	100	80 - 120	95	80 - 120	<0.000050	mg/L	NC	20		
7767702	Dissolved Titanium (Ti)	2022/01/07	100	80 - 120	97	80 - 120	<0.0050	mg/L	NC	20		
7767702	Dissolved Uranium (U)	2022/01/07	98	80 - 120	93	80 - 120	<0.00010	mg/L	0.34	20		
7767702	Dissolved Vanadium (V)	2022/01/07	101	80 - 120	97	80 - 120	<0.00050	mg/L	4.1	20		
7767702	Dissolved Zinc (Zn)	2022/01/07	101	80 - 120	98	80 - 120	<0.0050	mg/L	2.7	20		
7799018	Dissolved Calcium (Ca)	2022/01/26	NC	80 - 120	100	80 - 120	<0.05	mg/L	1.3	25		
7799018	Dissolved Magnesium (Mg)	2022/01/26	NC	80 - 120	95	80 - 120	<0.05	mg/L	0.69	25		
7799018	Dissolved Potassium (K)	2022/01/26	96	80 - 120	98	80 - 120	<1	mg/L	1.4	25		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7799018	Dissolved Sodium (Na)	2022/01/26	NC	80 - 120	97	80 - 120	<0.5	mg/L	0.86	25		
7799231	Turbidity	2022/01/28			93	85 - 115	<0.1	NTU	5.0	20		
7800742	Total Aluminum (Al)	2022/01/26	101	80 - 120	102	80 - 120	<0.0049	mg/L	0.11	20		
7800742	Total Antimony (Sb)	2022/01/26	103	80 - 120	100	80 - 120	<0.00050	mg/L	NC	20		
7800742	Total Arsenic (As)	2022/01/26	101	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20		
7800742	Total Barium (Ba)	2022/01/26	100	80 - 120	99	80 - 120	<0.0020	mg/L	0.73	20		
7800742	Total Beryllium (Be)	2022/01/26	101	80 - 120	101	80 - 120	<0.00040	mg/L	NC	20		
7800742	Total Boron (B)	2022/01/26	99	80 - 120	101	80 - 120	<0.010	mg/L	4.0	20		
7800742	Total Cadmium (Cd)	2022/01/26	102	80 - 120	100	80 - 120	<0.000090	mg/L	NC	20		
7800742	Total Calcium (Ca)	2022/01/26	NC	80 - 120	98	80 - 120	<0.20	mg/L	0.95	20		
7800742	Total Chromium (Cr)	2022/01/26	97	80 - 120	99	80 - 120	<0.0050	mg/L	NC	20		
7800742	Total Cobalt (Co)	2022/01/26	96	80 - 120	97	80 - 120	<0.00050	mg/L	NC	20		
7800742	Total Copper (Cu)	2022/01/26	99	80 - 120	97	80 - 120	<0.00090	mg/L	NC	20		
7800742	Total Iron (Fe)	2022/01/26	97	80 - 120	97	80 - 120	<0.10	mg/L	NC	20		
7800742	Total Lead (Pb)	2022/01/26	94	80 - 120	95	80 - 120	<0.00050	mg/L	NC	20		
7800742	Total Magnesium (Mg)	2022/01/26	NC	80 - 120	100	80 - 120	<0.050	mg/L	1.9	20		
7800742	Total Manganese (Mn)	2022/01/26	99	80 - 120	100	80 - 120	<0.0020	mg/L	3.2	20		
7800742	Total Molybdenum (Mo)	2022/01/26	101	80 - 120	98	80 - 120	<0.00050	mg/L	4.7	20		
7800742	Total Nickel (Ni)	2022/01/26	95	80 - 120	96	80 - 120	<0.0010	mg/L	NC	20		
7800742	Total Potassium (K)	2022/01/26	101	80 - 120	100	80 - 120	<0.20	mg/L	0.24	20		
7800742	Total Selenium (Se)	2022/01/26	100	80 - 120	100	80 - 120	<0.0020	mg/L	NC	20		
7800742	Total Silicon (Si)	2022/01/26	99	80 - 120	98	80 - 120	<0.050	mg/L	1.9	20		
7800742	Total Silver (Ag)	2022/01/26	99	80 - 120	98	80 - 120	<0.000090	mg/L	NC	20		
7800742	Total Sodium (Na)	2022/01/26	98	80 - 120	100	80 - 120	<0.10	mg/L	2.0	20		
7800742	Total Strontium (Sr)	2022/01/26	95	80 - 120	98	80 - 120	<0.0010	mg/L	1.8	20		
7800742	Total Thallium (Tl)	2022/01/26	94	80 - 120	95	80 - 120	<0.000050	mg/L	NC	20		
7800742	Total Titanium (Ti)	2022/01/26	96	80 - 120	99	80 - 120	<0.0050	mg/L	NC	20		
7800742	Total Tungsten (W)	2022/01/26	98	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20		
7800742	Total Uranium (U)	2022/01/26	100	80 - 120	102	80 - 120	<0.00010	mg/L	4.1	20		
7800742	Total Vanadium (V)	2022/01/26	99	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20		
7800742	Total Zinc (Zn)	2022/01/26	98	80 - 120	101	80 - 120	<0.0050	mg/L	0.86	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7800742	Total Zirconium (Zr)	2022/01/26	102	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20		
7812398	Total Organic Carbon (TOC)	2022/02/02	97	80 - 120	96	80 - 120	<0.40	mg/L	0.025	20		
7812399	Total Phosphorus	2022/02/02	104	80 - 120	100	80 - 120	<0.004	mg/L	0.92	20	100	80 - 120

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10

Stantec Consulting Ltd
Client Project #: 160961457
Site Location: TIKAL
Sampler Initials: RD

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

[redacted]
Anastassia Hamanov, Scientific Specialist

[redacted]
Brad Newman, B.Sc., C.Chem., Scientific Service Specialist

[redacted]
Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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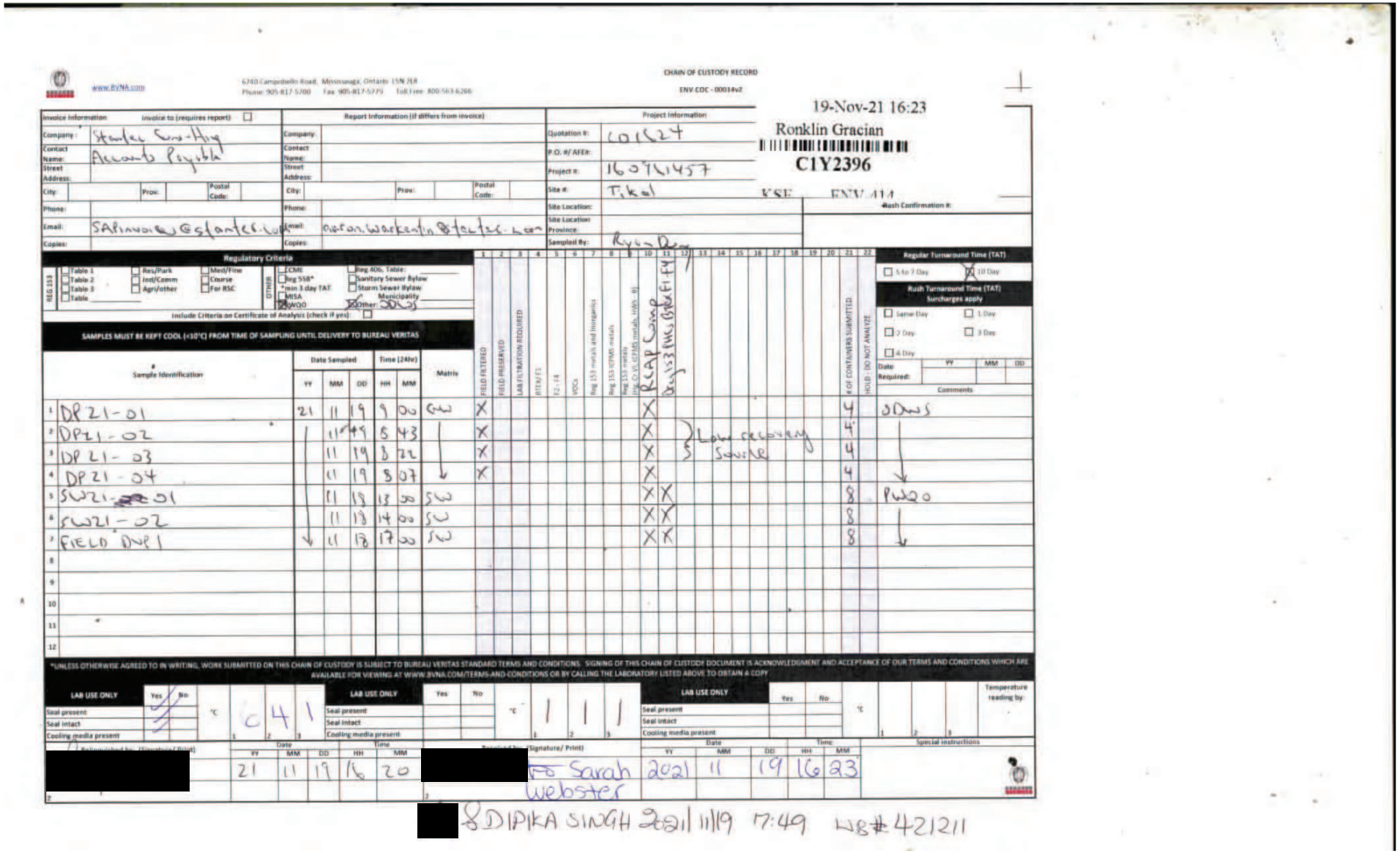

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CHAIN OF CUSTODY RECORD — ENV COC - 00014v2

19-Nov-21 16:23
Ronklin Gracian
C1Y2396

Invoice Information (invoice to (requires report) ☐): Company: Stantec Consulting; Contact Name: Accounts Payable; Street Address:; City:; Prov:; Postal Code:; Phone:; Email: SAPinvoices@stantec.com; Copies:

Report Information (if differs from invoice): Company:; Contact Name:; Street Address:; City:; Prov:; Postal Code:; Phone:; Email: Alison.Workentin@stantec.com; Copies:

Project Information: Quotation #: C01624; P.O. #/ AFE#:; Project #: 160961457; Site #: Tikal; Site Location:; Site Location Province:; Sampled By: Ryan Dea

Rush Confirmation #:

Regulatory Criteria: REG 153: ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ____ ☐ Res/Park ☐ Ind/Comm ☐ Agri/other ☐ Med/Fine ☐ Coarse ☐ For RSC. OTHER: ☐ CCME ☐ Reg 558* *min 3 day TAT ☐ MISA ☒ PWQO ☐ Reg 406, Table: ____ ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw ☐ Municipality ____ ☐ Other: SDWS

Include Criteria on Certificate of Analysis (check if yes): ☐

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

#	Sample Identification	Date Sampled YY	MM	DD	Time (24hr) HH	MM	Matrix	FIELD FILTERED	FIELD PRESERVED	LAB FILTRATION REQUIRED	BTEX/F1	F2 - F4	VOCs	Reg 153 metals and Inorganics	Reg 153 ICPMS metals	Reg 153 metals (Hg, Cr VI, ICPMS metals, HWS - B)	RCAP Comp Grab (153 PHCs, BTEX, F1-F4)		# OF CONTAINERS SUBMITTED	HOLD - DO NOT ANALYZE	Comments
1	DP21-01	'21	11	19	9	00	GW	X									X		4		SDWS
2	DP21-02		11	19	5	43		X									X		4		
3	DP21-03		11	19	8	22		X									X		4		
4	DP21-04		11	19	8	07	↓	X									X		4		↓
5	SW21-01		11	18	13	00	SW										X	X	8		PWQO
6	SW21-02		11	18	14	00	SW										X	X	8		
7	FIELD DUP1	↓	11	18	17	00	SW										X	X	8		↓
8																					
9																					
10																					
11																					
12																					

Regular Turnaround Time (TAT): ☐ 5 to 7 Day ☒ 10 Day

Rush Turnaround Time (TAT) Surcharges apply: ☐ Same Day ☐ 1 Day ☐ 2 Day ☐ 3 Day ☐ 4 Day

Date Required: YY MM DD

Comments

Lab receiving sample

*UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS AND CONDITIONS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS OR BY CALLING THE LABORATORY LISTED ABOVE TO OBTAIN A COPY

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present			6	4	1	

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present			1	1	1	

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present						

Temperature reading by:

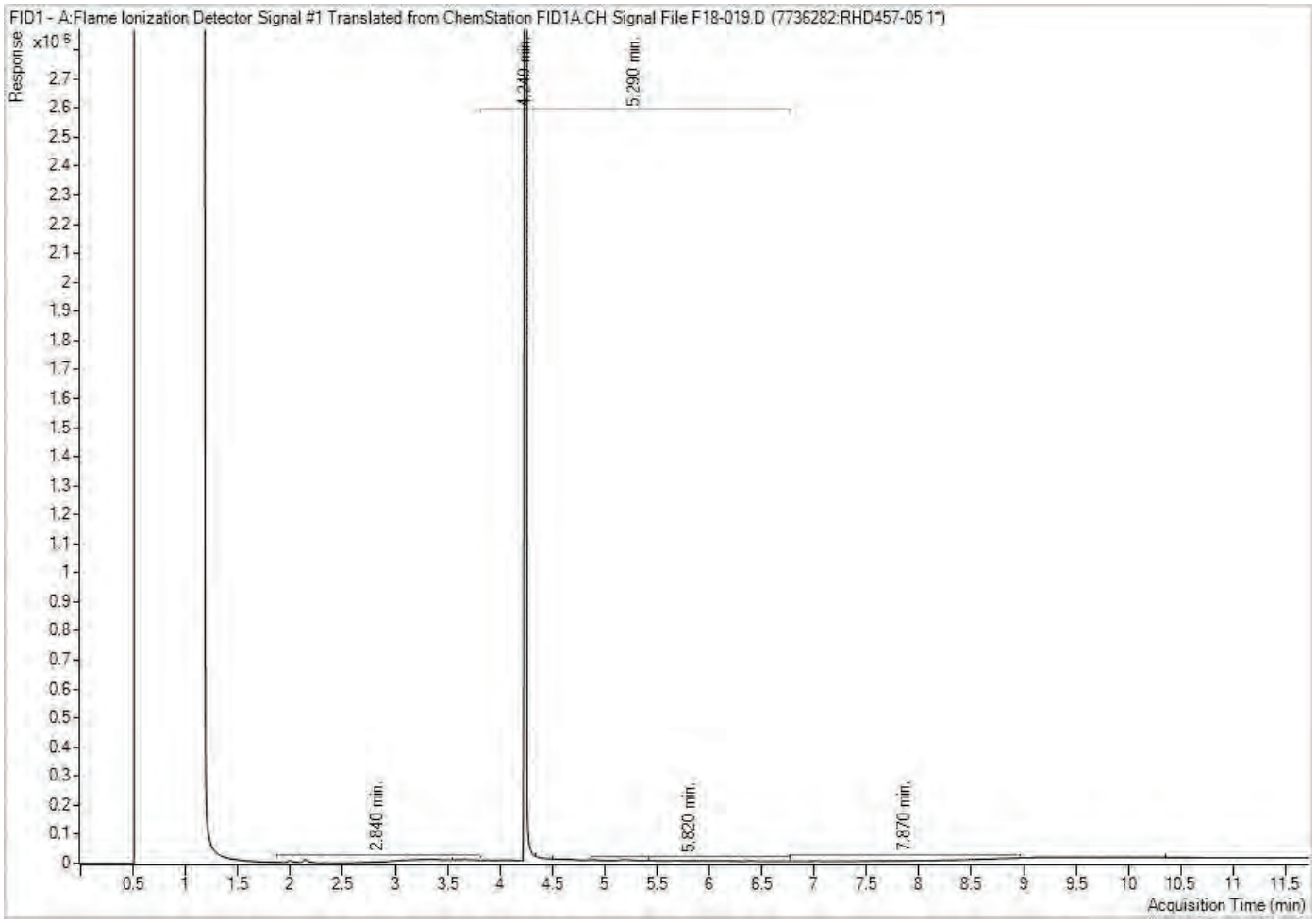
	Relinquished by: (Signature / Print)	Date YY	MM	DD	Time HH	MM	Received by: (Signature/ Print)	Date YY	MM	DD	Time HH	MM	Special instructions
1	[redacted]	21	11	19	16	20	[redacted] Sarah Webster	2021	11	19	16	23	
2													

[redacted] SDIPIKA SINGH 2021 11 19 17:49 WS# 421211

Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10
Bureau Veritas Sample: RHD457

Stantec Consulting Ltd
Client Project #: 160961457
Project name: TIKAL
Client ID: SW21-01

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



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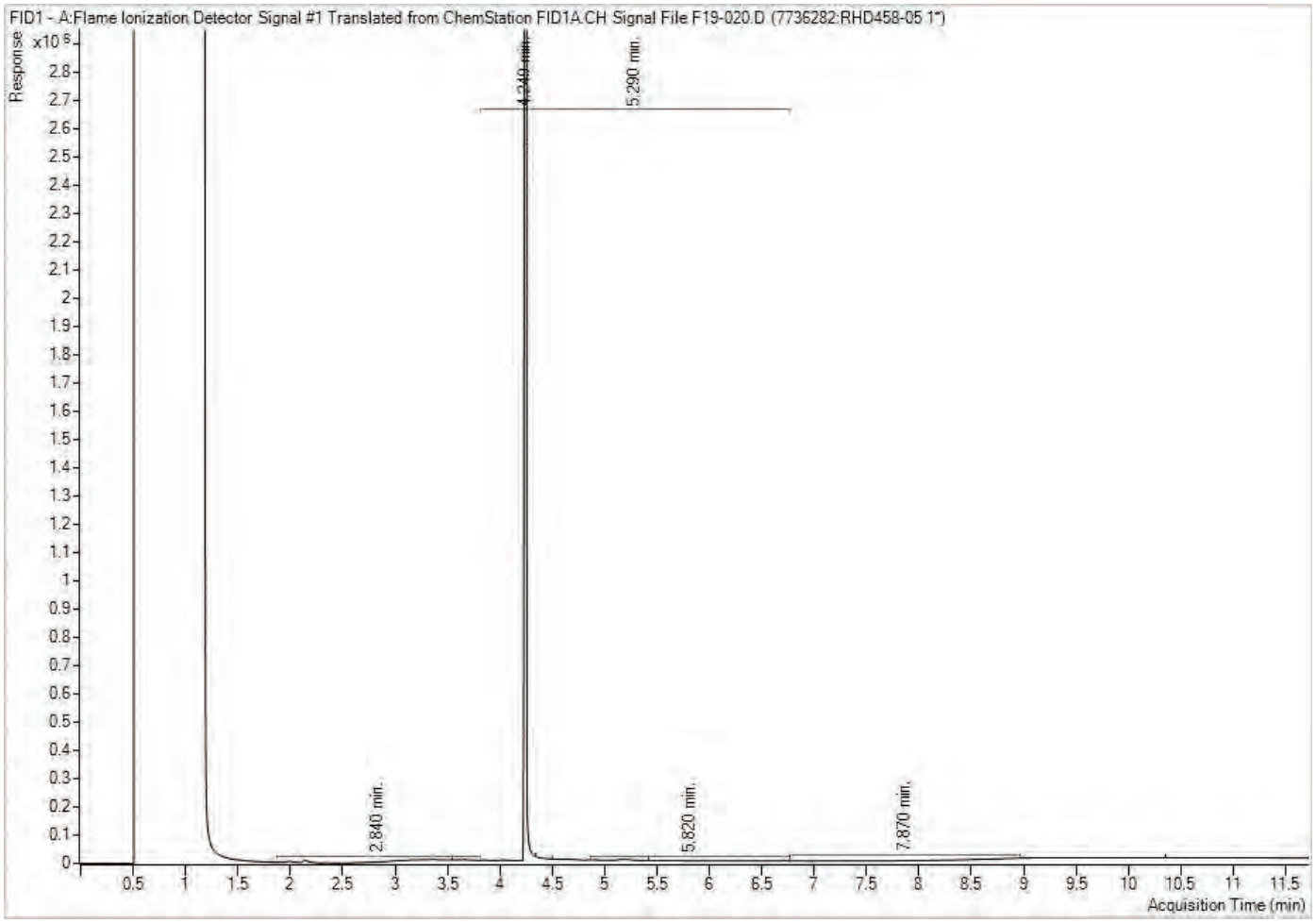
Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10
Bureau Veritas Sample: RHD458

Stantec Consulting Ltd
Client Project #: 160961457
Project name: TIKAL
Client ID: SW21-02

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



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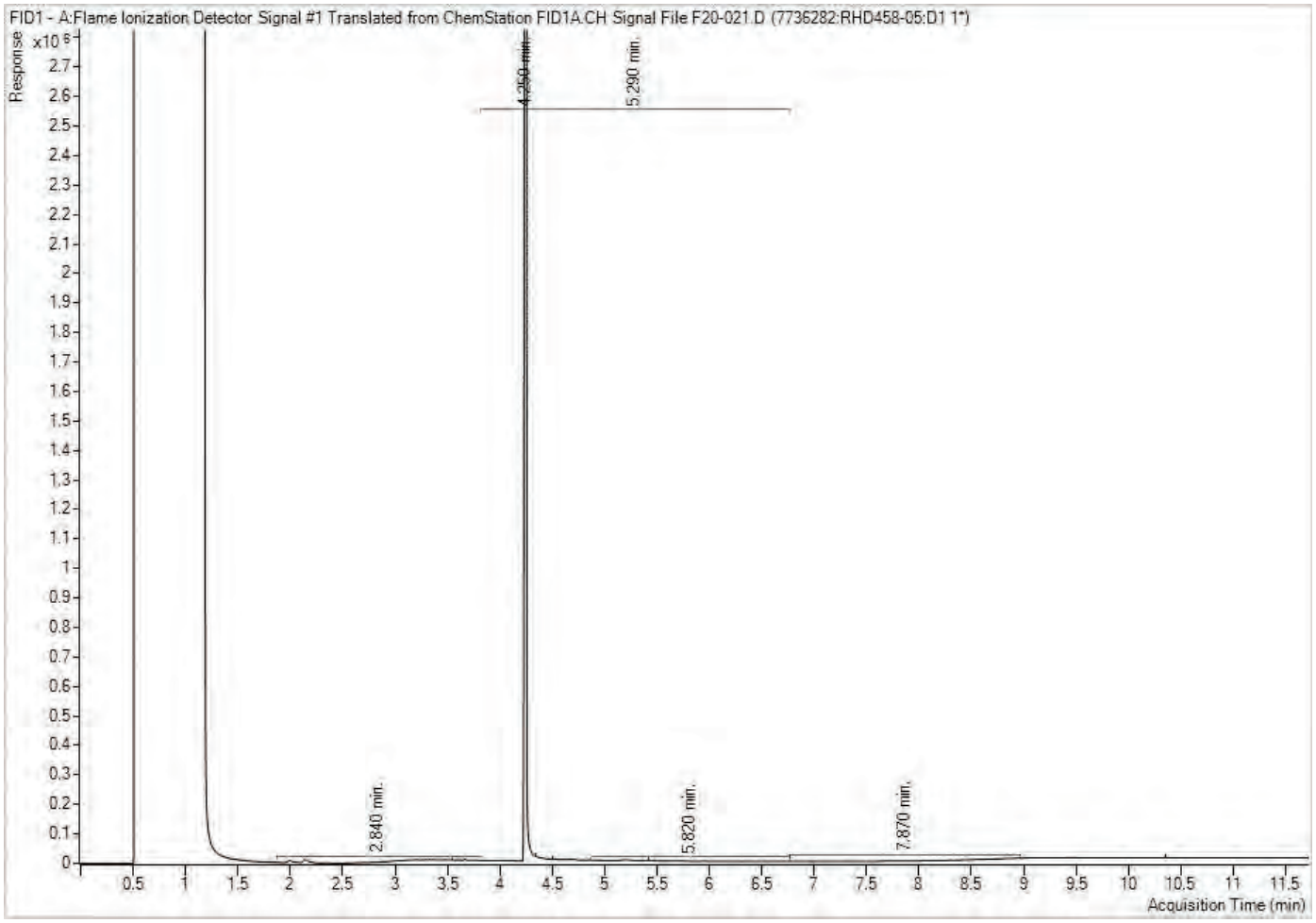
Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10
Bureau Veritas Sample: RHD458 Lab-Dup

Stantec Consulting Ltd
Client Project #: 160961457
Project name: TIKAL
Client ID: SW21-02

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



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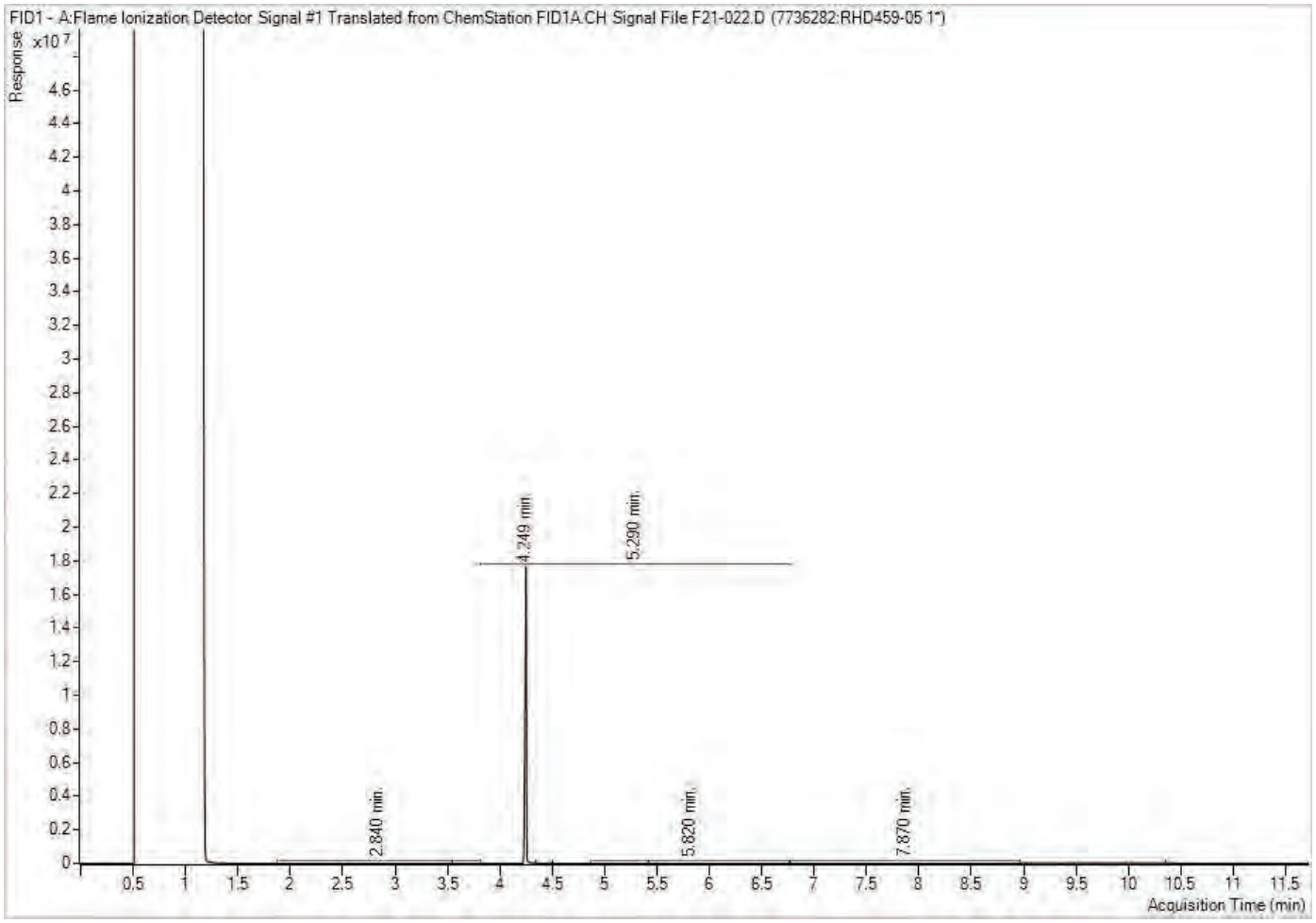
Bureau Veritas Job #: C1Y2396
Report Date: 2022/02/10
Bureau Veritas Sample: RHD459

Stantec Consulting Ltd
Client Project #: 160961457
Project name: TIKAL
Client ID: FIELD DUP1

Petroleum Hydrocarbons F2-F4 in Water Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Appendix F

Water Balance, Streamflow Analysis and Source Protection Mapping

TABLE F1
PRE-DEVELOPMENT MONTHLY WATER BALANCE

Monthly Water Balance Analysis - Thornthwaite and Mather model

Proposed Anthony Aggregate Pit Site, 4454 Victoria Road South, Puslinch, Ontario

Total Area Considered (ha) 8.77

Land Description Factors	Pre-Development Extraction Footprint								
Topography	0.18								
Soils	0.40								
Cover	0.20								
Sum (Infiltration Factor)	0.78								
Soil Moisture Capacity (mm)	75								
Subcatchment Area Considered (ha)	8.77								
Impervious Coefficient	0.00								
Impervious Area (ha)	0.00								0.00
Remaining Pervious Area (ha)	8.77								
Total Pervious Site Area (ha)	8.77								8.77
Percentage of Total Site Area	100%								100%

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Climate Data (Region of Waterloo International Airport Climate Station - 6144239, Ontario via Environment Canada Website - Climate Normals from 1991-2020)													
Average Daily Temperature (°C)	-6.3	-5.9	-0.8	5.9	12.6	17.8	20.2	19.1	15.2	8.8	2.6	-2.8	**7.2**
Precipitation (mm)	66	46	57	81	80	81	96	67	75	71	75	55	**851**
Evapotranspiration Analysis (Pre-Development Extraction Footprint)													
Heat Index	0.0	0.0	0.0	1.3	4.1	6.8	8.3	7.6	5.4	2.4	0.4	0.0	**36**
Unadjusted Potential Evapotranspiration (mm)	0.0	0.0	0.0	27.0	60.7	87.8	100.5	94.7	74.2	41.4	11.2	0.0	**497**
Potential Evapotranspiration Adjusting Factor for Latitude	0.81	0.92	1.06	1.18	1.27	1.29	1.22	1.11	0.98	0.86	0.76	0.74	
Adjusted Potential Evapotranspiration (mm)	0	0	0	32	77	113	123	105	73	36	9	0	**567**
PET (Malstrom, 1969) (mm/month)	0	0	0	32	77	113	123	105	73	36	9	0	**567**
Precipitation - PET (mm)	66	46	57	49	3	-33	-26	-38	3	35	66	55	**284**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-33	-59	-97	-88	-19	0	0	
Storage (S)	75	75	75	75	75	48	34	21	23	59	75	75	
Change in Storage	0	0	0	0	0	-27	-14	-14	3	35	16	0	
Actual Evapotranspiration (mm)	**0**	**0**	**0**	**32**	**77**	**107**	**111**	**81**	**73**	**36**	**9**	**0**	**524**
Recharge/Runoff Analysis													
Water Surplus (mm)	66	46	57	49	3	0	0	0	0	0	50	55	**327**
Potential Infiltration (I)	52	36	44	38	2	0	0	0	0	0	39	43	**255**
Potential Direct Surface Water Runoff (R)	**15**	**10**	**13**	**11**	**1**	**0**	**0**	**0**	**0**	**0**	**11**	**12**	**72**
Infiltration (mm)	**0**	**0**	**0**	**213**	**2**	**0**	**0**	**0**	**0**	**0**	**39**	**0**	**255**
Pervious Evapotranspiration (m^3)	0	0	0	2793	6760	9387	9698	7078	6374	3120	749	0	45959
Pervious Runoff (m^3)	1279	889	1100	952	60	0	0	0	0	0	962	1059	6302
Pervious Infiltration (m^3)	0	0	0	18720	213	0	0	0	0	0	3412	0	22345
Impervious Evapotranspiration (mm)	7	5	6	8	8	8	10	7	8	7	7	5	85
Impervious Runoff (mm)	60	41	51	73	72	72	87	60	68	64	67	49	766
Volumetric Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0

Pre-Development Infiltration	22,345	m^3/yr	255	mm/yr	61	m^3/day

TABLE F2
POST-DEVELOPMENT MONTHLY WATER BALANCE

Monthly Water Balance Analysis - Thornthwaite and Mather model

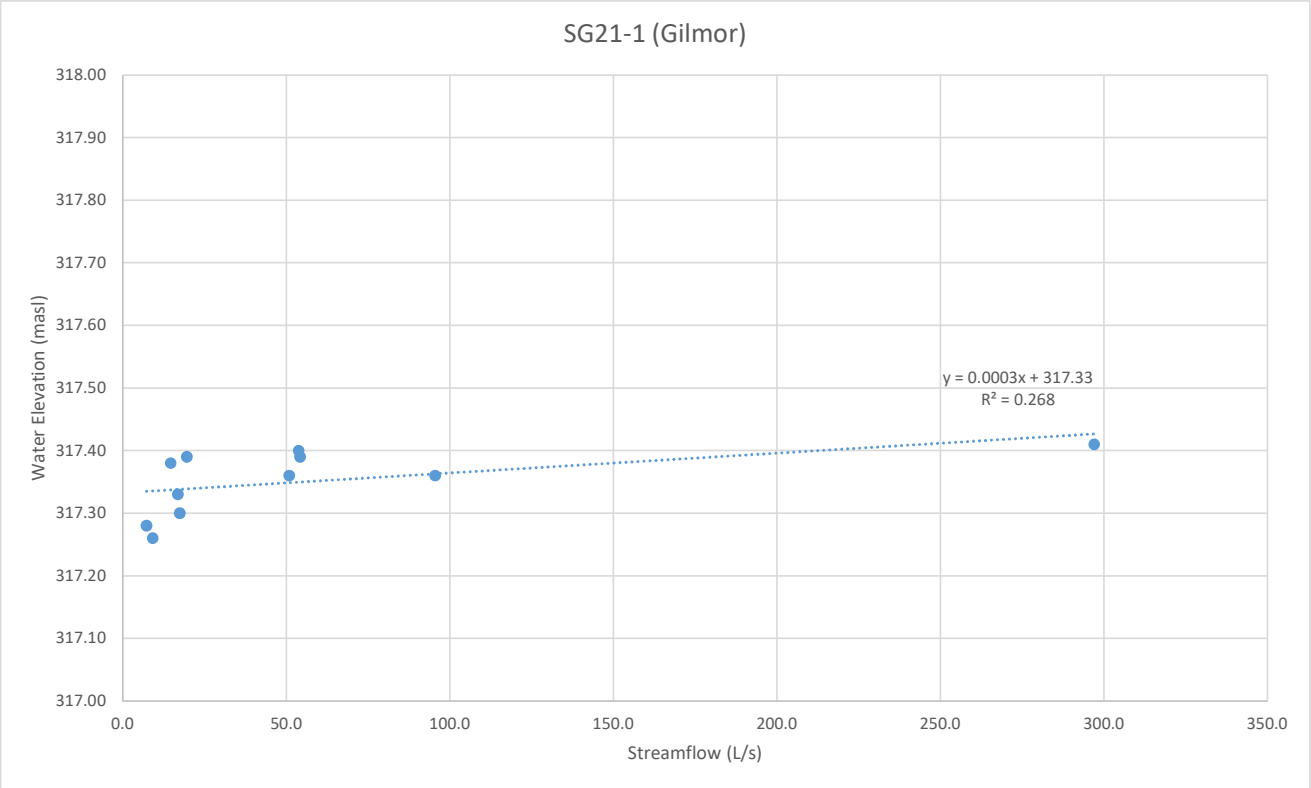
Proposed Anthony Aggregate Pit, 4454 Victoria Road South, Puslinch, Ontario

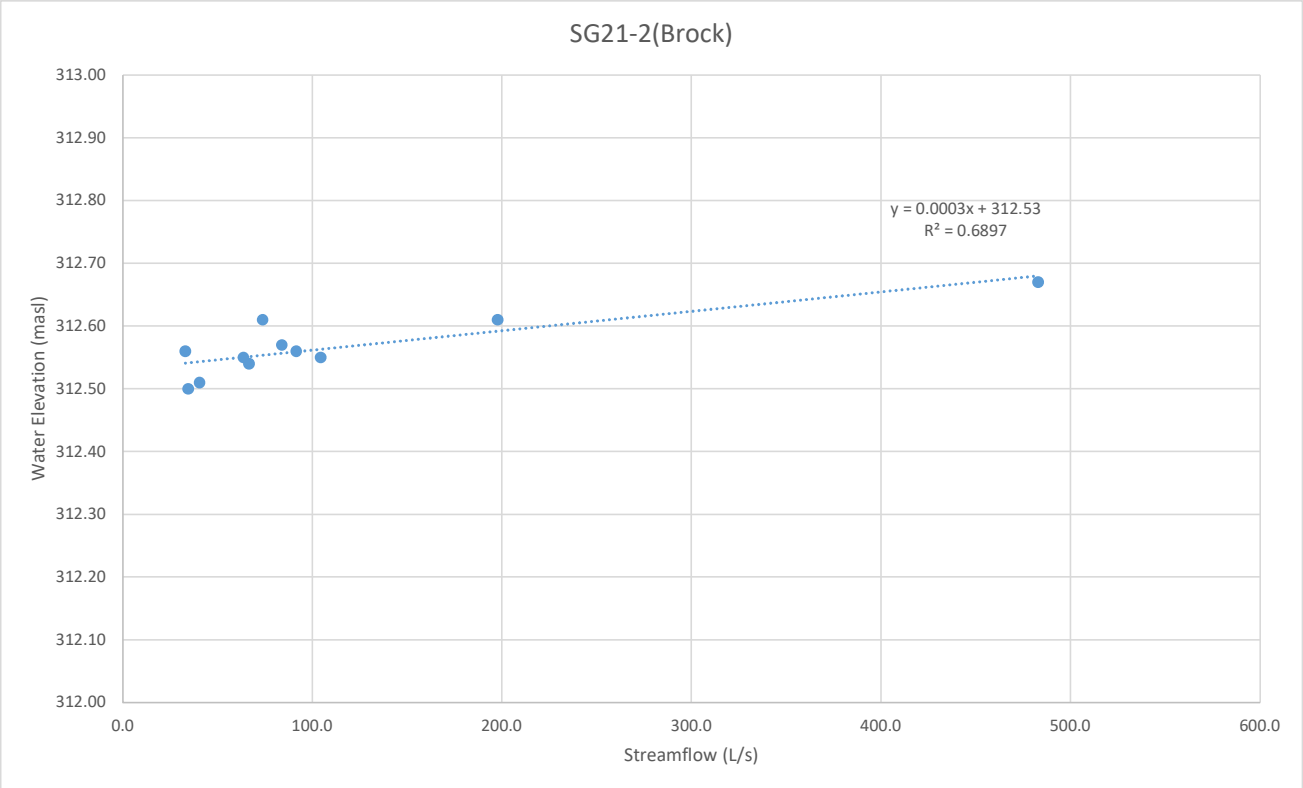
Total Site Area (ha) 8.77

Land Description Factors	Non-Ponded Areas	Ponded Areas
Topography	0.18	
Soils	0.40	
Cover	0.20	
Sum (Infiltration Factor)	0.78	
Soil Moisture Capacity (mm)	75	
Subcatchment Area (ha)	4.20	4.57
Impervious Coefficient	0.00	
Impervious Area (ha)	0.00	
Remaining Pervious Area (ha)	4.20	
Total Pervious Site Area (ha)	4.20	
Percentage of Total Site Area	48%	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Climate Data (Region of Waterloo International Airport Climate Station - 6144239, Ontario via Environment Canada Website - Climate Normals from 1991-2020)													
Average Daily Temperature (°C)	-6.3	-5.9	-0.8	5.9	12.6	17.8	20.2	19.1	15.2	8.8	2.6	-2.8	**7.2**
Precipitation (mm)	66	46	57	81	80	81	96	67	75	71	75	55	**851**
Evapotranspiration Analysis (Pre-Development Extraction Footprint)													
Heat Index	0.0	0.0	0.0	1.3	4.1	6.8	8.3	7.6	5.4	2.4	0.4	0.0	**36**
Unadjusted Potential Evapotranspiration (mm)	0.0	0.0	0.0	27.0	60.7	87.8	100.5	94.7	74.2	41.4	11.2	0.0	**497**
Potential Evapotranspiration Adjusting Factor for Latitude	0.81	0.92	1.06	1.18	1.27	1.29	1.22	1.11	0.98	0.86	0.76	0.74	
Adjusted Potential Evapotranspiration (mm)	0	0	0	32	77	113	123	105	73	36	9	0	**567**
PET (Malstrom, 1969) (mm/month)	0	0	0	32	77	113	123	105	73	36	9	0	**567**
Precipitation - PET (mm)	66	46	57	49	3	-33	-26	-38	3	35	66	55	**284**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-33	-59	-97	-88	-19	0	0	
Storage (S)	75	75	75	75	75	48	34	21	23	59	75	75	
Change in Storage	0	0	0	0	0	-27	-14	-14	3	35	16	0	
Actual Evapotranspiration (mm)	**0**	**0**	**0**	**32**	**77**	**107**	**111**	**81**	**73**	**36**	**9**	**0**	**524**
Recharge/Runoff Analysis													
Water Surplus (mm)	66	46	57	49	3	0	0	0	0	0	50	55	**327**
Potential Infiltration (I)	52	36	44	38	2	0	0	0	0	0	39	43	**255**
Potential Direct Surface Water Runoff (R)	**15**	**10**	**13**	**11**	**1**	**0**	**0**	**0**	**0**	**0**	**11**	**12**	**72**
Infiltration (mm)	**0**	**0**	**0**	**213**	**2**	**0**	**0**	**0**	**0**	**0**	**39**	**0**	**255**
Pervious Evapotranspiration (m^3)	0	0	0	1337	3237	4495	4644	3390	3053	1494	359	0	22010
Pervious Runoff (m^3)	613	426	527	456	29	0	0	0	0	0	461	507	3018
Pervious Infiltration (m^3)	0	0	0	8965	102	0	0	0	0	0	1634	0	10701
Impervious Evapotranspiration (mm)	3	2	3	4	4	4	5	4	4	4	4	3	45
Impervious Runoff (mm)	63	44	54	77	76	76	91	64	71	67	71	52	806
Volumetric Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0

Pre-Development Infiltration	**Non-Ponded Area**	**10,701**	**m^3/yr**	**122**	**mm/yr**	**29**	**m^3/day**
	Ponded Area	**46**	**m^3/yr**	**1**	**mm/yr**	**0**	**m^3/day**
	Total	**10,747**	**m^3/yr**	**123**	**mm/yr**	**29**	**m^3/day**
Pre-Development Infiltration		**22,345**	**m^3/yr**	**255**	**mm/yr**	**61**	**m^3/day**
Infiltration Deficit		**11,598**	**m^3/yr**	**132**	**mm/yr**	**32**	**m^3/day**





Client/Project

Hydrogeological Assessment Level I and II Report
For Proposed Anthony Aggregate Pit,
4454 Victoria Road South, Puslinch, ON

Figure No.

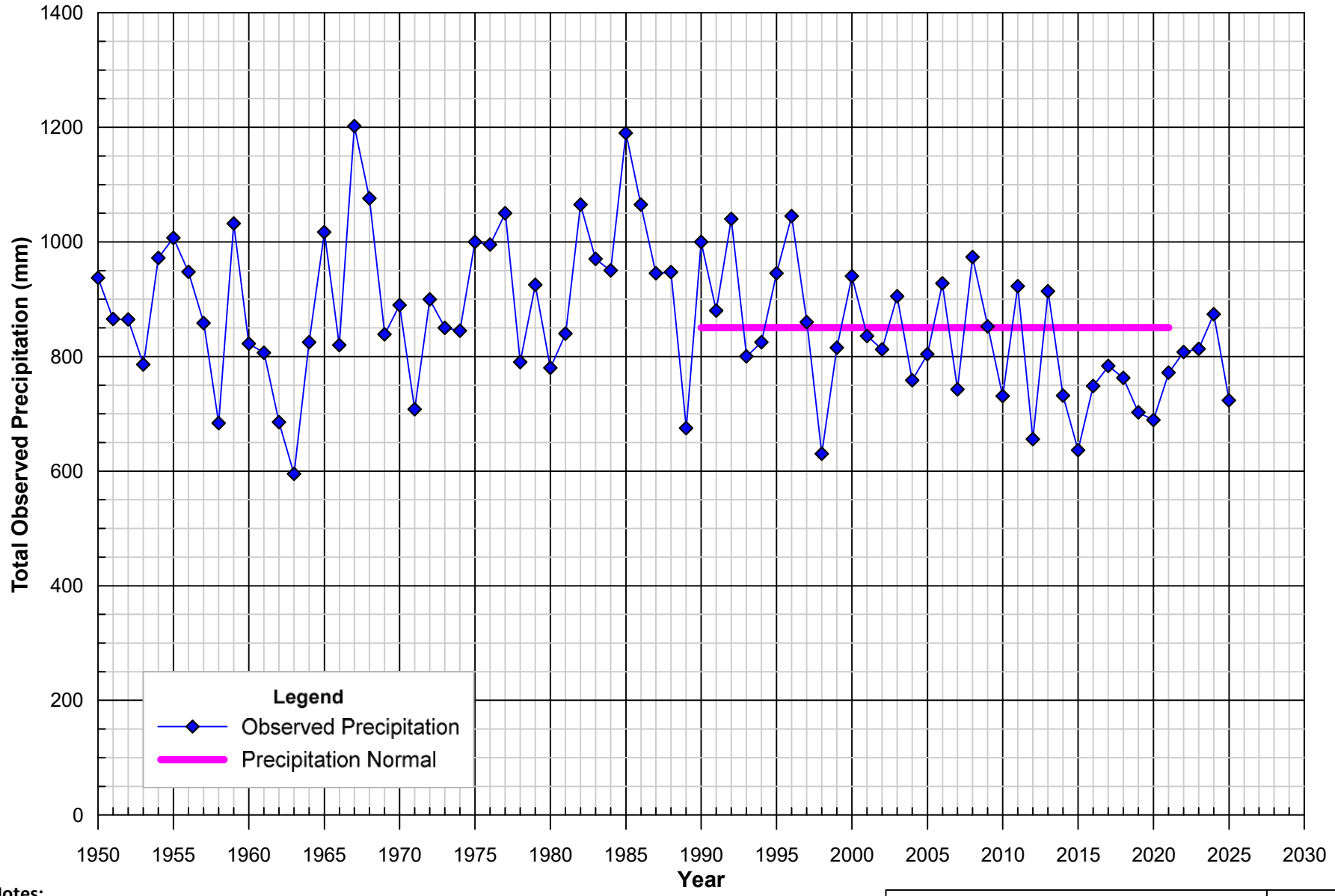
F1

Title

Streamflow Analysis

Stantec

\\ca0004-ppfss04\WORK_GROUP\01609\active\160961457\03_data\analytical\baseflow\From_Stephen\Fig F1 Streamflow Analysis.xlsx



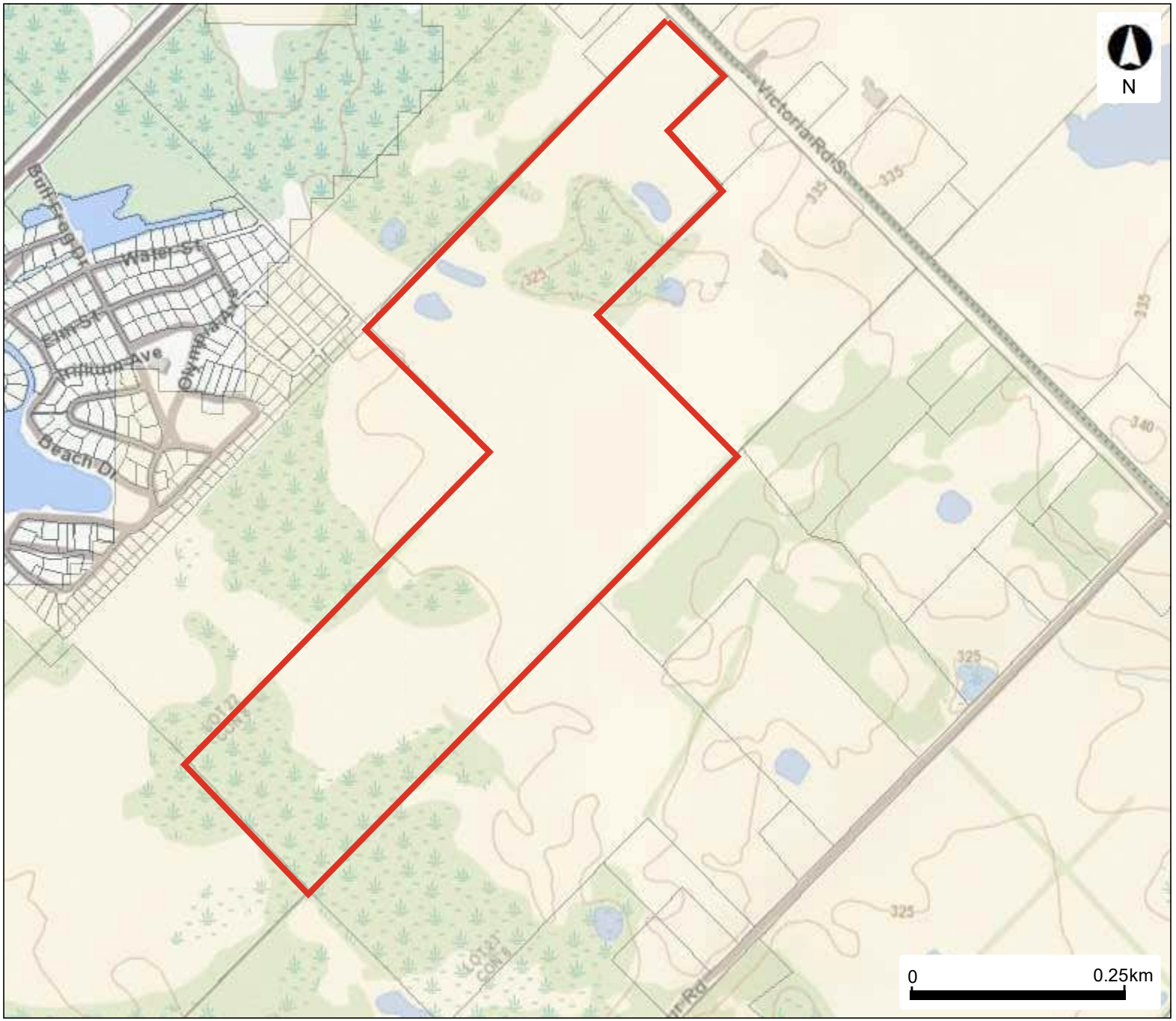
Notes:

1. Annual precipitation totals reflect the following data sources:
Shand Dam, Fergus (6142400) from 1950 to 1970, 2007 and 2022
Region of Waterloo Airport (6149387, 6149388, 6144239) from 1971 through 2026, except 2007 and 2022

2. Precipitation normal data provided by Environment Canada for Region of Waterloo Airport

Historic Precipitation Data		Stantec
DRAWN: AW	APPROVED: SMD	DATE: January 2026
PROJECT NUMBER: 160961457		FIGURE: F3

Figure F-4: Source Protection Mapping



Legend

Significant Groundwater Recharge Area
- N/A
- 0
- 2
- 4
- 6

Highly Vulnerable Aquifers

WHPA-E

Wellhead Protection Area
- A
- B
- C
- C1
- D
- F

Assessment Parcel

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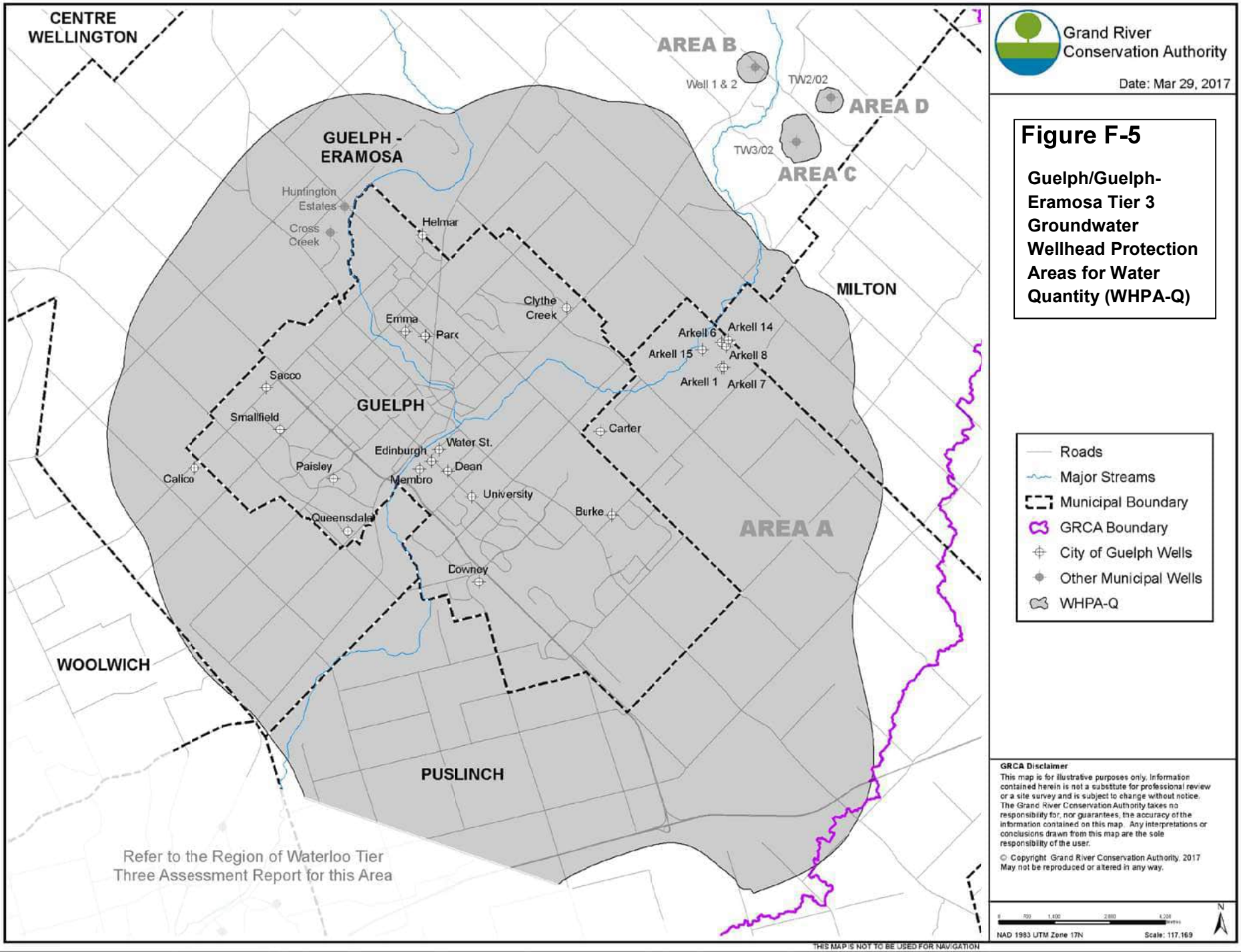
Map Created: 12/30/2024
Map Center: 43.47946 N, -80.13322 W



Grand River Conservation Authority

Date: Mar 29, 2017

Figure F-5

Guelph/Guelph-Eramosa Tier 3 Groundwater Wellhead Protection Areas for Water Quantity (WHPA-Q)

GRCA Disclaimer

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NAD 1983 UTM Zone 17N

Scale: 117,169

Appendix G

Groundwater Model Memorandum

Stantec

Memo

To:	Stephen May, Lands Manager -West CBM Aggregates	From:	Rick Reinke, Stephen Di Biase Stantec
Project/File:	160961457	Date:	February 6, 2026

CBM Aggregates, a division of division of St. Mary's Cement Inc,. (CBM) retained Stantec Consulting Ltd. (Stantec) to conduct a groundwater modeling and thermal transport study for the new proposed Anthony Aggregate Pit, located in the Township of Puslinch, near Aberfoyle, Ontario. A three-dimensional numerical groundwater flow and thermal transport model has been developed to evaluate potential water table drawdown and thermal impacts of the proposed Anthony Pit. This Technical Memorandum describes the construction and calibration of the model and the results of a predictive simulation to estimate potential thermal impacts due to the interaction of groundwater and the post-closure pit ponds.

1 Model Construction

A steady-state groundwater flow model was constructed using the USGS modular groundwater flow modeling code, MODFLOW, and transient thermal transport was simulated using the MT3D solute transport code coupled to the MODFLOW flow model. The local surface water catchment was used to define the extent of the model domain (Figure 1). Three model layers were used to represent the local geology based on a conceptual model developed by Stantec (Stantec, 2026) – Layer 1 representing unconsolidated overburden, Layer 2 representing silty clay deposits, and Layer 3 representing bedrock.

1.1 Hydrogeologic Parameters

Initial conductivity values were assigned based on limited site-specific data as described in the conceptual model report (Stantec, 2022). Hydraulic conductivity in model Layer 1 was assigned based on surficial geologic zones as shown in Figure 2 and Table 1. Layer 2 and Layer 3 were assigned a single hydraulic conductivity zone per layer. These initial parameter values were varied during model calibration but kept within expected ranges. Final calibrated values are also presented in Table 1. Vertical anisotropy was assigned a ratio of Kh:Kv = 10.

The values for specific storage, specific yield, and porosity assigned to each model layer are shown in Table 2. These were estimated based on the conceptual model and literature values (Fetter, 2001).

Areal recharge representing the amount of annual precipitation that infiltrates to the groundwater table was assigned an initial value of 365 mm/year based on the site conceptual model (Stantec, 2026). Areal recharge was reduced to 296 mm/year during model calibration. Evapotranspiration (ET) was set to 490 mm/year based on literature values for the region. ET extinction depth was set to 1 meter.

Reference: Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling

		Initial Model Kx (m/s)	Calibrated Model Kx after PEST (m/s)
Layer1	Organic deposits	5.00E-05	1.90E-05
	Glaciofluvial deposits (Gravelly deposits)	5.00E-05	1.50E-05
	Ice-contact stratified deposits	5.00E-05	1.67E-05
	Stone-poor, carbonate-derived silty to sandy till	5.00E-05	1.10E-04
Layer2	Silty Clay	1.00E-06	1.00E-06
Layer3	Bedrock	1.00E-07	4.00E-08

Table 1. Model hydraulic conductivity.

Model Layer	Specific yield, Sy dimensionless	Specific storage, Ss 1/d	Porosity dimensionless
1	0.15	0.02	0.3
2	0.05	0.001	0.05
3	0.02	1×10^{-5}	0.02

Table 2. Model storage parameters.

Reference: Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling

-

Figure 1. Local catchment scale model domain.

Reference: Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling

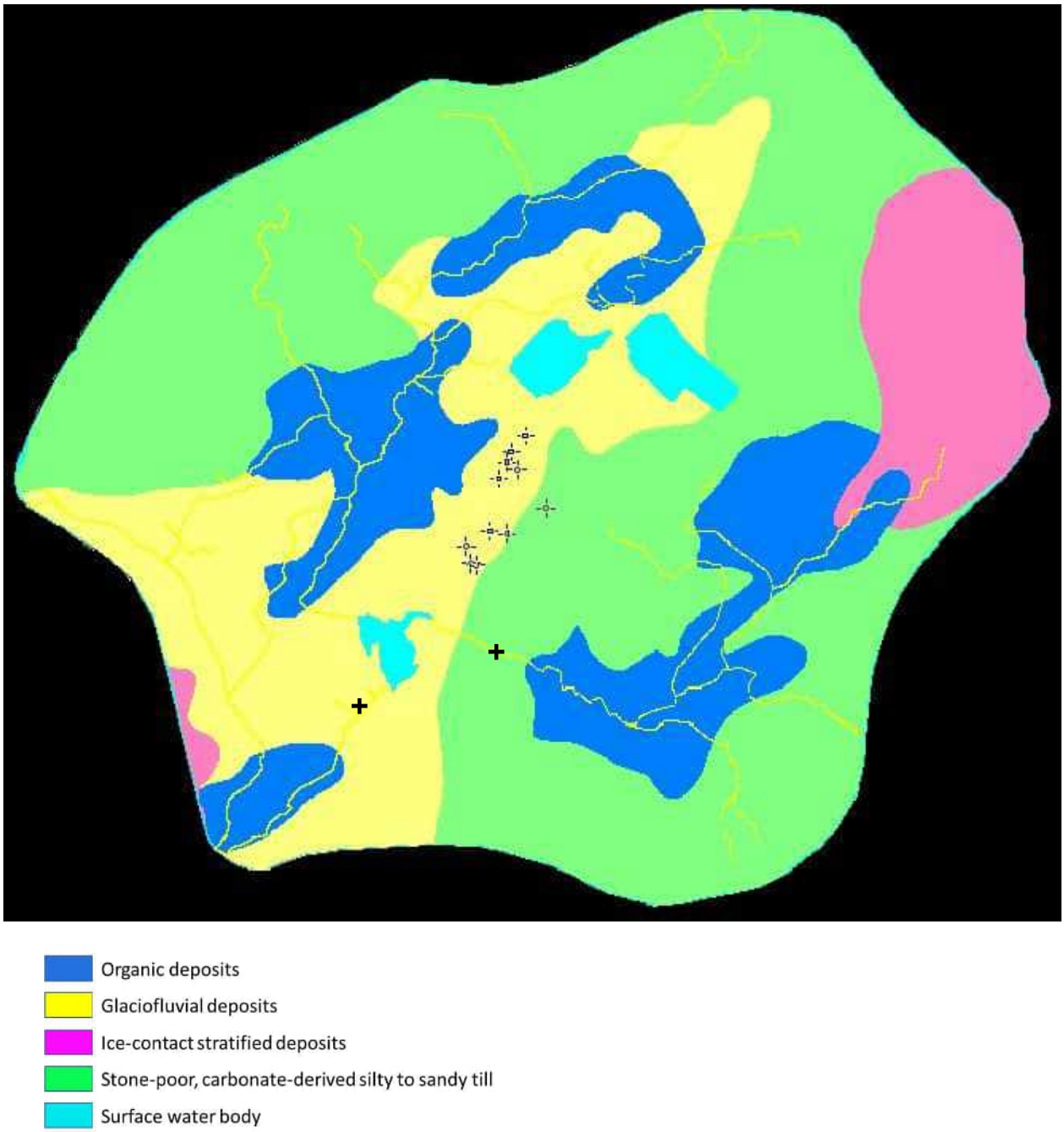

Figure 2. Overburden hydraulic conductivity zones.

1.2 Hydrogeologic Boundary Conditions

General Head Boundary (GHB) conditions were assigned to represent surface water bodies. Natural surface water bodies were assigned heads based on local topography, the proposed north pond at the Anthony Pit site was assigned a head of 321.7 meters, AMSL and the south pit was assigned a head value of 320.7 meters, AMSL.

An estimate of the regional potentiometric surface was developed based on available local and surrounding water level measurements, stream elevations, and estimated depths to water at local surface divides. The potentiometric heads where this surface intersects the model boundary were assigned to GHBs on the model boundary to simulate regional groundwater flow.

Drain boundary conditions were assigned to represent surface water stream drainages with drain elevation set to 0.5 meters below topography and drain conductance based on an assumed stream width of 1m over the length of the model cell with a streambed thickness of 1m and hydraulic conductivity of the streambed material of 100 m/d.

General Head and Drain Boundaries are shown on Figure 3.

1.3 Model Calibration

Model calibration is the process of adjusting model parameters and boundary conditions to obtain a match between field measurements and simulated values at specific calibration target locations. Hydraulic conductivity, recharge, and ET were optimized using the automated Parameter Estimation program, PEST, to obtain a best fit of the simulated water level elevations to measured values at the calibration target locations.

The flow model was calibrated to current pre-mining conditions. Water level elevations measured at eleven wells and piezometers in the area surrounding the proposed Anthony Pit were chosen as primary calibration targets. Water level elevations reported at 42 addition locations in the regional provincial groundwater database were used as secondary calibration targets. In addition, predicted model flows were compared to measured flows at two surface water monitoring stations on Aberfoyle Creek. Calibration target locations are shown on Figure 4

Final calibrated hydraulic parameters are shown in Table 1. The calibrated modeled potentiometric surface is shown on Figure 3.

Reference: Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling

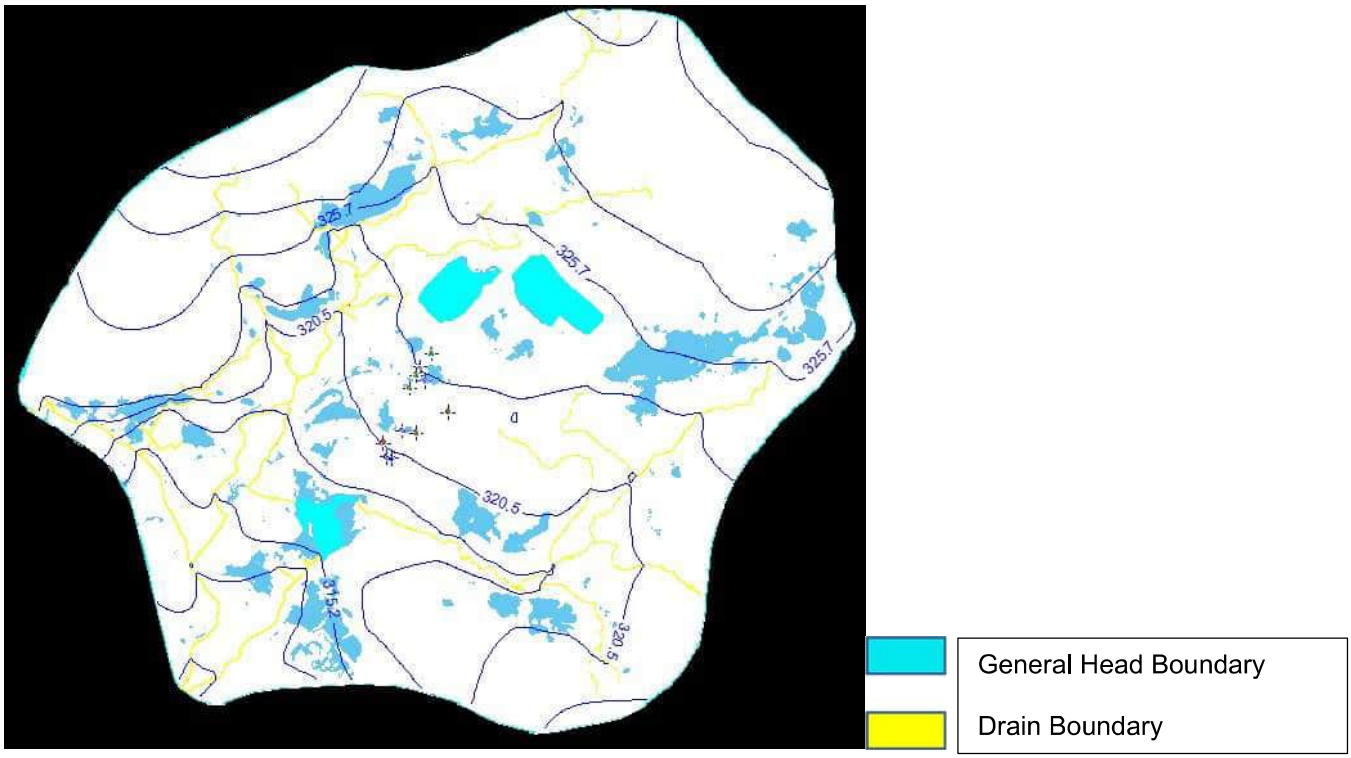

Figure 3. Simulated potentiometric surface, boundary conditions, and primary calibration target locations.

Reference: Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling

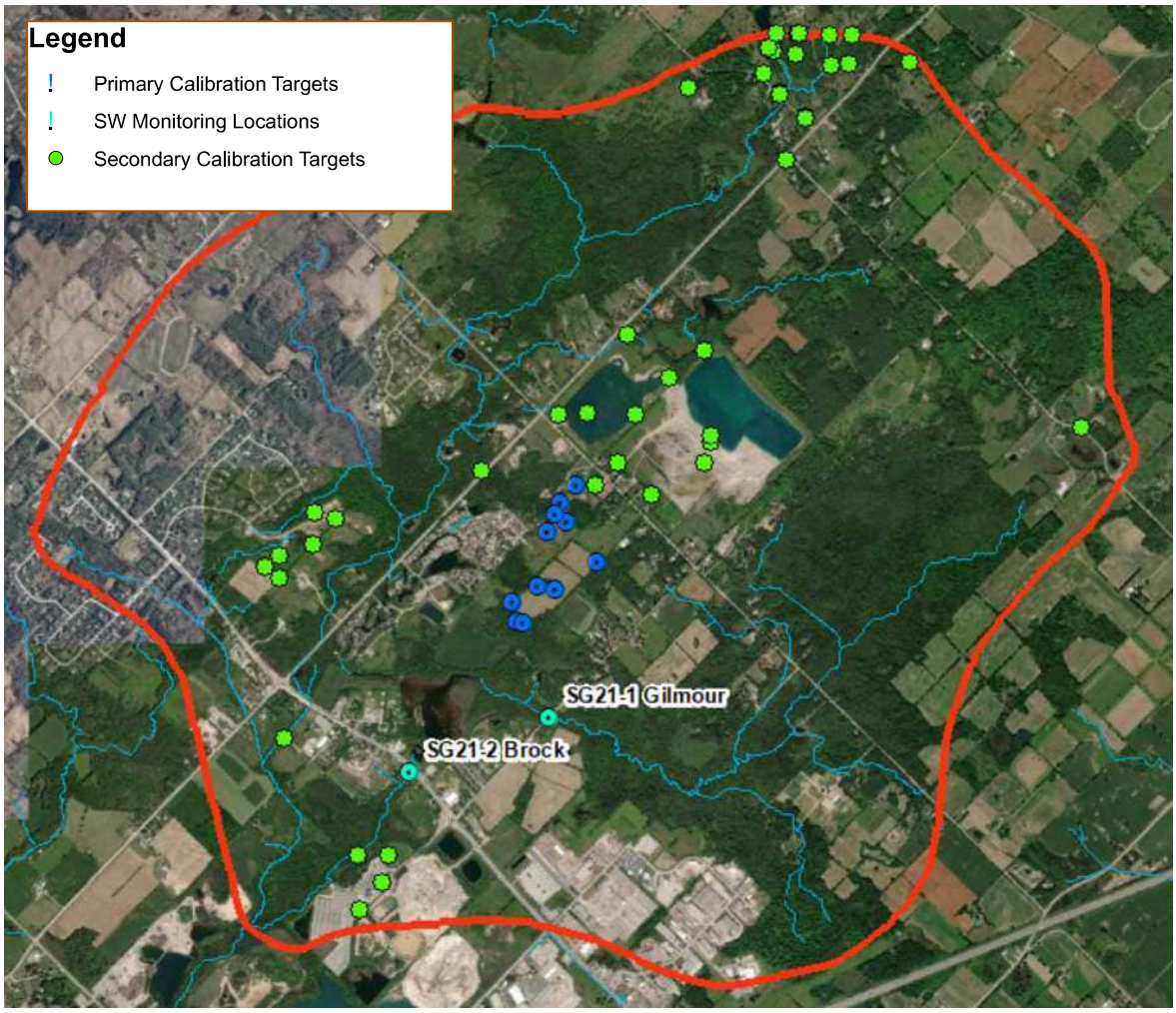

Figure 4. Primary and secondary calibration target locations.

Plots of simulated (modeled) versus observed (measured) groundwater elevations for the primary calibration targets are shown on Figure 5 and for the primary and secondary calibration targets on Figure 6. A line with a slope of 1 (i.e. simulated head = observed head) is shown for comparison. Calibration points plotting above this line, or positive residuals, indicate that modeled head is greater than the measured values at those locations, and, conversely, negative residuals where modeled head is less than the measured value plot below this line. These figures show that there is generally an even distribution of positive and negative residuals over the range of observed values indicating there is no bias toward overprediction or underprediction in the model calibration.

Statistical measures of model calibration are presented in Table 3. These measures include the standard error of the estimate and the root mean squared (RMS) error. In evaluating the fit between the observed and the simulated water levels, the RMS error is usually regarded as the best measure (Anderson and Woessner 1991). The RMS error is essentially a standard deviation calculated as the average of the squared differences between the measured and the simulated water levels. If the ratio of the RMS error to the total water level differential over the model area is small (e.g., less than 10%; Spitz and Moreno 1996), then the errors are only a small part of the overall hydraulic response of the model. In this simulation, the ratio of the RMS errors to the total water level differential (9.8% for the primary calibration targets and 6.9% for primary and secondary calibration targets) are less 10% indicating an acceptable model calibration.

Model calibration to surface water flows was assessed by comparing model simulated groundwater baseflow rates to measured values at two surface water monitoring stations, SG21-1 (Gilmor) and SG21-2 (Brock) on Aberfoyle Creek. Table 4 shows the measured flows at these stations on April 5, 2022 representing the spring runoff period and on June 1, 2022 representing a lower flow period. Model simulated flows are between the high and low measurements at these locations indicating a reasonable representation of groundwater/surface interaction.

Reference: Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling

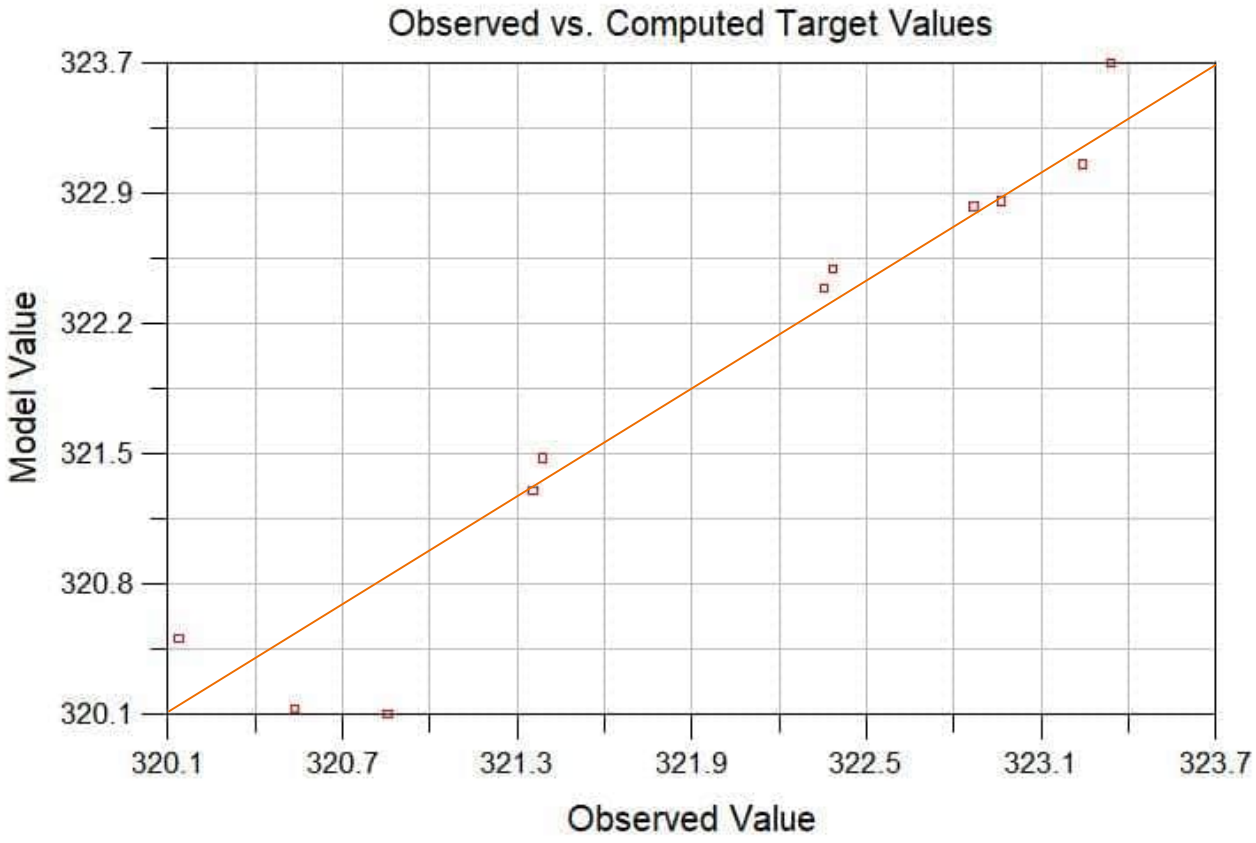

Figure 5. Modeled vs. Observed Heads – Primary Calibration Targets.

Reference: Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling

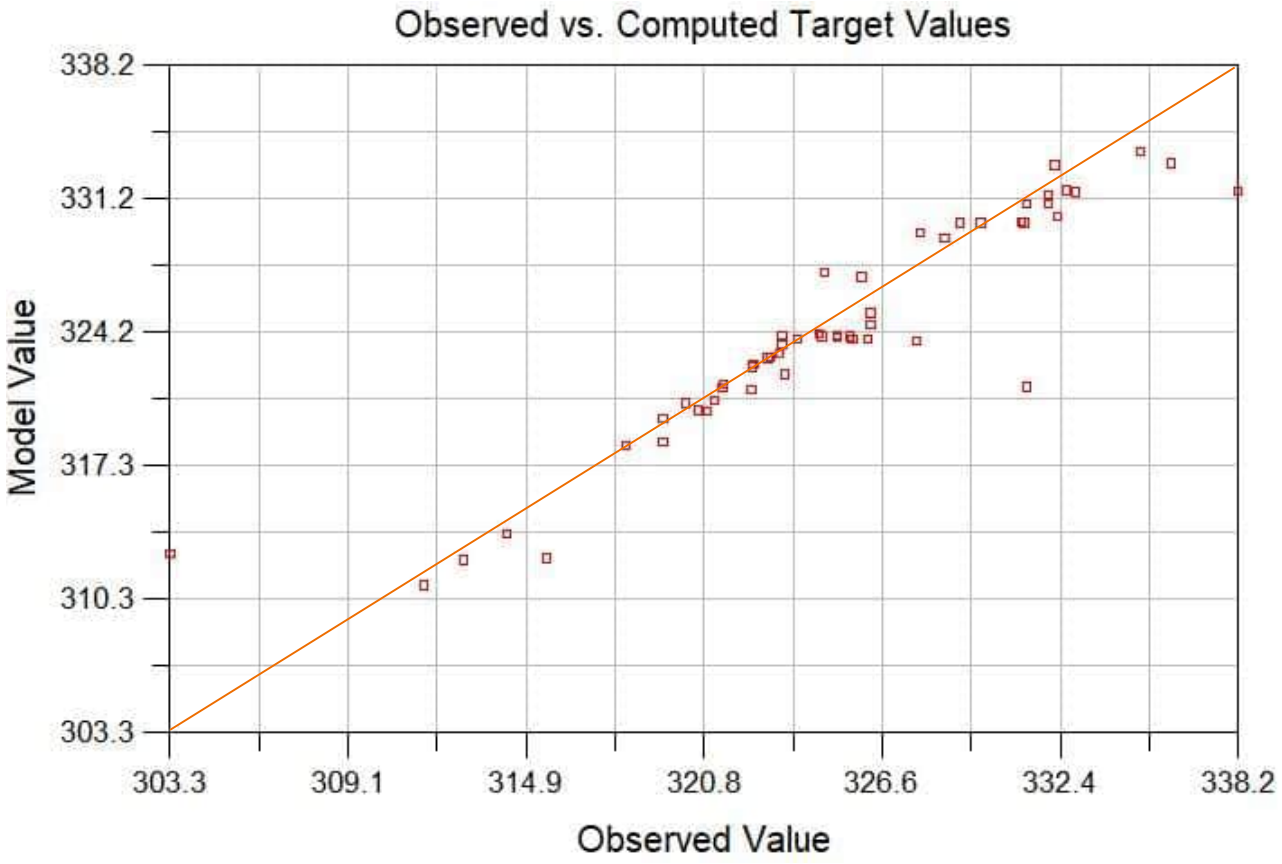

Figure 6. Modeled vs. Observed Heads – Primary and Secondary Calibration Targets.

Calibration Parameter	Primary Calibration Targets	Primary and Secondary Calibration Targets
Residual Mean	0.01m	0.65m
Residual Standard Deviation	0.31m	2.33m
Absolute Residual Mean	0.22m	1.39m
Residual Sum of Squares	1.05	311
RMS Error	0.31m	2.42m
Minimum Residual	-0.38m	-9.33m
Maximum Residual	0.74m	9.93m
Range of Observations	3.16m	34.90m
Scaled Residual Std. Dev.	0.098	0.067
Scaled Residual Abs. Mean	0.071	0.040
Scaled RMS Error	0.098	0.069
Number of Observations	11	53

Table 3. Model calibration statistics.

	Streamflow (L/s)											
Monitoring Station	Apr-22	Jun-22	Jul-22	Sep-22	Mar-23	Jul-23	Dec-23	May-24	Jul-24	Sep-24	Nov-24	Simulated
SG21-1 (Gilmor)	95.6	17.4	7.3	9.2	297.0	16.9	53.8	50.9	54.2	14.7	19.6	59.0
SG21-2 (Brock)	197.8	66.6	40.5	34.6	483.0	73.8	91.5	84.0	104.5	33.0	63.8	128.0

Table 4. Measure vs Simulated Streamflows.

2 Predictive Simulation – Groundwater Flow

The calibrated flow model was used to simulate how groundwater would respond to the creation of the two proposed pit ponds at the Anthony Pit site. The updated model containing the proposed pit ponds at the Anthony Pit site was created with the same boundary conditions and hydrogeologic parameters as the calibrated pre-mining steady state model with the addition of the two pit ponds. The pit ponds were simulated in the model using the MODFLOW General Head Boundary Package. The north most pit pond was assigned a specified head of 321.7 m and the southern pit pond was assigned a specific head of 320.7 m. Boundary conductance was set to 500 m/day. The newly added pit ponds can be seen represented in Figure 7.

The updated model was run in steady-state mode, and the results were compared with the results from the pre-mining steady-state model to estimate the potential drawdown in groundwater levels due to the presence of the proposed pit ponds.

Figure 8 shows simulated drawdown, or change in groundwater levels, due the addition of the proposed pit ponds at the Anthony Pit site. The estimated drawdown extents, as indicated by the 0.1 m drawdown contour in Figure 7, are approximately 360 meters to the southeast, about 0 meters to the southwest, about 150 meters to the northwest, and about 550 meters to the northeast.

Reference: Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling

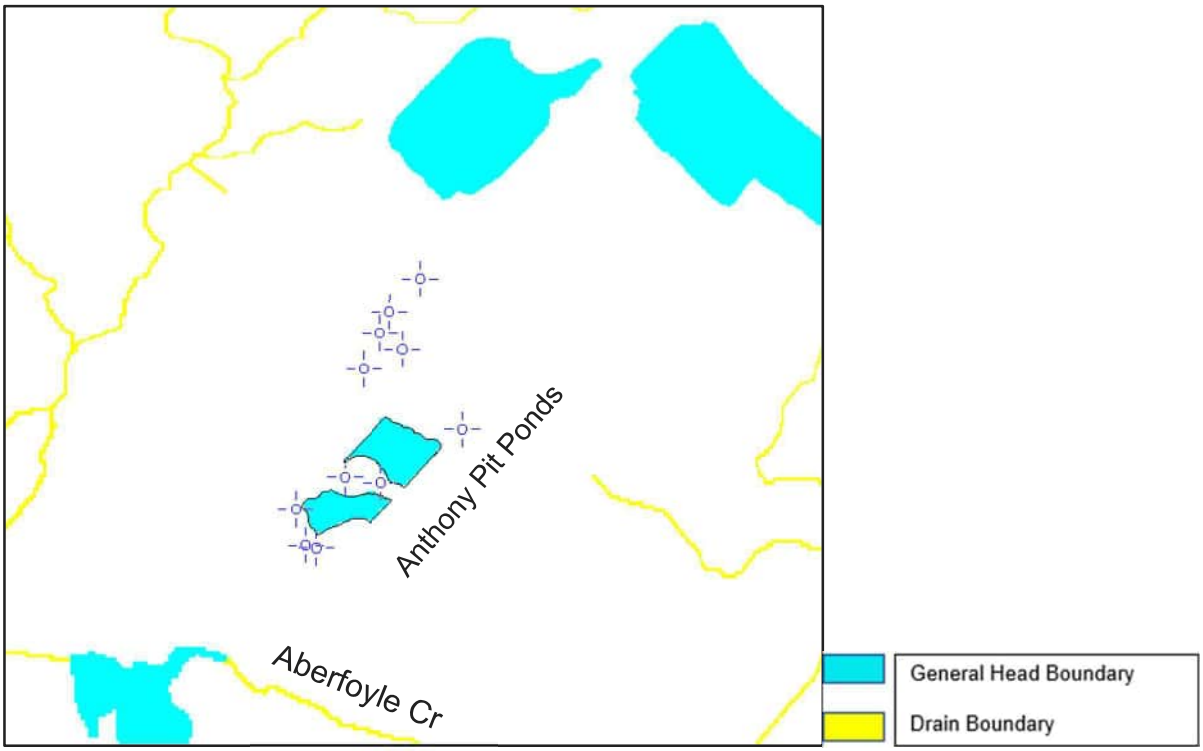

Figure 7. Boundary conditions of newly added Anthony Pit Ponds.

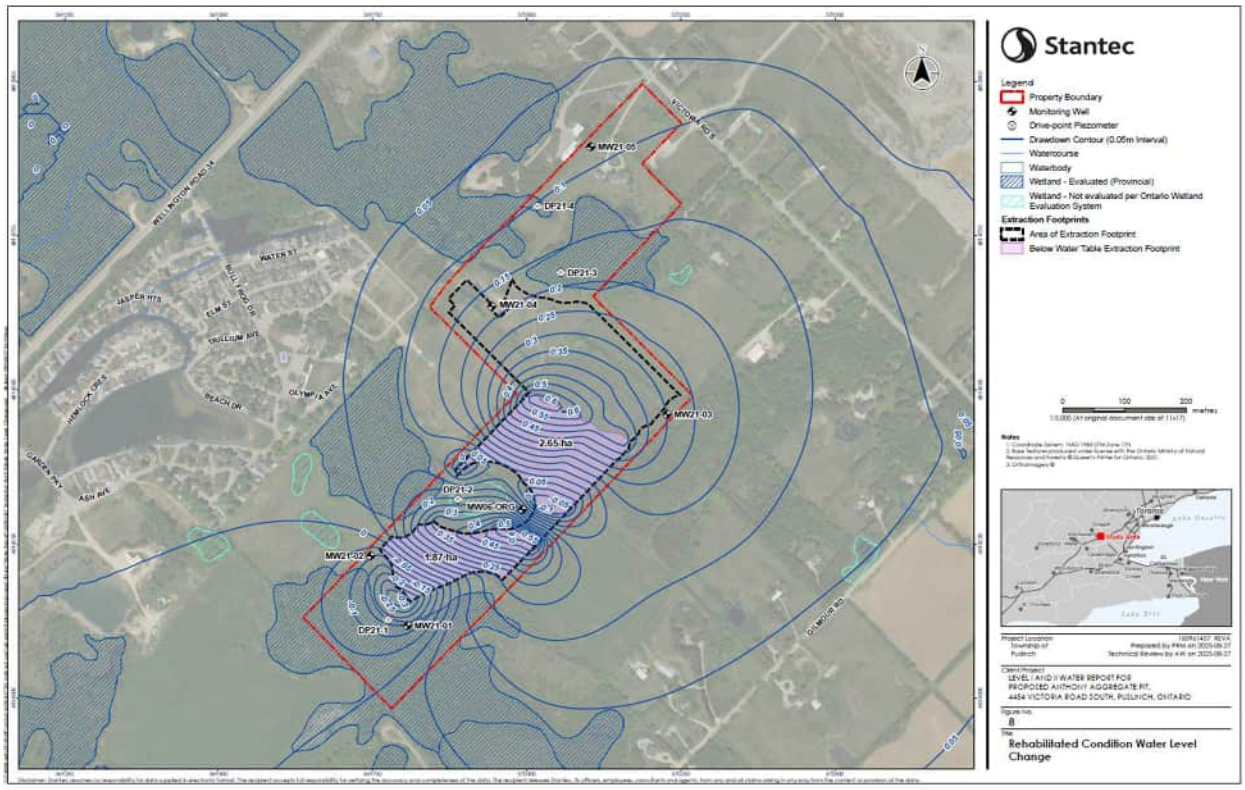

Figure 8. Simulated drawdown due to the addition of the Anthony Pit Ponds

3 Predictive Simulation - Heat Transport

The calibrated flow model was used as a basis for thermal transport predictions using the solute transport code MT3D-MS. A predictive thermal transport simulation was run with conservative assumptions to estimate potential changes in groundwater temperature due to the presence of the proposed pit ponds at the Anthony Pit site formed after mining concludes.

Heat transport in an aquifer is generally governed by heat convection along with the fluid phase, heat conduction and dispersion through the fluid and aquifer sediment, and heat exchange between the aqueous phase and the aquifer sediment. Based on the analogy between solute transport and heat transport equations, variables for the MT3D solute transport simulator can be re-interpreted for heat transport. The solute concentration is replaced by the temperature in Kelvin degrees. The distribution coefficient K_d for solute transport is replaced by the thermal distribution. The molecular diffusion in solute transport can be

represented by the thermal conduction in heat transport. This thermal conduction term is referred to as the bulk thermal diffusivity. Additional information on using solute transport simulation for heat transport modeling can be found in Hecht-Mendez, et.al. (2010) and Zheng (2010). Thermal transport parameters used in the predictive simulations are shown in Table 6.

The groundwater flow and thermal transport model was run to assess potential thermal impacts of the post extraction pit ponds. Solar radiation will warm the proposed pit ponds during the summer months leading to potential warming as groundwater flows through the warmer pit ponds and may eventually discharge to downgradient streams. The predictive model simulates a case where the pit ponds temperature is a constant 6^{O} C above ambient groundwater temperature. In actuality, the pit ponds temperature will fluctuate seasonally where the pit ponds temperature may be below ambient groundwater temperature during the winter months and only above the ambient groundwater temperature during the summer months. Therefore, these predictions should be considered conservative.

The transient thermal transport simulation was run for a period of 100 years. Figures 9 through 12 show the simulated shallow groundwater temperature above ambient after 10, 25, 50, and 100 years. As shown in the figures, warmer water from the proposed pit ponds at the Anthony Pit site moves downgradient via the transport processes of advection, thermal conduction, heat dispersion, and heat diffusion to the south toward Aberfoyle Creek. Groundwater slightly above ambient temperature begins to reach Aberfoyle Creek after about 10 years into the simulation (Figure 9).

After 25 years, the model results indicate groundwater approximately 2^{O}C above ambient groundwater temperature is discharging to Aberfoyle Creek (Figure 10). As the simulation continues, at 50 (Figure 11) and 100 (Figure 12) years the area of groundwater discharge to Aberfoyle Creek above ambient groundwater temperature apers to remain relatively constant after 25 years, and the maximum temperature discharging to Aberfoyle Creek remains approximately 2^{O}C above ambient. It should be noted that this does not represent all groundwater discharging to Aberfoyle Creek over this stream reach. Groundwater is also discharging to Aberfoyle Creek from south and from below which will in effect dilute the overall groundwater discharge temperature over this reach.

Variable	Value	Units
Overburden Porosity, n	0.3	-
Fractured Bedrock Porosity, n	0.05	-
Competent Bedrock Porosity, n	0.02	-
Thermal Distribution Factor, K_d	2.1×10^{-4}	m^3/kg
Dry Bulk Density, ρ_b	1,961	Kg/m^3
Thermal Diffusivity, D_h	0.16	m^2/d
Ambient Aquifer Temperature, T_b	281.15	K
Average Annual Temperature of Pit Ponds, T_{PL}	287.15	K
Longitudinal Dispersivity, α	0.5	m
Transverse Horizontal Dispersivity, α_T	0.5	m
Transverse Vertical Dispersivity, α_v	0.5	m

Table 6. Thermal Transport Parameters.

Reference: **Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling**

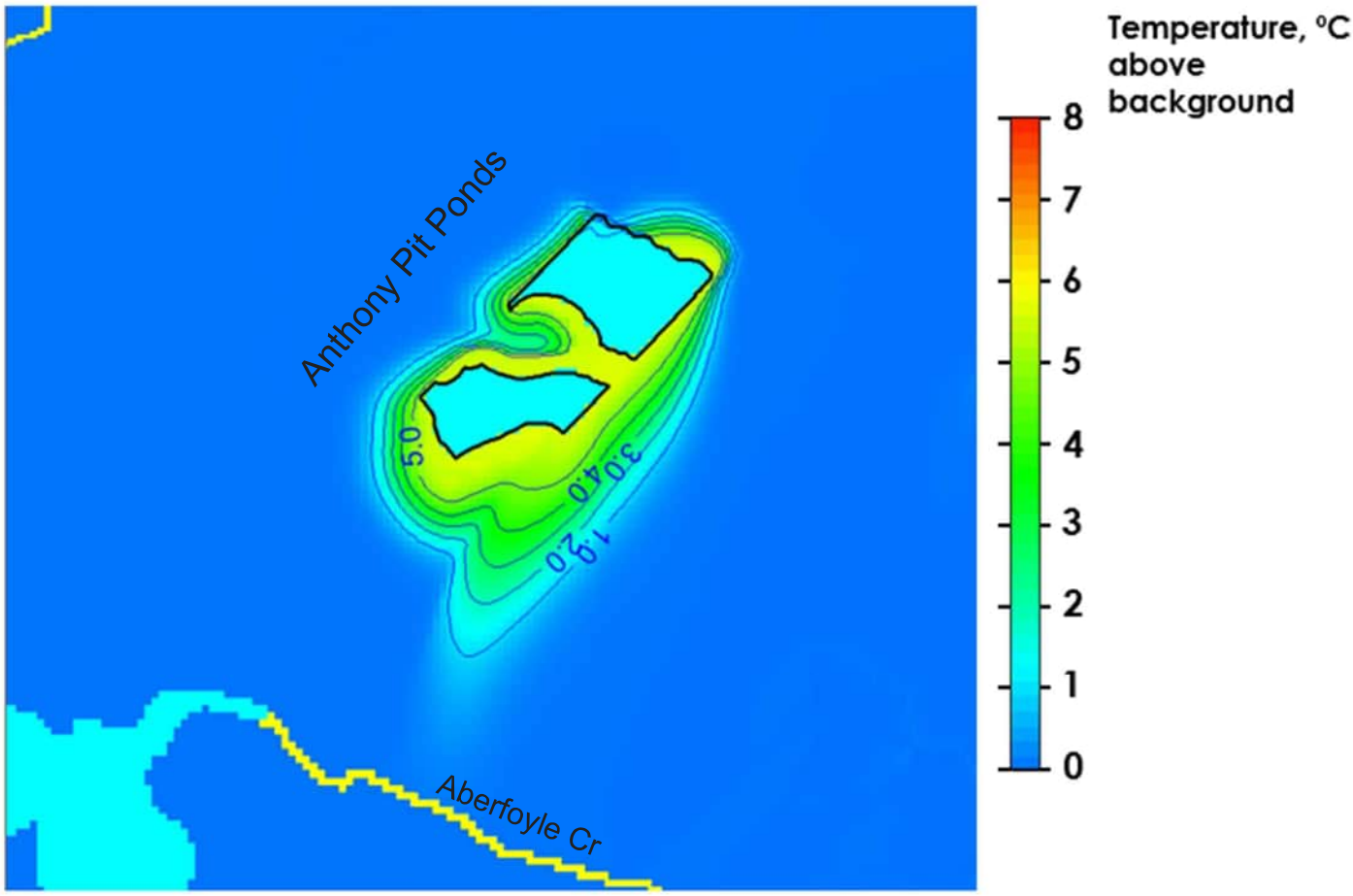

Figure 9. Predictive simulation results – groundwater temperature above ambient after 10 years (C.I. = 1°C).

Reference: Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling

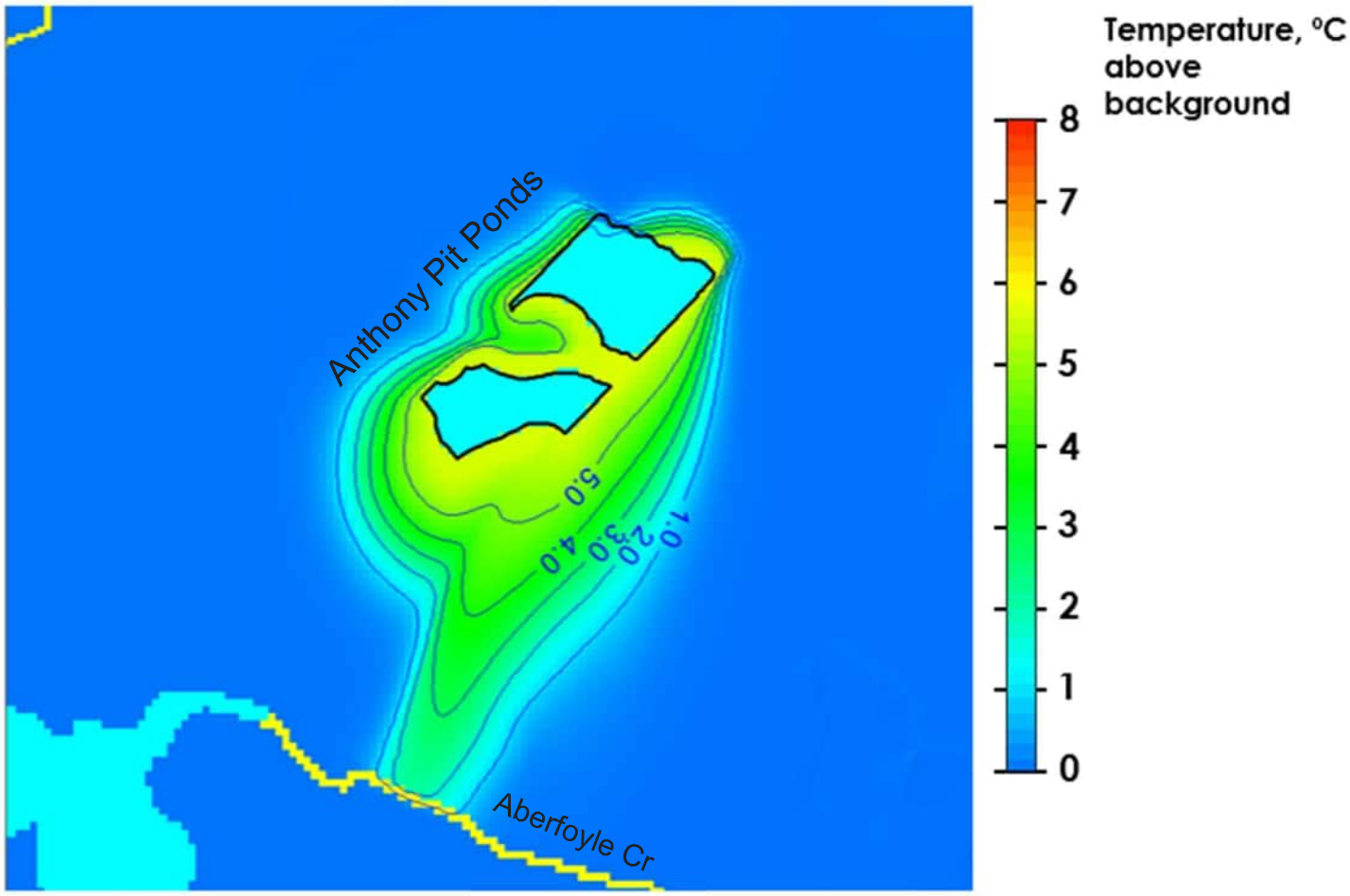

Figure 10. Predictive simulation results – groundwater temperature above ambient after 25 years (C.I. = 1°C).

Reference: Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling

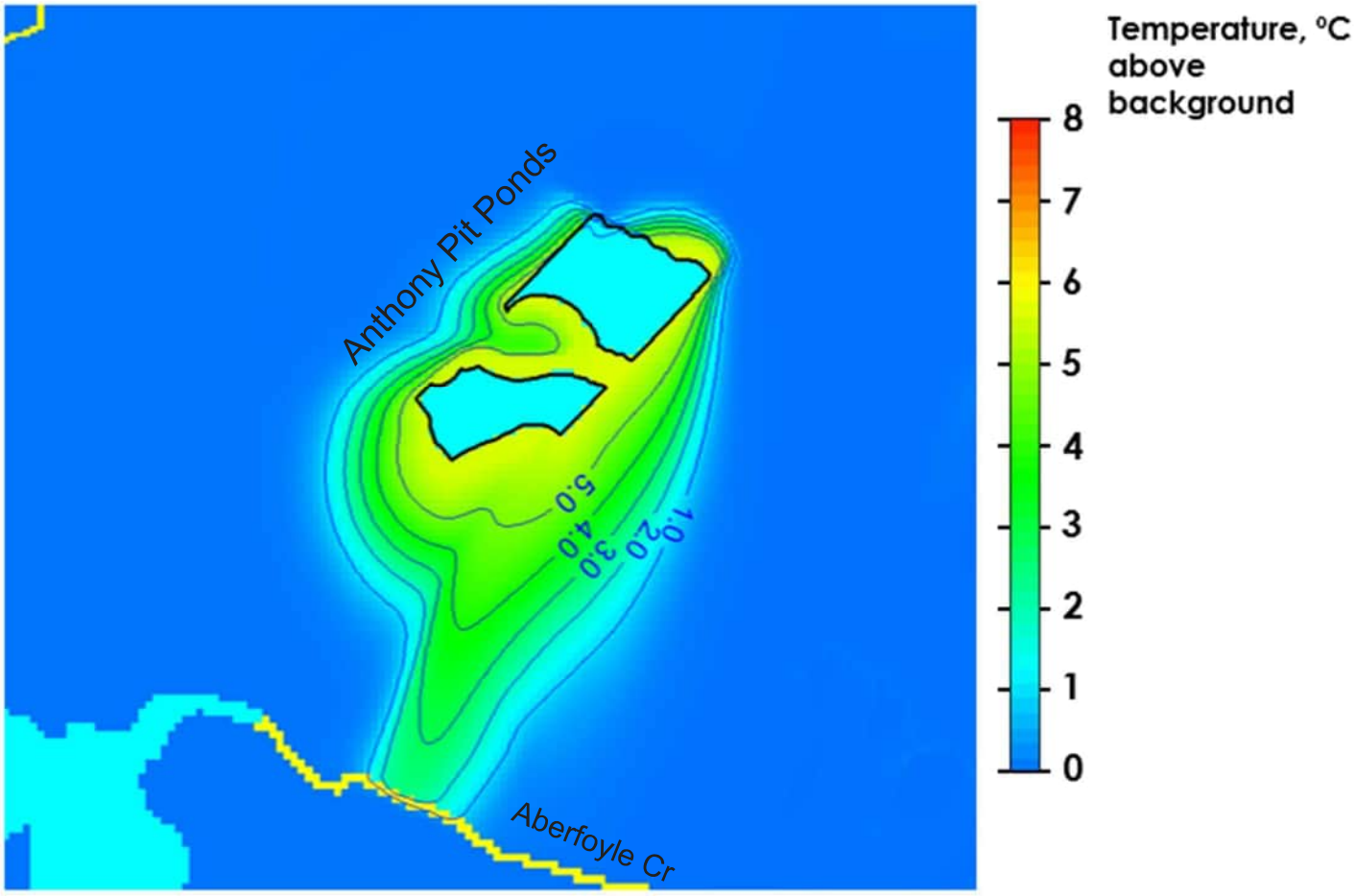

Figure 11. Predictive simulation results – groundwater temperature above ambient after 50 years (C.I. = 1°C).

Reference: **Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling**

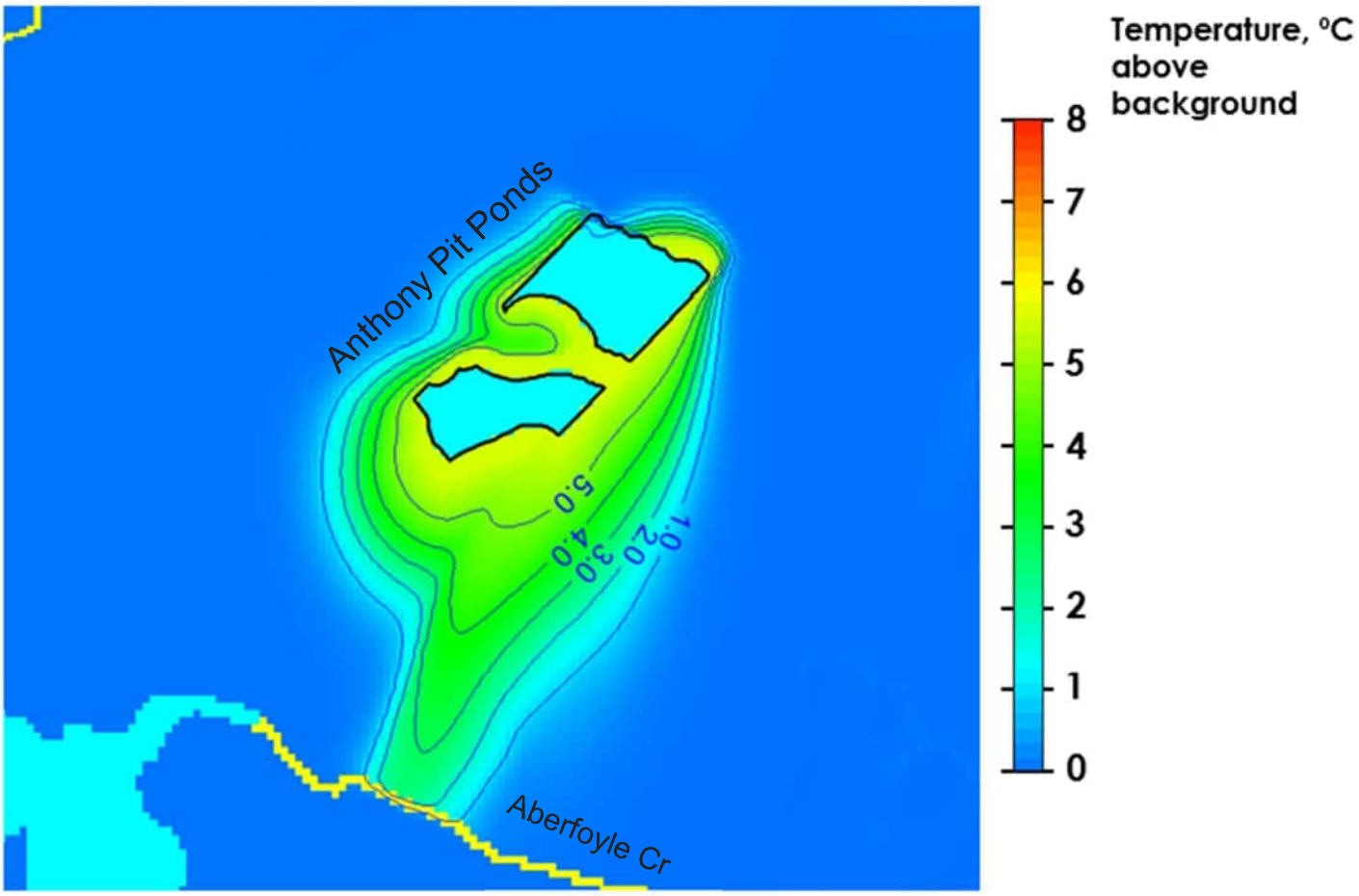

Figure 12. Predictive simulation results – groundwater temperature above ambient after 100 years (C.I. = 1°C).

4 Summary and Conclusions

A three-dimensional steady-state groundwater flow model and a transient thermal transport model were constructed to simulate and assess potential effects of drawdown and elevated groundwater temperature in the proposed pit ponds at the Anthony Pit site on local groundwater and surface water. A conservative simulation with a constant pit pond temperature of 6^{O}C above the ambient groundwater temperature was run over a 100-year duration.

The flow model was used to estimate the expected area of drawdown from the proposed pit ponds. The estimated drawdown extents, as indicated by the 0.1 m drawdown contour, are approximately 360 meters to the southeast, about 0 meters to the southwest, about 150 meters to the northwest, and about 550 meters to the northeast.

The thermal transport model indicates that groundwater with a temperature slightly above ambient begins discharging to a localized section of Aberfoyle Creek after approximately 10 years, and that the maximum temperature increase for any of groundwater discharge to Aberfoyle Creek during the 100-year simulation is approximately 2^{O}C above the ambient groundwater temperature with the majority of the groundwater discharge not having any increase above ambient groundwater temperatures.

It should be noted that this estimated temperature increase only represents the portion of groundwater discharge originating from the Anthony Pit ponds and does not represent all groundwater discharging to Aberfoyle Creek over this stream reach. Groundwater is also discharging to Aberfoyle Creek from south and from below which will in effect dilute the overall groundwater discharge temperature over this reach.

A less conservative case could be simulated by the thermal transport model with the pit pond temperature changing seasonally.

5 References

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Fetter, C.W., 2001. Applied Hydrogeology, Fourth Edition. Prentice-Hall, New Jersey.

Hecht-Mendez, J., N. Molina-Giraldo, P. Blum, and P. Bayer, 2010. Evaluating MT3DMS for Heat Transport Simulation of Closed Geothermal Systems, Groundwater, Vol. 8, No. 5, pp.741-756.

Stantec, 2026. Level I and Level II Water Report for Proposed Anthony Aggregate Pit 4454 Victoria Road South, Puslinch, Ontario.

Zheng, C., 2010. MT3DMS v5.3 Supplemental User's Guide, Technical Report February 2010, U.S. Army Corps of Engineers.

Reference: **Technical Memorandum - Proposed Anthony Aggregate Pit Groundwater Flow and Thermal Transport Modeling**

Sincerely,

STANTEC CONSULTING SERVICES INC.

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[redacted]Stephen Di Biase 2026.02.06 09:47:22 -05'00'

Rick Reinke P.Geo., P.Geoph.
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rick.reinke@stantec.com

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Senior Hydrogeologist
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Appendix H

Project Team Curriculum Vitae

Stephen Di Biase M.Sc., P.Geo.

Senior Hydrogeologist

26 years of experience · Markham, Ontario

Stephen Di Biase is a Senior Hydrogeologist with the Environmental Services division. His 25 years of experience includes hydrogeological investigations in support of large-scale groundwater supply and dewatering projects. He brings extensive knowledge of groundwater exploration, drainage basin surveys, water balance calculations, aquifer mapping, GUDI assessments and development constraint mapping for projects located near sensitive wetlands, headwaters and kettle lake complexes in the vicinity of glacial moraines and the Niagara Escarpment.

EDUCATION

B.Sc. Earth Sciences, University of Waterloo, Waterloo, Ontario, 1999

M.Sc. Hydrogeology, University of Toronto, Toronto, Ontario, 2005

CERTIFICATIONS & TRAINING

Construction Dewatering and Groundwater Control (National Groundwater Assoc.), Waterloo, Ontario, 2005

Project Management (Golder Associates Internal Training Course), Markham, Ontario, 2005

Contracts and Liability (Golder Associates Internal Training Course), Markham, Ontario, 2004

Project Management, Queen's University School of Business, Ontario, 2001

Field Methods in Hydrogeology, University of Waterloo, Ontario, 2001

Ontario Ministry of Transportation Approved for Medium Complexity Hydrogeological Projects, Markham, Ontario, Canada, 2023

MEMBERSHIPS

Member, National Ground Water Association

Member, Ontario Ground Water Association

Canadian National Chapter, International Association of Hydrogeologists

Hydrogeologist, Professional Geoscientists Ontario

PROJECT EXPERIENCE

GROUNDWATER SUPPLY / WELLS

New Well Exploration Program | Township of Centre Wellington | Elora, ON, Canada | 2021 - | Project Manager

Construction of pilot test wells in four target areas surrounding the communities of Elora and Fergus. Field studies include bedrock coring, geophysical logging, packer testing, 7-day pumping tests, groundwater quality analysis and evaluation GUDI conditions.

Logan Well Feasibility Assessment | City of Guelph | Guelph, ON, Canada | 2021 - | Project Manager

Reconstruction and performance testing of a 306 mm diameter municipal test well. This project included management of drilling contractor, supporting permitting applications and supervision of a 3-day performance test. A feasibility study is being undertaken to determine if the Logan Well will be a viable groundwater supply source for the City of Guelph. Field study and reporting includes an assessment of GUDI conditions and effects of groundwater pumping on local environmental receptors.

Craighurst Groundwater Supply Investigation | Craighurst Partnership Limited | Craighurst, ON, Canada | 2020 - 2022 | Project Manager

Hydrogeology task manager responsible for developing a new groundwater supply source for the community of Craighurst. This project included the construction and performance testing of a new 306 mm diameter test production well at 36 L/s. Stantec's responsibilities for this study included contract tendering and administration, development of a groundwater monitoring network, securing provincial permits to take water, supervision of a 30-day performance test and a GUDI assessment of the new well.

Groundwater Supply Class Environmental Assessment | Town of Orangeville | Orangeville, Ontario, Canada | 2018 - 2022 | Project Manager

Project Manager for the Town of Orangeville Groundwater Supply Class Environmental Assessment. This project included the construction and performance testing of a new test production well along the Town's northeastern boundary. The field investigation included: installation of 1 cored bedrock borehole, downhole geophysical logging of 6 test wells, reconstruction of 3 open bedrock boreholes with multi-level monitoring well nests and a 30-day groundwater pumping test at 3,629 m3/day. The effects of groundwater pumping were monitored at a total of 34 locations, including 16 monitoring well nests, 3 surface water stations, 5 wetland piezometers and 10 private wells.

Guelph Water Supply Master Plan* | City of Guelph | Guelph, Ontario | 2013 - 2014 | Task Manager

Hydrogeology Task Manager responsible for the assessment of existing production well capacities. This project included a modelling analysis to assess the performance and effects of municipal well operation during conditions of drought and unforeseen well shut-downs.

Waterloo North Water Supply Class Environmental Assessment* | Region of Waterloo | Waterloo, Ontario | 2008 - 2010 | Task Manager

Hydrogeology task manager for the Waterloo North Water Supply Class Environmental Assessment. This project included the construction of a new test production well and performance testing of three test production wells within the Waterloo North Study Area. Golder's role in the Waterloo North Class EA includes management of the drilling and performance testing contracts, supporting the RMOW applications for access agreements, municipal sewer use permitting, MOE PTTWs, supervision of a 42-day performance test and preparation of an Environmental Study report supporting the test production wells through the EA process.

Southwest Quadrant Water Supply Class Environmental Assessment* | City of Guelph | Guelph, Ontario | 2008 - 2012 | Task Manager

Hydrogeology task manager for the City of Guelph Southwest Quadrant Water Supply Class Environmental Assessment. This project included the construction and performance testing of two new (15 inch diameter) test production wells in the City of Guelph. Performance testing of the new wells required a combined pumping rate of 134 L/s, a 3 km diversion of pumped groundwater, municipal sewer use permits, an Ontario Ministry of Environment Permit To Take Water, access agreements, an extensive groundwater and surface water monitoring program (including approximately 70 groundwater monitoring wells, 10 surface water monitoring stations and two private wells). A challenge during this complicated testing program was ensuring that performance testing of the new production wells did not adversely affect the operation of the existing municipal water supply system or impact surface water flow conditions in the receiving water courses.

Preliminary Design for Stage 2 Expansion of Aquifer Storage and Recovery (ASR) System * | Region of Waterloo | Kitchener, Ontario | 2008 - 2014 | Task Manager

Hydrogeology task manager supporting the preliminary design of the Stage 2 Expansion for the Regional of Waterloo Aquifer Storage and Recovery System. This project included the construction and performance assessment of six test wells at the Mannheim Water Treatment Plant. Groundwater modelling analysis was undertaken to develop a preliminary design plan that would optimize the performance of the expanded system.

Prospect Park Groundwater Supply Study* | Region of Halton | Acton, Ontario | 2011 - 2012 | Project Manager

Project Manager for the Region of Halton Prospect Park Groundwater Supply Study. This project included the analysis of data collected from the Prospect Park Well Field over a 5 year period to assess the potential to develop additional groundwater supply.

Baden-New Hamburg Water Supply Master Plan* | Regional Municipality of Waterloo | New Hamburg and Baden, Ontario | 2008 - 2010 | Task Manager

Hydrogeology Task Manager responsible for the assessment of existing production capacity of three well fields in proximity to the communities of Baden and New Hamburg.

Groundwater Supply Class Environmental Assessment* | Town of Shelburne | Shelburne, Ontario | 2009 - 2012 | Task Manager

Hydrogeology Task Manager responsible for the installation and performance testing of a new groundwater supply well in proximity to the Town of Shelburne. This project included negotiations with the Ontario Ministry of Environment regarding inter-basin transfer within the Great Lakes catchment area and a 72-hour groundwater pumping test. Golder completed an Environmental Study Report to satisfy a Federal Environmental Assessment process as well as a Provincial Class Environmental Assessment.

Aquafarms 93* | Ice River Springs | Feversham, Ontario | 2007 - 2009 | Project Manager

Carried out the field study and reporting requirements of a hydrogeological impact assessment for a commercial water supply operation. This project included aquifer performance testing, geophysical testing of water supply wells, monitoring of local domestic wells, and co-ordination of groundwater, surface water and ecological field studies.

Dagmar Ski Resort* | Dagmar Ski Resort | Glen Major, Ontario | 2003 - 2004 | Hydrogeologist

Evaluated the potential yield and hydrogeologic impact of two high-capacity water supply wells completed in the Oak Ridges Moraine Aquifer to support an application for a PTTW for the resort snow-making system.

DEWATERING AND PUMPING SYSTEMS

Toronto-York Spadina Subway Extension (TYSSE)* | Toronto Transit Commission | Toronto, Ontario, Canada | Hydrogeologist

Hydrogeologist for the Principal Engineering Consultant of the Toronto-York Spadina Subway Extension. This project included hydrogeology investigation and dewatering assessment at 6 proposed subway stations and 25 associated subsurface structures. Responsibilities included preparation of tender contract documents and specifications.

** denotes projects completed with other firms*

Eglinton Crosstown Light Rail Transit* | Toronto, Ontario | Hydrogeologist

Hydrogeologist responsible for preparation of dewatering assessment supporting the design of the Yonge and Allen Road Stations of the proposed Eglinton Crosstown Light Rail Transit.

Bayview Avenue Widening* | The Miller Group | Richmond Hill, Ontario | 2016 - 2018 | Project Manager

Installed forty (40) 152 mm diameter pressure relief wells to depressurize a confined aquifer and facilitate the construction of a regional sewer main.

Steeles Avenue Widening* | Fermar Paving Ltd. | Hornby, Ontario, Canada | 2016 - 2017 | Project Manager

Installed eight (8) 150 mm diameter pressure relief wells to depressurize a confined aquifer and facilitate the construction of bridge footings across water courses.

Nuclear Waste Management Organization* | Fox Construction Services | Darlington Nuclear Site , Ontario | Project Manager

Designed and installed dewatering system in support of upgrades at the Darlington Nuclear Plant

AGGREGATE SERVICES

Nelson Quarry Extension* | Nelson Aggregate Co | Burlington, ON, Canada | 2006 - 2011 | Project Hydrogeologist

Hydrogeologist responsible for the development of a field investigation to establish the potential impact of a proposed Quarry extension plan on locally significant environmental features. This field study required liaison with MOE officials, coordination of multi-disciplinary environmental investigations, procurement of testing permits and aquifer performance testing.

Lafarge Canada Inc.* | Lafarge Canada Inc. | Dundas, Ontario | 2008 - 2010 | Hydrogeologist

Hydrogeologist responsible for the development of a field investigation to establish the potential impact of a proposed Quarry extension plan on locally significant environmental features. This field study required liaison with MOE officials, coordination of multi-disciplinary environmental investigations, procurement of testing permits and aquifer performance testing.

Aaron Warkentin P. Eng.

Senior Hydrogeologist, Associate

23 years of experience · Waterloo, Ontario

Aaron is a results-oriented professional and project manager with over 20 years of consulting experience focusing on hydrogeological investigations, landfill compliance and mine/aggregate licensing monitoring and reporting, environmental impact assessment studies, hydrogeological permitting and compliance, and water resources engineering. Aaron possesses a sound understanding and is proficient in the application of hydrogeological principles and field techniques.

Aaron processes strong project management skills and has acted as project manager and/or project hydrogeologist for numerous projects involving water supply evaluations, groundwater management studies, large-scale multi-year monitoring programs, hydrogeological permitting and compliance, groundwater monitoring and hydrogeological impact investigations for construction development projects, landfill, mining and aggregate monitoring, licensing and compliance, throughout Ontario. Aaron is skilled in the analysis and interpretation of aquifer performance testing data, characterization and logging of geologic formations, evaluating groundwater-surface water interactions, developing groundwater and contaminant models, and has a working knowledge of groundwater protection legislation in Ontario.

Aaron has a strong working knowledge of the Earthsoft EQuIS data management system and portal development applications through project managing the develop of these types of custom knowledge management portal solutions. Aaron has extensive experience working on projects in support of proposed construction development and dewatering, including design and implementation of baseline and long-term groundwater monitoring program

EDUCATION

B.A.Sc., University of Waterloo Environmental (Civil) Engineering, Waterloo, Ontario, Canada, 2003

REGISTRATIONS

Professional Engineer #100144791, Professional Engineers Ontario, June 14, 2010

PROJECT EXPERIENCE

HYDROGEOLOGY

Cambridge East and Waterloo North Groundwater and Surface Water Monitoring Programs | Regional Municipality of Waterloo | Cambridge, Ontario | 2021-2023 | Project Hydrogeologist

Per the Region's Water Supply Master Plan and Class EA recommendations additional groundwater and surface water monitors were installed to be included in monitoring programs for the subject areas. Aaron acted as project hydrogeologist and assisted coordination of monitoring well construction and piezometer installations for the Region's Cambridge East and Waterloo North Groundwater and Surface Water Monitoring Program. Coordinated well geophysics and rehabilitation activities. An adaptive management plan is to be developed to document response related to future increased pumping.

Hydrogeologic Assessment, South Strasburg Trunk Sanitary Sewer | City of Kitchener | Kitchener, Ontario | 2017-2021 | Project Hydrogeologist

As part of the detailed design and construction of the South and Middle Strasburg Trunk Sanitary Sewer, Aaron acted as Project Hydrogeologist to prepare the required Hydrogeologic Assessments in support of PTTW and EASR applications for construction dewatering. The assessments detailed expected dewatering locations and volumes, discharge locations, and monitoring as required. Aaron also assisted in preparation of a wetland hydrogeological assessment as required by local conservation authority.

Eagles Nest Golf Course Irrigation Well Supply Assessment | Vaughan, Ontario | 2016-2017 | Project Manager / Project Hydrogeologist

Coordinated and completed new irrigation well installation at golf course, located within secondary buffer area of Keele Valley Landfill. Completion of a hydrogeologic investigation in support of a short term testing under a permit to take water for the irrigation well. Testing included a 72-hour pumping test and water level monitoring within adjacent monitoring wells. Coordinated and attended meetings with the Agencies (City of Toronto and MECP). Completed Permit to Take Water application for the short term pumping test.

Malahide Well Supply Assessment | IGPC | Aylmer, Ontario | 2017 | Project Hydrogeologist

Aaron acted as project hydrogeologist and assisted in a due-diligence assessment of the inactive Malahide Township well as a potential future water supply source for IGPC, Aylmer, ON. Coordinated well rehabilitation activities, and completion of a hydrogeologic investigation in support of a short term testing under a permit to take water for the Malahide Township supply well. Testing included a 24-hour pumping test and water level monitoring within adjacent monitoring wells. Aaron completed MECP permitting requirements for the project.

Greensville Backup Water Supply Project | City of Hamilton | Hamilton, Ontario | 2014 | Project Hydrogeologist

Aaron acted as project hydrogeologist in coordination and completion of production well drilling in bedrock near to the Niagara escarpment, 48-hour pumping tests, groundwater and surface water monitoring, coordination with City of Hamilton and Agencies, and hydrogeological assessment report preparation for permitting.

Fourth Line Well Field Hydrogeological Impact Assessment | Regional Municipality of Halton | Acton, Ontario | 2013-2014 | Project Hydrogeologist

The Region of Halton undertook a study to investigate the potential of expanding the taking from the Fourth Line well field by including a test well. The scope of work was to assess the impacts of increasing the daily taking from the well field above the then existing permitted rate. The environmental impact assessment included assessment of results of a comprehensive well pumping test to determine impacts to groundwater users, and an ecological review of nearby terrestrial and aquatic habitat to determine impacts to natural features. Aaron acted as project hydrogeologist and assisted in completion of the environmental impact assessment for the Region of Halton. Aaron completed background data review, analysis of pumping test data, and groundwater and surface water impact assessment report preparation.

Joe Sams Leisure Park Irrigation Supply Project | City of Hamilton | Waterdown, Ontario | 2011-2013 | Project Hydrogeologist

A water supply evaluation was completed for Joe Sam's Leisure Park within the City of Hamilton and confirmed the need for additional supply to meet sports field irrigation demands. Test drilling was completed in 2011 and an additional groundwater supply well was installed within the bedrock aquifer. Aaron acted as project hydrogeologist and assisted in a hydrogeologic investigation completed in support of a long-term permit to take water including a pumping test and water groundwater and surface water level monitoring.

Water Supply Assessment | City of Hamilton | Waterdown, Ontario | 2011-2013 | Project Hydrogeologist

In 2011, a water supply evaluation was completed for Joe Sam's Leisure Park within the City of Hamilton and confirmed the need for additional supply to meet sports field irrigation demands. Test drilling was completed in 2011 and an additional groundwater supply well was installed within the bedrock aquifer. Aaron acted as project hydrogeologist and assisted in a hydrogeologic investigation completed in support of a long-term permit to take water including a pumping test and water groundwater and surface water level monitoring.

PTTW Applications and Monitoring for Development Sites | Various, Ontario | 2012-present | Project Hydrogeologist / Permitting Coordinator

Aaron acted as Project Hydrogeologist and/or Permitting Coordinator to prepare groundwater permit to take water or environmental activity and sector registry permitting for water takings required as part of construction dewatering for various development projects in Ontario. Projects have included coordination of drilling and well monitoring, analysis of data to determine required permitting approach. The site conditions have ranged from industrial, commercial areas to residential areas, agricultural fields or shallow bedrock. As part of each application, an assessment of hydrogeological conditions was completed to evaluate construction dewatering requirements and evaluate potential interference concerns and mitigation measures. Water quality was reviewed, and discharge locations and a discharge plan determined. Consultation with clients and Agencies as required.

Pond Decommissioning | London, Ontario | Hydrogeologist

Assisted in preparation of MOECC Permit to Take Water reporting and application for dewatering during pond decommissioning in London, Ontario.

Fourth Line Well Field Hydrogeological Impact Assessment | Regional Municipality of Halton | Acton, Ontario | 2013-2014 | Project Hydrogeologist

The Region of Halton undertook a study to investigate the potential of expanding the taking from the Fourth Line well field by including a test well. The scope of work was to assess the impacts of increasing the daily taking from the well field above the then existing permitted rate. The environmental impact assessment included assessment of results of a comprehensive well pumping test to determine impacts to groundwater users, and an ecological review of nearby terrestrial and aquatic habitat to determine impacts to natural features. Aaron acted as project hydrogeologist and assisted in completion of the environmental impact assessment for the Region of Halton. Aaron completed background data review, analysis of pumping test data, and groundwater and surface water impact assessment report preparation.

Hespeler Waste Water Treatment Upgrades | Cambridge, Ontario | Project Hydrogeologist

Coordination of monitoring well testing for Region of Waterloo WWTP construction upgrades project, completed MOECC Permit to Take Water reporting and application.

MINING

Bissett Creek Mine Project | Northern Graphite Corporation | Ottawa, Ontario, Canada | 2018-2021 | Project Hydrogeologist

As part of the development of an open pit mine to access the graphite deposit, Aaron acted as Project Hydrogeologist to prepare the required Hydrogeologic Assessments in support of the PTTW application to facilitate the dewatering of the open pit. The assessments characterized groundwater flow and quality in relation to the open pit, detailed expected dewatering locations and volumes, discharge locations, assessment of potential effects of dewatering on the environment, and monitoring as required.

Greenstone Gold Mine Project | Equinox Gold Greenstone Mine | Geraldton, Ontario, Canada | 2024-Present | Project Manager

Aaron acted as project manager and assisted in coordination of work between multiple disciplines and consultants including hydrogeology, geochemistry, hydrology, terrestrial and aquatics as well as process, treatment plant, and mine engineers. Coordinated with discipline leads to complete agency monitoring and reporting requirements for the open pit mine. Groundwater Conceptual Modelling Hemlo Mine Property Expansion | Barrick Gold Corporation | Hemlo, Ontario, Canada | 2024-Present | Project Manager Aaron acted as project manager and assisted in coordination of work for a conceptual groundwater modelling for a feasibility study of the mine expansion project and intended to assist in permitting requirements.

OIL AND GAS PIPELINES

Hamilton to Milton Pipeline Project | Hamilton/Milton, Ontario | Project Hydrogeologist

Coordination of monitoring well testing and sampling for Union Gas pipeline installation near Milton, ON, attended and presented at meetings with Agencies, completed MOECC Permit to Take Water application and supporting hydrogeological assessment report preparation.

Brantford to Kirkwall Pipeline Project | Hamilton, Ontario | Project Hydrogeologist

Coordination of monitoring well drilling and sampling for Union Gas pipeline installation near Hamilton, ON, completed MOECC Permit to Take Water application and supporting hydrogeological assessment report preparation.

Thunder Bay Pipeline Project | Thunder Bay, Ontario | Project Hydrogeologist

Union Gas pipeline replacement/installation near Thunder Bay, ON, completed MOECC Permit to take Water application and supporting hydrogeological assessment report preparation.

Nanticoke Meter Station | Ancaster, Ontario | Project Hydrogeologist

Coordination of monitoring well testing for TransCanada Pipelines Limited meter station construction project, completed MOECC Environmental Activity and Sector Registry reporting and registration.

PTTW Applications and Monitoring | Various, Ontario | Hydrogeologist / Project Manager

Assisted in preparation of groundwater permit to take water applications for water takings required as part of construction dewatering and pipeline installation. The site conditions have ranged from industrial, commercial areas to residential areas, agricultural fields or shallow bedrock and have crossed creeks, rivers and lakes. As part of each application, an assessment of hydrogeological conditions was completed to evaluate construction dewatering requirements and evaluate potential interference concerns and mitigation measures. Water quality was reviewed and discharge locations considered.

Hydrogeological Report and EASR Application | Toronto, Ontario | Hydrogeologist

For Enbridge Gas Distribution (EGD) sites including Keele St. and Ashtonbee Stations, Assisted in the completion of hydrogeological assessments and Permit To Take Water application / Environmental Activity and Sector Registry (EASR) registration in support of construction dewatering. The hydrogeological review detailed available site conditions, proposed construction activity, dewatering estimates and discharge options. Potential interference concerns were evaluated and mitigation measures recommended.

Trans Mountain Expansion Project Knowledge Management Portal | Trans Mountain Corporation | Calgary, Alberta, Canada | 2021-Present | Project Manager

To facilitate data transfer, storage, and assessment Stantec assisted Trans Mountain in development of a knowledge management portal for the project. Aaron acted as project manager for the knowledge management portal development, coordinating with the various stakeholders, including 3rd party consultants and Stantec personnel. Aaron oversees and coordinates the development of the portal system and database to provide digital custom solutions for data transfer and visualization.

Rick Reinke PGeo, PGeoph

Geophysicist – Senior Water Resources Modeler

39 years of experience · Denver, Colorado

Rick has over 37 years of professional experience, with expertise in the mining industry, oil and gas operations and groundwater consulting. He currently specializes in hydrologic modeling, hydrogeologic field investigations, and well test analysis and interpretation. Rick's groundwater modeling experience includes coal bed methane (CBM) studies, coal mine and overburden dewatering, groundwater resource development, contaminant transport, unsaturated zone flow, finite element modeling, density-dependent flow and dual-domain mass transport, and integrated groundwater and surface water modeling. Rick has also managed and implemented numerous field programs, including a variety of drilling and site investigation operations, well installations, well stimulation, hydraulic testing, soil and water sampling at CERCLA and RCRA sites, geophysical investigations, coal bed methane pilot studies, water supply investigations, coal mine and overburden dewatering, and environmental site investigations.

EDUCATION

BS Applied Geophysics, Michigan Technological University, Houghton, Michigan, 1986

MS Geophysics, University of Wyoming, Laramie, Wyoming, 1991

MS Geology, Western Michigan University, Kalamazoo, Michigan, 1994

REGISTRATIONS

Professional Geophysicist, Association of Professional Engineers and Geoscientists of Alberta

Professional Geoscientist, Association of Professional Engineers and Geoscientists of Alberta

MEMBERSHIPS

Member, National Ground Water Association

PROJECT EXPERIENCE

GROUNDWATER MODELING

Aquifer Storage and Recovery (ASR) Well Program | South Florida Water Management District | Okeechobee, Florida | Groundwater Modeling Lead

With a planned total capacity of 275 MGD, the Lake Okeechobee Watershed Restoration Project ASR Program is currently one of the largest aquifer storage and recovery projects in the world. It involves the construction of 55 ASR wells—each capable of pumping 5 MGD—at eight sites throughout the Lake Okeechobee watershed. Stantec was selected to evaluate the potential for developing these sites to support the construction of ten ASR well pairs. Rick is serving as the groundwater modeling lead for local-scale ASR model of the C-38N and C-38S sites. In this capacity, he is overseeing the development of a groundwater model using the SEAWAT code to evaluate ASR injection and recovery scenarios at each site.

Springtree Wellfield Modeling | City of Sunrise | Sunrise, Florida | Groundwater Modeler

The City of Sunrise operates sixteen Biscayne Aquifer water supply wells at the Springtree wellfield. Because eight wells have low specific capacity, the City needs to add additional wells to increase the capacity and reliability of the wellfield and provide rotational capacity for the rehabilitation or replacement of some existing wells. Rick conducted a 2-D modeling assessment to assess the impact of adding wells on the City's water use allocation permit.

Lower Tamiami Groundwater Flow Model | Bonita Springs Utilities (City of Bonita Springs) | Bonita Springs, Florida

Rick provided senior review and modeling support for the City of Bonita Springs' Lower Tamiami Groundwater Flow Model. His responsibilities included responding to information requests from SFMWD.

Potash Brine Feasibility Study, Lake Mackay, Australia, Agrimin | Project Manager

Managed development of density-dependent groundwater flow and dual-domain mass transport model of Lake Mackay, Australia to evaluate brine extraction from unconfined dry lakebed sediments. Model was used to develop mine plan and estimate reserves for mine definitive feasibility study. Performed gap analysis of PFS data and supported client on hydrogeology field and lab data acquisition program to bring project to DFS level. Competent Person (CP) for the hydrogeology and reserves sections of the JORC Technical Report and DFS Report for the project.

Potash Brine Feasibility Study, Sevier Lake, Utah, Crystal Peak Minerals | Project Manager

Managed development of density-dependent groundwater flow and dual-domain mass transport model of Sevier Playa, Utah to evaluate brine extraction from playa sediments. Model was used to develop mine plan and estimate reserves for mine feasibility study. Qualified Person (QP) for the hydrogeology and reserves sections of the NI43-101 Technical Report and FS Report for the project.

Navajo Mine Extension Project, Farmington, New Mexico, BHP | Groundwater Modeler

Developed saturated-unsaturated groundwater flow and transport model using FEFLOW to assess the effects of pit drainage and re-saturation of mine backfill as well as long-term effects of mine spoils and coal combustion byproducts on groundwater quality.

Site-Wide Water Balance Hydrologic Model, Rocky Flats Environmental Technology Site, Jefferson County, Colorado, US Department of Energy | Groundwater Modeler

Groundwater modeler for Site-Wide Water Balance (SWWB) hydrologic modeling project using the MikeSHE integrated modeling code at the Rocky Flats Environmental Technology site in Jefferson County, Colorado. Responsibilities included assisting lead modeler in developing the SWWB and presenting project plans and progress to client and stakeholder groups including DOE, EPA, CDPHE, the State Engineer's office, cities, counties, and citizen groups.

3M Project, San Juan Basin, Colorado, Colorado Oil & Gas Conservation Commission | Groundwater Modeler

Developed a groundwater model of the Fruitland Formation, San Juan Basin, Colorado and New Mexico. The hydrologic model was used to define pre-CBM production pressures and groundwater flows, including discharge to streams, to test various conceptual models of internal barriers and baffles, and to provide starting conditions for a transient reservoir model. Model development integrated formation permeabilities and porosities (determined from reservoir modeling), multiple recharge assessment techniques, stable isotope chemistry (and interpreted recharge temperatures), and major-ion groundwater chemistry.

Redfield Project, Denver, Colorado, Brown Retail Group | Groundwater Modeler

Developed groundwater model to assess the performance of a hydraulic containment system at the contaminated Redfield industrial site. The model was used to optimize injection well locations and injection rates of remediation system. Developed a separate groundwater transport model for optimization of an enhanced bioremediation system.

HYDROGEOLOGY

Grosmont Well Testing Program, Wabasca, Alberta, Canada, Shell Canada | Project Manager

Managed a large scale well testing program over four winter field seasons for a major oil and gas developer in northern Alberta. Work included over fifty single well production and injection tests with straddle packers in open holes and through perforated and cased wells; multi-well interference testing; and a production test in a horizontal well.

Coal Bed Methane Pilot Studies and Discharge Water Management, Powder River Basin Coal Bed Methane Operations, Gillette, Wyoming, Devon Energy | Project Manager

Managed two CBM pilot studies in the Powder River Basin of Wyoming. Conducted well testing programs to evaluate the effects of complex geology and coal anisotropy on coal depressurization during CBM production. The pilot consisted of several multi-well aquifer tests to evaluate coal permeability, aquifer storage properties, dissolved methane content, and groundwater quality of CBM production water. Analyzed and interpreted data and reported on results. Discharge water management for CBM field in the Powder River Basin, Wyoming. Permitted various water discharge management options including discharge to surface water drainages and containment in small reservoirs. Work also included assuring client remained in compliance with various State and Federal regulations.

Naarin Sukhait and Tsagaan Tolgoi Mines, South Gobi Province, Mongolia, Ivanhoe Mines | Project Manager

Managed a field investigation and mine dewatering study for two proposed open pit coal mines in South Gobi Province, Mongolia. Oversaw drilling and well installation and conducted well testing programs for water supply investigation and dewatering evaluation at two proposed mine pit locations. Incorporated results of field investigations into numerical groundwater model to determine anticipated pit inflows and to evaluate various dewatering strategies.

Smith Ranch-Highlands Uranium Operations, Douglas, Wyoming, Cameco Resources | Project Manager

Managed well testing program, data analysis and reporting for in-situ leaching (ISL) uranium mine. Oversaw development of a groundwater flow and particle tracking model using to evaluate a restoration plan for an in-situ leaching (ISL) uranium mine in the Powder River Basin, Wyoming. Model results were submitted to regulatory agencies as part of the application for approval of the mine unit restoration plan.

Chemical Manufacturing Facilities - Environmental Investigation and Groundwater Monitoring Program, Lake Charles, Louisiana, Bayport and Channelview, Texas, ARCO Chemical Company | Project Manager

Project manager for environmental investigation and groundwater monitoring programs at various CERCLA and RCRA sites. Duties included coordinating drilling and sampling operations, report preparation, and ensuring compliance with Federal and State regulations. Provided technical oversight of monitoring well drilling and installation.

Turtle Bayou Superfund Site, Crosby, Texas, ARCO Chemical Company | Hydrogeologist

Coordinated drilling and sampling operations, prepared report, and ensured compliance with Federal and State regulations. Provided technical oversight of well drilling and installation to monitoring the effectiveness of SVE and ISB remediation systems.

Elk Mountain Project, Elk Mountain, Wyoming, Shell Unconventional Resource Evaluation | Project Manager

Hydrogeology field manager for coal to liquids pilot study and field investigation in the Carbon Basin, Wyoming. Installed and conducted aquifer tests on several baseline monitoring wells. Conducted quarterly groundwater sampling. Incorporated field data in numerical groundwater model of the project area.

Yucca Mountain Project, Nevada, Nye County Nuclear Waste Repository Project Office | Principal Investigator

Managed and implemented several hydrogeologic investigations and monitoring programs for a local stakeholder of the proposed Yucca Mountain Nuclear Waste Repository.

PUBLICATIONS & WHITEPAPERS

Co-authored with A.O'Hayre, B.Musslewhite, D.Place, Application of Saturated-Unsaturated Groundwater Flow Model to Simulate the Probable Hydrologic Consequences of Mining at the Navajo Mine Extension Project, New Mexico. *National Meeting of the American Society of Mining and Reclamation, Billings, Montana*, 2009.

Co-authored with P.Vaca, J.Klenke, M.Hausner, and L.Kryder, Distributed Temperature Perturbation Sensing (DTPS) Measurements in Valley Fill Aquifer (VFA) Wells under Pumping Conditions at Nye County EWDP Site 22, Part Two – Data analysis and Modeling. *Devil's Hole Symposium. Death Valley, California*, 2012.

Overview of Nye County Gravity Fault Well Testing Program, Amargosa Valley, Nevada. . *Devil's Hole Symposium. Death Valley, California*, 2014.

Mark Hausner, Levi Kryder, John Klenke, Richard Reinke, and Scott Tyler. Interpreting Variations in Groundwater Flows from Repeated Distributed Thermal Perturbation Tests. *Groundwater, Vol. 54, No.4*, 2016.

With every community, we redefine what's possible.

Stantec is a global leader in sustainable architecture, engineering, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

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Source Water Protection Screening Form

Screening form for building permits, minor variance, consent to sever, lot line adjustment and other *Planning Act* applications

Your property is in a vulnerable drinking water area. To process your application, the municipality needs additional information about the existing and proposed activities occurring on the property, as required by the *Clean Water Act*. Find out more information about Source Water Protection and your role in drinking water protection at www.wellingtonwater.ca

This form must be filled out by the owner, the applicant, or their designate. Mandatory information includes:

- Section 1 – entire section
- Section 2 – entire section
- Section 3 – questions A to J marked "yes". Please review each question to determine if it applies
- Section 4 – entire section

*For assistance in completing this form, please refer to the **"Explanatory Guide"** beginning on page 7*

Section 1: General Information

Property Address or Legal Description: 4454 Victoria Road South

Roll Number (if known): _____

Owner/Applicant Information:

Owner
Name: Laura Anthony
Phone:
E-mail:

Applicant/Designate (if different than Owner)
Name: Andreanne Simard, CBM Aggregates, a division of St. Marys Cement Inc. (Canada)
Phone: 4163331459
E-mail: andreanne.simard@vcimentos.com

Who should we contact if additional information is required?

- ☐ Owner
- ☑ Applicant

How is your property serviced? Check all that apply:

- ☐ Unserviced
- ☐ Municipal Water
- ☐ Municipal Sanitary Sewer
- ☑ Private Well
  - Approximate Well Age: _____
- ☑ Septic System

How is your building heated? Check all that apply:

- ☒ Natural Gas
- ☑ Propane
- ☐ Home Heating Oil
- ☐ Other: _____

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Section 2: Proposal

	Application Type (check all that apply)
☐	New Building
☐	Expansion/Conversion of Existing Building
☐	New or Replacement Septic System
☐	Change of Use
☐	Demolition Permit
☐	Consent Application *(severance, lot line adjustment)*
☐	Minor Variance
☐	Development Agreement
☑	Other: Official Plan and Zoning By-law amendments

	Proposed Land Use (check all that apply)
☐	Single Family Residential *(detached, semi-detached)*
☐	Multi-Residential *(townhouse, condo, apartment, etc.)*
☐	Agricultural
☐	Commercial *(including mixed use, office, retail, etc.)*
☐	Industrial
☐	Institutional
☐	Home-based Business
☐	Recreational (*park, golf course, marina, etc.)*
☑	Other: Sand and gravel pit

Description of proposed land use or current land use if no change is proposed. Include a description of servicing, and building/structure use and size:

The Official Plan and Zoning By-law amendments will permit the development of a sand and gravel pit (Anthony Pit). A Class A licence application under the Aggregate Resources Act will be submitted in conjunction to the Ministry of Natural Resources.

Section 3: Potential Threat Activities Associated with Application

A. Are liquid fuels or wastes handled or stored on the property?

- ○ Yes, complete Table A below
- ◉ No, continue to Section B

Table A	Existing	Proposed	Total Volume	Inside Home	Outside Home	Not Applicable
More than 250L of Liquid Fuel *(e.g. gas, diesel)*	☐	☐				☐
Home Heating Oil or Waste Oil	☐	☐		☐	☐	☐
Industrial/Commercial Waste	☐	☐				☐
PCB Waste	☐	☐				☐
Hazardous Waste	☐	☐				☐
Handling of untreated liquids/solids from septic systems or holding tanks	☐	☐				☐

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B. Are non-residential chemicals handled or stored on the property?

- ○ Yes, complete Table B below
- ◉ No, continue to Section C

If you own a home-based business that handles or stores chemicals, complete Table B.

Table B	Existing	Proposed	Total Volume	Not Applicable
Paint, Stain, Lacquer, Enamel, etc.	☐	☐		☐
Auto repair/maintenance	☐	☐		☐
Degreasers/liquids for washing metal parts	☐	☐		☐
Industrial manufacturing/processing	☐	☐		☐
Chemical Solvents	☐	☐		☐
Dry cleaning chemicals	☐	☐		☐
Adhesives, furniture strippers	☐	☐		☐
Other Chemicals	☐	☐		☐

If "Other Chemicals" are existing or proposed, please provide information about the chemicals:

C. Are road salt or de-icing chemicals stored or applied? Is snow stored on the property?

This includes winter maintenance completed by a contractor on behalf of the property owner

- ○ Yes, complete Table C below
- ◉ No, continue to Section D

Table C	Covered	Uncovered	Volume Stored/Area Applied	Not Applicable
Road salt/de-icing chemical storage	☐	☐		☐
Size of area road salt/de-icing chemicals are applied				☐
Snow storage area greater than □ par□□□ spaces □□□□ □				☐

D. Are hard surfaces proposed that may reduce water infiltration into the ground?

This includes driveways, sidewalks, parking lots, large building roofs, patios, etc.

- ◉ Yes
- ○ No, continue to Section E

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E. Are stormwater management activities existing or proposed on the property?

- ○ Yes, complete Table E below
- ◉ No, continue to Section F

Table E	Existing	Proposed	Not Applicable
Stormwater Pond	☐	☐	☐
Oil/Grit or Oil/Water Separator	☐	☐	☐
Catch basins or sediment control *(e.g. Stormceptor)*	☐	☐	☐
Infiltration galleries	☐	☐	☐
Other *(e.g. vegetated swales, constructed wetlands, etc)*	☐	☐	☐

If "Other" stormwater management activities are existing or proposed, please provide further details:

F. Are groundwater transport pathways existing or being created?

Transport pathways are human constructed pathways through soil and bedrock that may increase the vulnerability of groundwater to certain contaminants.

- ◉ Yes, complete Table F below
- ○ No, continue to Section G

Table F	Existing	Proposed	Not Applicable
Vertical Geothermal System	☐	☐	☐
Well not in use (*includes domestic wells and environmental or geotechnical monitoring wells*)	☐		☐
Aggregate Project	☐	☑	☐
Non-residential or Large Multi-Residential Cassions/Building Piers	☐	☐	☐
Utilities/Excavation in fractured bedrock	☐	☐	☐
Parking garage/tunnel	☐	☐	☐

If any of the above transport pathways are occurring, please provide a brief description of the proposal and any relevant construction details (maps/cross-sections/figures, depth of excavation, etc). If constructing a geothermal system, please provide details including depth, vertical or horizontal, and whether the system is closed or open loop.

The enclosed site plan provides the operational plan of the proposed above and below water pit. The subject lands will be excavated to a maximum depth of 304 masl.

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G. Is non-residential water use existing or proposed?

This includes water used for agricultural, commercial, industrial, or institutional purposes such as manufacturing, irrigation, car/truck washing, etc. but does not include typical office use.

- ○ Yes, describe below
- ◉ No, continue to Section H

Please describe what water is used for on the property. Include approximate volume (L/day), if known.

H. Are manure, biosolids or livestock uses existing or proposed on the property?

- ○ Yes, complete Tables H1, H2, and H3 below
- ◉ No, continue to Section I

Table H1	Application	Storage	Product Name	Not Applicable
Manure	☐	☐		☐
Biosolids, commercial food waste, etc. *(i.e. NASM)*	☐	☐		☐

Table H2	Existing	Proposed	Type of Animals	Estimated # of Animals	Not Applicable
Grazing/Pasture of Livestock	☐	☐			☐
Livestock Outdoor Confinement Yard	☐	☐			☐

Table H3	Existing	Proposed	Not Applicable
Nutrient Management Plan or Strategy, NASM Plan	☐	☐	☐
Environmental Farm Plan	☐	☐	☐

I. Are fertilizers or pesticides used or stored on the property?

This includes fertilizer and pesticide use for agricultural purposes as well as commercial, industrial, institutional, and multi-residential landscaped areas. Single family houses are excluded.

- ○ Yes, complete Table I below
- ◉ No, continue to Section J

Table I	Application	Storage	Product Name	Not Applicable
Fertilizer	☐	☐		☐
Pesticide	☐	☐		☐

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J. Are provincial approvals required for any activities on the property?

- (•) Yes, complete Table J below
- ( ) No, continue to Section 4

Table J	Existing	Proposed	Description	Not Applicable
Environmental Compliance Approval	☐	☐		☑
Permit To Take Water	☐	☐		☑
Aggregate Resource Act Approvals	☐	☑	Class A Licence application	☐
Environmental Activity Sector Registry	☐	☐		☑

Section 4: Declaration of Person (Owner or Applicant) Engaged in Activity

By signing below, I declare that the information contained in this application and all attached documentation is true and accurate to the best of my knowledge. I understand that incomplete or inaccurate information may void any Notices or approvals issued relating to the proposal for which this application was intended.

Laura Anthony — Applicant or Owner Name

[redacted] — Applicant or Owner Signature

Apr. 17 2026 — Date

Information is collected pursuant to the *Municipal Freedom of Information and Protection of Privacy Act*, R.S.O. 1990, c. M.56 and the *Clean Water Act*, 2006, S.O. 2006, c. 22 for the administration and enforcement of the *Clean Water Act*. Please note that business identity information is not considered personal information pursuant to the *Municipal Freedom of Information and Protection of Privacy Act*.

For any inquiries about the collection of this information, please contact the Risk Management Office, Wellington Source Water Protection, 1 MacDonald Square, Elora, ON, N0B 1S0, 1-844-383-9800.

Explanatory Guide for Completing the Source Water Protection Screening Form

Your property is located within a municipal well head protection area or intake protection zone and therefore may be subject to the *Clean Water Act,* 2006. The Wellhead Protection Area (WHPA) is the area around a municipal well where land use activities have the potential to affect the quality and quantity of water that flows into the wellhead. For more information, refer to www.wellingtonwater.ca or contact 1-844-383-9800.

To assist staff in determining whether your property and/or application is subject to the Act, the Source Water Protection Screening Form is completed to inventory the activities that are proposed on your property. The following sections explain the form.

Section 1 – General Information

Please fill out the municipal address and property owner for the subject property. If the Roll Number is known, please enter it here. Please indicate who we should contact if we have any questions about the application.

Servicing information:
Please fill out how your property is serviced, whether it is municipally serviced or if you are on a private well or septic system. If you are on a private well, please indicate the year the well was installed, or approximate age. Please also indicate your heating source.

Section 2 – Proposal

Please check all that apply to the application and provide a brief explanation of the proposed development. If you are applying for something not listed or the proposed land use is not listed, please fill out the "Other" box.

Section 3 – Potential Threat Activities Associated with Application

Within this section, please fill out all that apply to your application. If there is a square provided in the table, please provide a check mark; if there is a blank space in the table please write in the applicable information.

3 A Liquid Fuel Handling and Storage, Waste Handling/Storage

Fill out this section if you have liquid fuel storage or handling greater than 250 litres (1 gal = 3.785 L). This can be located in land uses for residential, agricultural, gas, commercial, industrial or institutional purposes and includes gasoline, diesel or home heating oil. It does not include propane or natural gas.

Fill out this section if there is hazardous waste or liquid industrial waste stored on the property including waste oil, solvents, and automotive fluids. Please note storage or disposal of oil does not include restaurant oil or grease. Storage of hazardous waste or liquid industrial waste includes wastes requiring reporting through the Resource Productivity and Recovery Authority's Hazardous Waste Program Registry (formerly HWIN), if applicable. Disposal of waste on site includes landfilling and incineration. Typically, this □ □o □ □e at co□ □ erc□a□or □dustr□a□propert□es□

□□out t□s sect□o□ □t□e app□cat□o□ s □□o□ed □t□e pu□p□□ out or d□sposa□treat□ e□t o□ra□ se□a□e or septa□e□porta pott□es or □o□d□□ ta□□s□

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3 B Chemical Handling and Storage

Fill out this section if the application is regarding one of the listed chemical handling or storage activities on the form. If you use a chemical not listed, please provide additional details.

3 C Road Salt Application, Handling and Storage & Snow Storage

Fill out this section if there will be road salt or de-icing chemicals stored on the property or applied on a private road, parking lot, or sidewalk located on the property. Please provide estimates in m^3 for volume and m^2 for area.

Fill out this section if there will be snow storage on the property if the storage area will be greater than [illegible]. For reference, [illegible] is roughly the size of [illegible] spaces[illegible]

3 D Groundwater Recharge Reduction

Fill out this section if there will be an increase in impervious surfaces on the property. For example, asphalt (driveways and parking areas) and covered areas (roofs, decks and structures). If building within the current building envelope, then it is not an increase. Please describe the type of hard surface proposed and approximate size. Please note this section only applies within the Town of Erin.

3 E Stormwater Management

Fill out this section if any stormwater management features exist or will be built on the property. This does not apply to single-family homes.

3 F Transport Pathway

Transport pathways are human constructed pathways through soil and bedrock that may increase the vulnerability of groundwater to certain contaminants.

- If a geothermal system is existing or proposed, please provide construction details, including depth, vertical or horizontal, closed loop or open loop in the space provided.
- Private wells include environmental or geotechnical monitoring wells and domestic wells.
- A large residential application includes multi-story, multi-unit residential developments.
- A road occupancy permit application could indicate when fracture bedrock excavation occurs.

3 G Non-residential water use

Fill out this section if your property is serviced by a well. Describe what activities use water, and approximate volumes, if known. This does not include water use associated with normal office operations such as bathrooms.

3 H Agricultural Uses

H1 Manure, Biosolids:

Fill out this section if there is application, handling or storage of Agricultural Source Material (ASM) (manure) or Non-Agricultural Source Material (NASM) on the property. ASM and NASMs include; manure (ASM) and biosolids, commercial food waste, etc. For more information on NASMs and ASMs please look at fact sheet number 4, available on our website, www.wellingtonwater.ca.

H2 Grazing and pasturing of livestock, Livestock outdoor confinement yard:

Fill out this section if there is any grazing, pasturing or housing of one or more livestock on the property excluding household pets. Livestock can include cows, horses, sheep, goats and other animals. If unsure, please contact Wellington Source Water Protection for clarification. Please give an estimation of the number of animals, as well as the type of animal(s).

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H3 Agricultural Activity Plans
Fill out this section if an agricultural activity plan exists for the property. This includes Nutrient Management Strategies, Nutrient Management Plans, Non-Agricultural Source Material Plans, and Environmental Farm Plans.

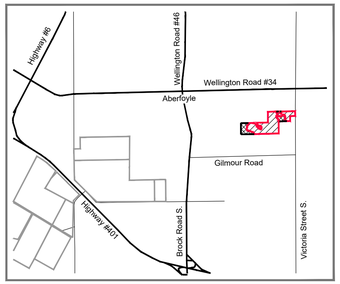
3 I Fertilizer & Pesticides
Fill out this section if there is storage or use of fertilizer or pesticides for agricultural or commercial use. This includes use by a contractor to maintain landscaped areas on the poperty. Do not fill out this section if products are used only for personal use.

3 J Provincial Approvals
Fill out this section if there are any prescribed instruments that apply to or are registered for the property. Please provide details regarding the type of instrument and attach a copy of the instrument to your application.

Section 4 - Declaration
Either the owner or the applicant must sign and date the form.

Wellington Source Water Protection
Risk Management Office | 1 MacDonald Square, Elora, ON, N0B 1S0
1-844-383-9800 | sourcewater@centrewellington.ca | wellingtonwater.ca

Key Plan

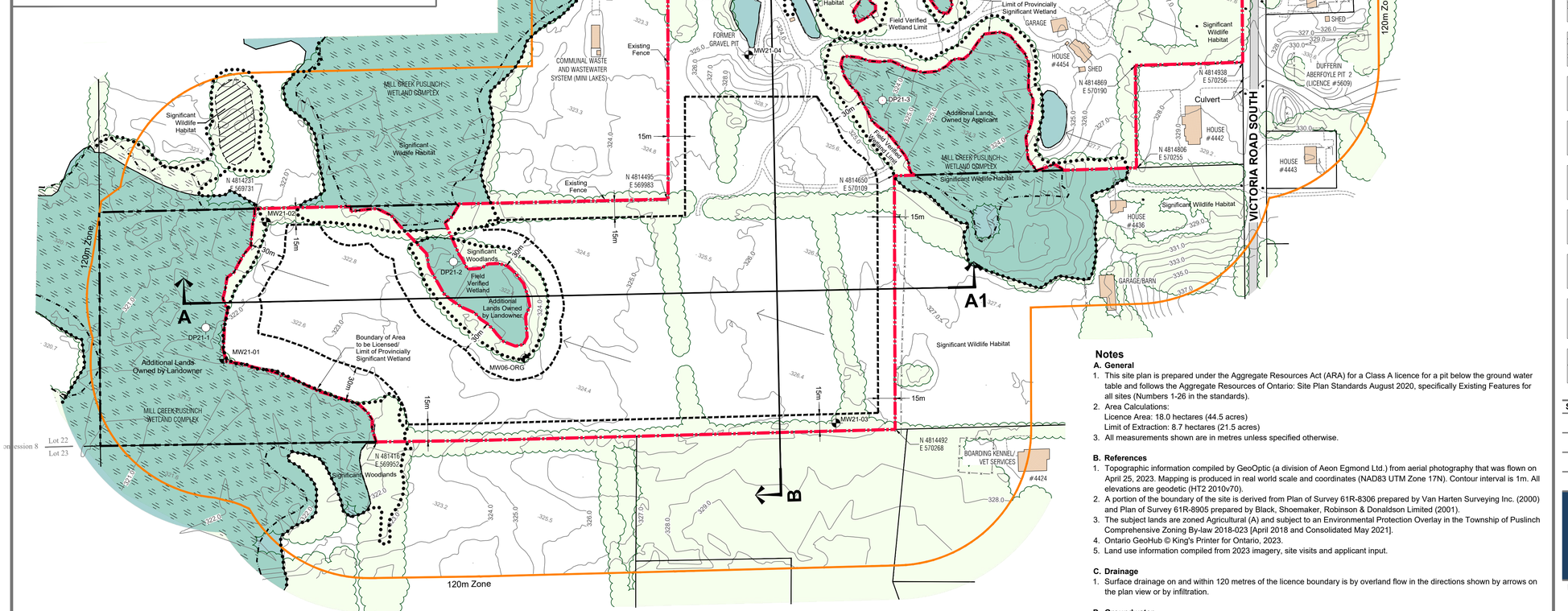


Subject Lands

Additional Lands Owned by Landowner

Additional Lands Licensed by CBM

SCALE
0 0.5 1.0 2.0
KILOMETRES



Notes

A. General

1. This site plan is prepared under the Aggregate Resources Act (ARA) for a Class A licence for a pit below the ground water table and follows the Aggregate Resources of Ontario: Site Plan Standards August 2020, specifically Existing Features for all sites (Numbers 1-26 in the standards).
2. Area Calculations:
   Licence Area: 18.0 hectares (44.5 acres)
   Limit of Extraction: 8.7 hectares (21.5 acres)
3. All measurements shown are in metres unless specified otherwise.

B. References

1. Topographic information compiled by GeoOptic (a division of Aeon Egmond Ltd.) from aerial photography that was flown on April 25, 2023. Mapping is produced in real world scale and coordinates (NAD83 UTM Zone 17N). Contour interval is 1m. All elevations are geodetic (HT2 2010v70).
2. A portion of the boundary of the site is derived from Plan of Survey 61R-8306 prepared by Van Harten Surveying Inc. (2000) and Plan of Survey 61R-8905 prepared by Black, Shoemaker, Robinson & Donaldson Limited (2001).
3. The subject lands are zoned Agricultural (A) and subject to an Environmental Protection Overlay in the Township of Puslinch Comprehensive Zoning By-law 2018-023 [April 2018 and Consolidated May 2021].
4. Ontario GeoHub © King's Printer for Ontario, 2023.
5. Land use information compiled from 2023 imagery, site visits and applicant input.

C. Drainage

1. Surface drainage on and within 120 metres of the licence boundary is by overland flow in the directions shown by arrows on the plan view or by infiltration.

D. Groundwater

1. The elevation of the on-site interpreted groundwater table ranges from 323.5 masl in the eastern portion of the site to 320.5 masl in the western portion of the site The existing water table elevations are shown on each cross section on page 5 of 5.
2. The maximum predicted groundwater table within the limit of extraction at the Site is 322.7 m masl in the northeastern corner to 320.3 masl in the southwestern corner.

E. Site Access and Fencing

1. There is an existing field access to the site off Victoria Road South as shown on the plan.
2. Post and wire fencing (unless noted otherwise) exists in the locations shown on the plan view.

F. Aggregate Related Site Features

1. Remnants of a former gravel pit (excavation face) exist in the north portion of site. There are no existing aggregate operations or features on-site such as processing areas with stationary or portable equipment, stockpiles, recyclable materials, scrap, haul roads, fuel storage or berms.

G. Significant Natural Features

1. On-site: Wetlands, Significant Woodlands, Significant Wildlife Habitat
2. Off-site within 120m: Wetlands (PSW, Unevaluated), Significant Woodlands, Significant Wildlife Habitat

H. Significant Human-made Features

1. On-site: former gravel pit area, house and associated buildings
2. Off-site within 120m: ARA Licence, former ARA Licence, waste/wastewater processing facility, Mini Lakes Condominium Community, houses

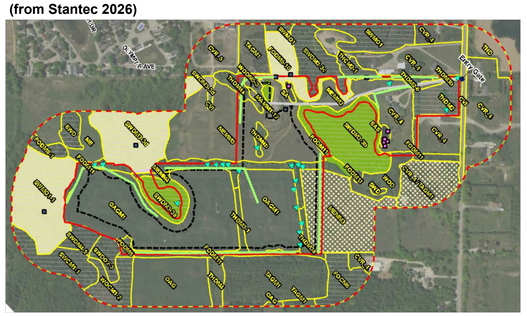
I. Cross Sections

1. As shown on this page. Detailed sections are shown on page 5 of 5.
2. Cross section locations are identified on the plan view for each drawing.

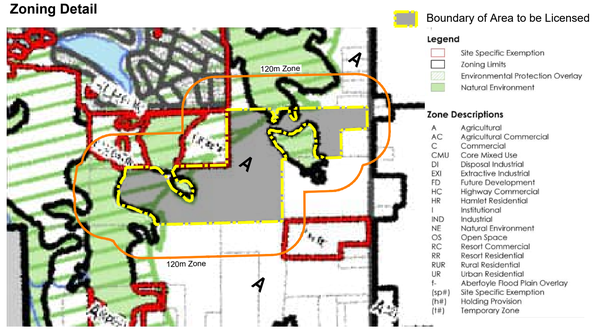
J. Report References

1. Noise: "CBM Anthony Pit Noise Assessment Report" January 6, 2026 (Source: Stantec Consulting Ltd.)
2. Natural Environment: "Natural Environment Report, Proposed Anthony Pit" March 6, 2026 (Source: Stantec Consulting Ltd.)
3. Hydrogeology: "Level I and II Water Report for Proposed Anthony Aggregate Pit" February 13, 2026 (Source: Stantec Consulting Ltd.)
4. Maximum Predicted Water Table Report: "Maximum Predicted Water Table Technical Memorandum" February 13, 2026 (Source: Stantec Consulting Ltd.)
5. Archaeology: "Stage 1-2 Archaeological Assessment: Proposed Anthony Pit (formerly Proposed Tikal Pit Expansion)" December 10, 2024 (Source: Stantec Consulting Ltd.)
6. Traffic: "Anthony Pit 4454 Victoria Road South Transportation Impact Study" October 7, 2025 (Source: CIMA+)
7. Agricultural: "Proposed Anthony Pit: Agricultural Considerations Review" January 5, 2026 (Source: MHBC)
8. Cultural Heritage Report: "Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment - Anthony Pit" September 22, 2025 (Source: Stantec Consulting Ltd.)
9. Dust: "Best Management Plan for Fugitive Dust: Anthony Pit Project" January 22, 2026 (Source: Stantec Consulting Ltd.)

Significant Wildlife Habitat Detail (from Stantec 2026)



Zoning Detail



Legal Description

PART OF LOT 22
CONCESSION 8
(Geographic Township of Puslinch)
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON

Legend

- Boundary of Area to be Licensed
- Additional Lands Owned by Landowner
- Existing Fence — POST & WIRE FENCE UNLESS OTHERWISE NOTED
- Public Road - Paved
- Driveway - Paved
- Driveway - Unpaved
- Existing Access
- Hydro Pole
- Provincially Significant Wetland — LIO/GEOHUB
- Field Verified Wetland — STANTEC 2025
- Unevaluated Wetland — LIO/GEOHUB
- Groundwater Monitor Drive-point Piezometer (MW21-05, DP21-3) — STANTEC 2024
- Cross Sections (A1) — SEE PAGE 5 OF 5 FOR EXISTING AND REHABILITATED CROSS SECTIONS
- Limit of Extraction — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Contour with Elevation — METRES ABOVE SEA LEVEL
- Existing Spot Height Elevation — METRES ABOVE SEA LEVEL
- Building/Structure — LOCATION AND USE FOR BUILDINGS ON-SITE AND WITHIN 120m ARE SHOWN ON THIS PAGE
- Existing Vegetation
- Direction of Surface Drainage (IF ANY)
- Drainage Feature — AS INDICATED
- Parcel Fabric — LOCATION APPROXIMATE
- Lots and Concessions (Lot 21 / Lot 22)
- Significant Woodlands — STANTEC 2025
- 120m Zone

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 | WWW.MHBCPLAN.COM

MNR Approval Stamp

MHBC Stamp

north

Applicant

VOTORANTIM cimentos | cbm

55 Industrial St. 4th Floor Toronto, Ontario M4G 3W9
Telephone: (416) 696-4411

Applicant's Signature

Andreanne Simard
Director of Lands, Resources and Environment
Votorantim Cimentos North America (VCNA)

Project

Anthony Pit

MNR Licence Reference No.

Pre-approval review:

For Submission to MNR - May 2026

Plan Scale **1:2,000 (Arch D)**

SCALE
0 25 50 100
METRES

Plot Scale	1:2 [1mm = 2 units] MODEL
Drawn By	D.G.S.
Checked By	N.D.
File No.	Y321AU

File Name

EXISTING FEATURES PLAN

Drawing No.

1 OF 5

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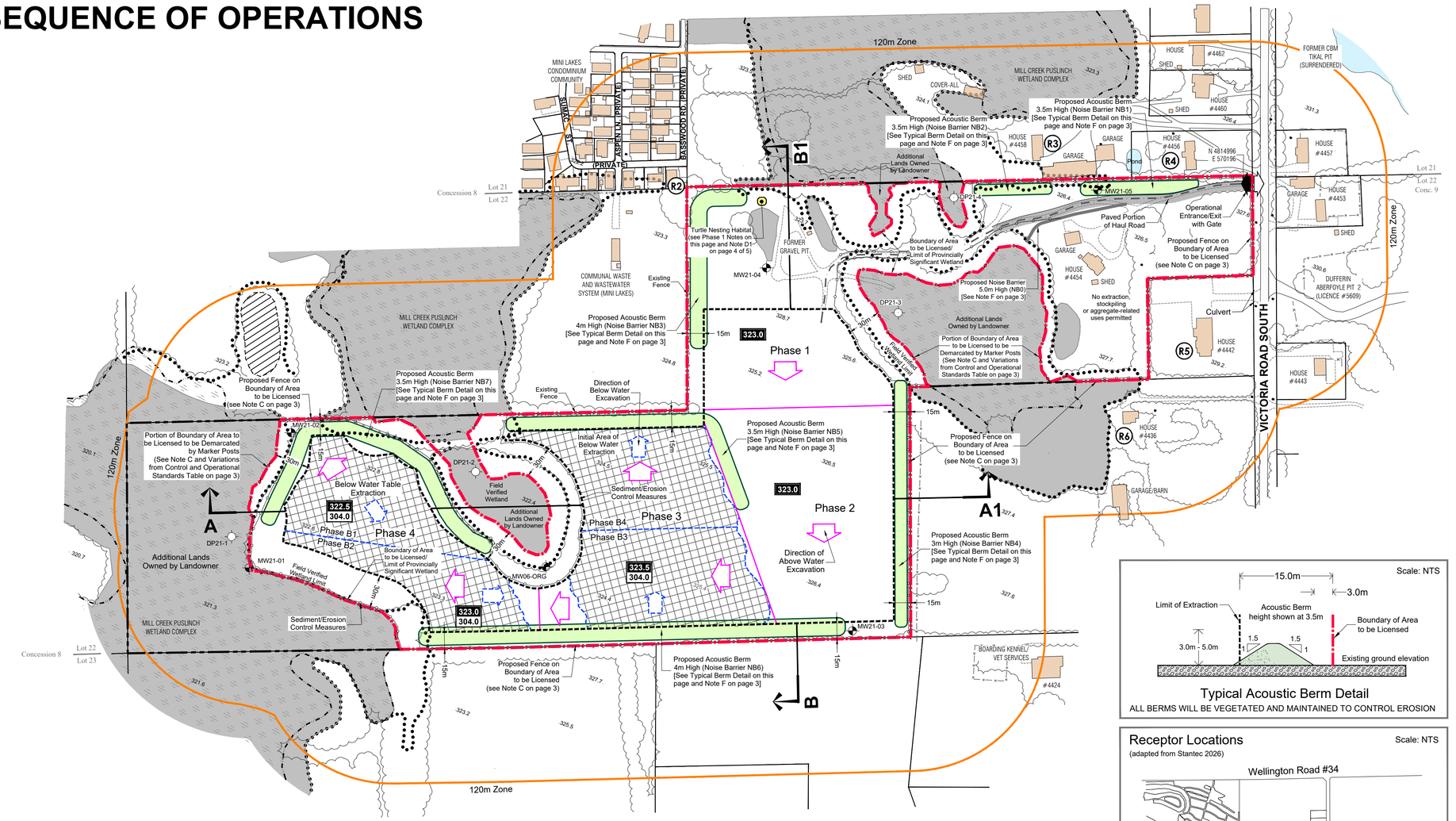
SEQUENCE OF OPERATIONS



Phase Notes:

Phase 1 (Above Water Extraction)
1. Establish operational entrance/exit.
2. Remove vegetation where applicable. Prior to vegetation removal, and where applicable, sediment/erosion control measures (eg. silt fencing) will be installed as shown on Sequence of Operations. These measures will be inspected as part of monitoring activities.
3. The perimeter of the site will be fenced in accordance with the Aggregate Resources Act prior to commencement of extraction on the site, with the exception of the boundaries that are in the woodlot/wetland areas. These locations will be demarcated by 1.2m high marker posts. Fencing is to be 1.2m high post and wire fence. A 1.2m gate will be installed prior to operations at the entrance/exit location shown and kept locked when the pit is not in operation (also see Sequence of Operations and Variations from Control and Operation Standards on this page and page 3 of 5).
4. The new turtle nesting habitat shall be constructed prior to removal of existing habitat as a result of berm construction (see Note L2f on page 3 of 5 for details)
5. Initial stripping of topsoil for use in construction of acoustic berms (NB1, NB2 and NB3) or store on pit floor. NB0, NB1 and NB2 shall be implemented before any extraction occurs.
6. Establish internal haul route for shipping of product off site for processing in the existing Aberfoyle South Pit (Licence #5497).
7. Extraction will commence in the north central portion of the site and proceed southerly to a maximum depth of 323.0 masl.
8. Prepare Phase 2 for above water extraction.

Phase 2 (Above Water Extraction)
1. Strip topsoil and use in progressive rehabilitation of pit floor and side slopes in Phase 1, where area is available and not required for operational aspects of site (haul road, stockpiles etc.).
2. Extraction in Phase 2 will proceed in a southerly direction until limit of extraction is reached. The maximum depth of extraction will be 323.0 masl.
3. Prepare Phase 3 for above water extraction.

Phase 3 (Above Water Extraction)
1. Strip topsoil and use in progressive rehabilitation of pit floor and side slopes in Phase 2 where area is available and not required for operational aspects of site (haul road, stockpiles etc.).
2. Above water extraction will proceed in an westerly and northerly direction. The maximum depth of extraction will be 323.5 masl.
3. Complete rehabilitation in Phase 1 (subject to any operational requirements for pit floor area) and initiate progressive rehabilitation in Phase 2.
4. Prepare Phase 4 for above water extraction.

Phase 4 (Above Water Extraction)
1. Strip topsoil and use in progressive rehabilitation of pit floor and side slopes in Phase 2 or 3, where area is available and not required for operational aspects of site (haul road, stockpiles etc.).
2. Above water extraction will proceed in an westerly and northerly direction. The maximum depth of extraction will range between 322.5 masl and 323.0 masl.
3. Complete progressive rehabilitation in Phase 2 and initiate above water table side slope progressive rehabilitation in Phases 3 and 4.
4. Prepare Phase 4 for above water extraction.

Phase 4 (Below Water Extraction)
1. Construct noise barriers NB6 and NB7 prior to below water extraction occurring.
2. Begin below water extraction in northern area (Phase B1) and continue in a southerly direction. The maximum depth of extraction will be 304.0 masl.
3. Material from dragline operations will not be stored in adjacent 30m setback from wetland but shall be stored on pit floor or in adjacent Phases.
4. Initiate progressive rehabilitation of below water side slopes from a north to south direction as operations progress.
5. Prepare Phase B2 for below water extraction.

Phase 3 (Below Water Extraction)
1. The new wetland area shall be created in accordance with the Wetland Area Detail (page 4 of 5). The wetland shall be created once below water extraction is complete in Phase 4.
2. Construct noise barrier NB4 and NB5 prior to below water extraction occurring.
3. Creation of shallow shoreline areas in the southern setback area of this Phase (See Rehabilitation Plan, page 4 of 5).
4. Below water extraction will follow the same direction as above water extraction and proceed in an northerly direction to the depths (pit floor) shown on the Sequence of Operations. The maximum depth of extraction will be 304.0 masl.
5. Initiate progressive rehabilitation of below water side slopes from a west to east direction as operations progress.

Phase 5 (Not Shown)
1. Remove equipment on site.
2. Complete all side slopes.
3. Final rehabilitation to be completed (see Rehabilitation Plan on page 4 of 5).

Typical Acoustic Berm Detail

Scale: NTS

ALL BERMS WILL BE VEGETATED AND MAINTAINED TO CONTROL EROSION

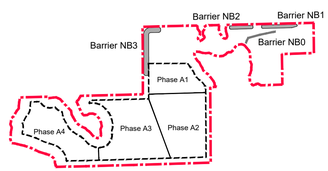
Receptor Locations

Scale: NTS

(adapted from Stantec 2026)

Phasing of Acoustic Berms Above Water Table Extraction

Scale: NTS

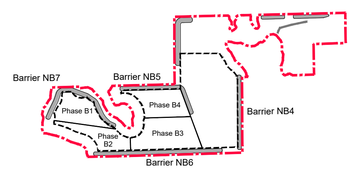


Barriers NB0, NB1 and NB2 - Prior to commencement of extraction phases.
Barrier NB3 - Prior to commencement of extraction phase A1 or B4.

Source: "CBM Anthony Pit - Noise Impact Report" January 2026 (Source: Stantec Consulting Ltd.)

Phasing of Acoustic Berms Below Water Table Extraction

Scale: NTS



Barriers NB4, NB5 and NB6 - Prior to commencement of extraction phases B3 or B4.
Barriers NB6 and NB7 - Prior to commencement of extraction phases B1 or B2.

Source: "CBM Anthony Pit - Noise Impact Report" January 2026 (Source: Stantec Consulting Ltd.)

Legal Description

PART OF LOT 22
CONCESSION 8
(Geographic Township of Puslinch)
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON

Legend

- Boundary of Area to be Licensed
- Additional Lands Owned by Landowner
- Existing Spot Height Elevation — METRES ABOVE SEA LEVEL
- Existing Fence — POST & WIRE FENCE UNLESS OTHERWISE NOTED
- Building/Structure — LOCATION AND USE FOR BUILDINGS ON-SITE AND WITHIN 120m ARE SHOWN ON THIS PAGE
- Existing Vegetation
- Drainage Feature — AS INDICATED
- Provincially Significant Wetland — LIO/GEOHUB
- Field Verified Wetland — STANTEC 2025
- Unevaluated Wetland — LIO/GEOHUB
- MW21-05 / DP21-3 Groundwater Monitor Drive-point Piezometer — STANTEC 2024
- Significant Woodlands — STANTEC 2025
- Limit of Extraction — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Operational Entrance/Exit — MAINTAINED BY A GATE WHICH WILL BE CLOSED WHEN PIT IS NOT IN OPERATION
- Direction of Above Water Excavation — SEE NOTES ON THIS PAGE/PAGE 3 OF 5
- Direction of Below Water Excavation — SEE NOTES ON THIS PAGE/PAGE 3 OF 5
- Area of Below Water Excavation
- Elevation — ABOVE WATER DEPTH OF EXTRACTION / MAXIMUM DEPTH OF BELOW WATER EXTRACTION/PIT FLOOR
- Internal Haul Road — INITIAL TYPICAL LOCATION. LOCATION TO VARY AS OPERATIONS PROGRESS
- Fence — 1.2m HIGH POST & WIRE FENCE UNLESS OTHERWISE NOTED
- Sediment/Erosion Control Measures — SEE NOTE C3 ON PAGE 3 OF 5
- Acoustic Berm — SEE "TYPICAL BERM DETAIL" ON THIS PAGE AND NOTES ON PAGE 3 OF 5
- R3 Receptor Locations
- A1 Cross Sections — SEE PAGE 5 OF 5 FOR EXISTING AND REHABILITATED CROSS SECTIONS

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR, KITCHENER, ON, N2B 3X9 | P: 519.576.3650 | WWW.MHBCPLAN.COM

MNR Approval Stamp

MHBC Stamp

[redacted]

north

Applicant

VOTORANTIM cimentos / cbm

55 Industrial St. 4th Floor Toronto, Ontario M4G 3W9
Telephone: (416) 696-4411

Applicant's Signature

[redacted]

Andreanne Simard
Director of Lands, Resources and Environment
Votorantim Cimentos North America (VCNA)

Project

Anthony Pit

MNR Licence Reference No.

Pre-approval review:

For Submission to MNR - May 2026

Plan Scale **1:2,000 (Arch D)**

SCALE
0 25 50 100
METRES

Plot Scale 1:2 [1mm = 2 units] MODEL

Drawn By D.G.S.

Checked By N.D.

File No. Y321AU

File Name

OPERATIONAL PLAN

Drawing No.

2 OF 5

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A. General

1. This site plan is prepared under the Aggregate Resources Act (ARA) for a Class A licence for a pit below the ground water table and follows the Aggregate Resources of Ontario: Site Plan Standards August 2020, specifically Operations for all sites (Numbers 33-56 in the standards).
2. Area Calculations:
   Licence Area: 18.0 hectares (44.5 acres)
   Limit of Extraction: 8.7 hectares (21.5 acres)
3. No more than 1,000,000 tonnes of aggregate shall be removed from this site in any calendar year.
4. Based on the available groundwater elevation data, the maximum predicted groundwater table within the limit of extraction is 322.7 masl in the northeastern corner (MW21-03) to 320.3 masl in the southwestern corner (MW21-02).
5. Agricultural use may continue in areas not under extraction.
6. Setbacks will be as shown and labelled on the Site Plans.
7. Source Water Protection: The site lies within the Grand River Source Protection Area which is part of the Lake Erie Source Protection Region (LESPR). The site is not proximal to any Wellhead Protection Area (WHPA). The site is located within the Wellhead Water Quantity Zone and is classed as a Significant Groundwater Recharge Area (SGRA). No proposed on-site activities are considered to be significant drinking water threats.
8. All measurements shown are in metres unless specified otherwise.

B. Hours of Operation

1. Extraction (from above and below the water table) will be carried out between 07:00 and 19:00 Monday through Friday and 08:00 to 16:00 on Saturdays. No aggregate operations (e.g. extraction, loading and hauling) will occur outside of these hours.
2. Activities used to prepare the site for extraction, such as stripping of topsoil, construction of the berms, or activities related to the rehabilitation of the site after extraction is completed are considered to be construction activities and are only permitted to occur during the daytime (i.e. 07:00 to 19:00) Monday to Friday except statutory holidays.

C. Site Access and Fencing

1. There is one existing access to the site from Victoria Road South. This access will be used for the operational entrance/exit and will be gated.
2. A portion of the Boundary of Area to be Licensed is fenced. The boundary adjacent to the Mini Lakes Condominium Community and the boundary adjacent to #4442 Victoria Road South is fenced. Where this fencing is not compliant, it will meet ARA requirements prior to commencement of extraction on site. Fencing will be installed along the remaining portions of the licence (see Sequence of Operations diagram on page 2 of 5) that are not within environmental areas. In these areas 1.2m high marker posts that are visible form one to the other will be installed to demarcate the boundary (see Note M 'Variations from Control and Operation Standards').
3. Sediment/erosion control measures (e.g. silt fencing) shall be installed along the portions of the licensed boundary as shown on the Sequence of Operations between the area to be disturbed and the wetlands/woodland limit prior to commencement of work (see Note L2c 'Natural Environment').

D. Drainage

1. Drainage of undisturbed areas will continue and will be in the directions shown on the Existing Features drawing on page 1 of 5. During above water excavation, surface drainage from active pit areas will be detained within the pit area. For below water excavation, drainage will be directed toward the pond area. Drainage will also percolate naturally through the soil.

E. Site Preparation

1. There will be no temporary buildings or structures incidental to the pit operation on the site.
2. Prior to site preparation, a Spills Contingency Plan shall be developed (see Note L2d 'Natural Environment')
3. Timber resources will be salvaged for use as saw logs, fence posts and fuel wood where appropriate. Non-merchantable timber, stumps and brush may be used in for aquatic habitat enhancement or mulched for use in progressive rehabilitation. Excess material not required for uses mentioned above will be burned (with applicable permits).
4. Topsoil and overburden shall be stripped and stored separately in accordance with the Sequence of Operations diagram.
5. Excess topsoil and overburden not required for immediate use in the construction of acoustic berms or rehabilitation, may be temporarily stockpiled within the limit of extraction. Topsoil and overburden stockpiles shall be located within the limit of extraction (see Note M 'Variations from Control and Operational Standards').
6. Any stockpiled topsoil/overburden will be vegetated with locally sourced native plantings/seed mixture.

F. Berms and Screening

1. Acoustic berms shall be constructed as shown/described on the Sequence of Operations diagram and Phase Notes (see page 2 of 5 for details).
2. See 'Typical Acoustic Berm Detail' on page 2 of 5 for details relating to berm construction. Berms will be vegetated and maintained to control erosion using a low maintenance grass/legume seed mixture (e.g. MTO Seed Mix) composed of Creeping red Fescue, Perennial Ryegrass, Kentucky Bluegrass and White Clover. Temporary erosion control will be implemented as required.
3. Existing vegetation within the setbacks shall be maintained to the extent possible where berms are to be located. Additional nodal plantings shall occur within setbacks as shown on the Rehabilitation Plan (page 4 of 5).

G. Extraction Sequence

1. The operational plan depicts a schematic operations sequence for this property. Phases do not represent any specific or equal time period. The direction of extraction will be in accordance with the Sequence of Operations diagram shown on page 2 of 5. All extraction and transportation equipment operating within these Phases shall comply with the restrictions identified in Note L 'Noise'.
2. Rehabilitation will be progressive and proceed as limits of extraction (area and depth) are reached. Any deviations from the operations sequence shown (extraction, stripping and rehabilitation areas) will require the approval of MNR.
3. Notwithstanding the operation and rehabilitation notes, demand for certain products or blending of materials may require minor deviations in the extraction and rehabilitation sequence. Any major deviations from the operations sequence shown will require approval from MNR.
4. See Phase Notes on page 2 of 5 for details.

H. Extraction Details

1. The maximum depth of extraction is as shown as spot elevations and extraction will occur in up to 2 lifts within the extraction area as shown on the Sequence of Operations Diagram on page 2 of 5 and in accordance with the Ministry of Labour requirements. The maximum lift height shall be 20m, with a typical face height of 10m, but will not exceed Ministry of Labour guidelines. The proposed pit floor will range in elevation from 323.0 masl (above water) to 304.0 masl (below water).
2. Aggregate stockpiles will be located on the pit floor and will move throughout the life of the operations of the pit. Stockpiles may be located anywhere within the limit of extraction and will be a maximum 20m in height (see Note M 'Variations from Control and Operational Standards').
3. There will be no aggregate processing or recycling at this pit.
4. Internal haul road locations will vary as extraction progresses through the site.

I. Equipment and Processing

1. The equipment used on site for above water extraction may include: 1 loader. For below water extraction, the equipment may include: 1 dragline or excavator and 1 loader. Also, portable equipment will used for site preparation and rehabilitation including hydraulic shovels, dozers and scrapers.
2. There will be no aggregate processing on site. Processing will be carried out at other CBM licences.

J. Fuel Storage

1. There will be no fuel storage on site.
2. Mobile fuel trucks will be used for fuelling of equipment. Designated fuelling and equipment maintenance area, located at least 30 m away from surface water features will be implemented.

K. Scrap and Recycling

1. No scrap will be stored on site.
2. No recycling activities will take place on site.

L. Report Recommendations

1. **Noise: "CBM Anthony Pit Noise Assessment Report" January 6, 2026 (Source: Stantec Consulting Ltd.)**
   a. Sound power levels for the Project equipment must be at or below the values identified in Table 4-1. If other equipment is used for the Project, their sound levels must be confirmed through measurements or manufacturer data to meet the levels provided in Table 4-1.
   b. The quantity of equipment, including truck volumes, must not exceed those modelled in this assessment.
   c. Noise barrier NB0 is a discretionary noise barrier for the on-site dwelling (R11/OR11), which is exempted per NPC-300. It should be implemented before any extraction phases begin.
   d. Noise barriers NB1 and NB2 are to be implemented as shown on Sequence of Operations Diagram on page 2 of 5 before any extraction phases begin.
   e. Noise barrier NB3 is to be implemented before any extraction phases begin in working area A1 or B4.
   f. Noise barriers NB4, NB5, and NB6 are to be implemented before below water extraction occurs in working area B3 or B4.
   g. Noise barriers NB6 and NB7 are to be implemented before below water extraction occurs in working area B1 or B2.
   h. Noise barriers NB0 through NB7 are to meet the minimum heights and extents.
   i. Noise barriers NB0 through NB7 are to be of solid construction with no gaps and have a surface density of at least 20 kg/m2. The noise barriers can be a single or combination of barrier system such as noise wall, earth berm, acoustical fence or shipment containers provided they meet the overall height and extents.
   j. Noise barriers NB3, NB5, NB6, and NB7 are to be acoustically absorptive on the surface facing the extraction area. These noise barrier surfaces are to meet a minimum noise reduction coefficient (NRC) value of 0.7. Earth berms would be expected to satisfy this NRC requirement.
   k. Activities used to prepare the site for excavation, such as the stripping of topsoil, construction of the berm, or activities related to the remediation of the site after the extraction is completed as considered to be construction activities and are only permitted to occur during the daytime (i.e. 07:00 to 19:00) Monday to Friday except statutory holidays.

Table 4-1: Noise Source and Sound Power Summary

Noise Source	Overall Sound Power Level (dBA)	Source Location[b]	Sound Characteristics[c]
Loader	108	O	S
Dragline [d]	114	1O	S
Moving Truck	106	O	S
Idling Truck	91	O	S

Notes:
a. The listed sound power level does not reflect the time-weighting considered in the model
b. "O" indicates Outdoor
c. Sound Characteristics per NPC-104: S = Steady
d. Although an excavator may be alternatively used for below water extraction, only the dragline is considered as it generates higher noise emissions and results in a conservative assessment

2. **Natural Environment: "Natural Environment Report, Proposed Anthony Pit" March 6, 2026 (Source: Stantec Consulting Ltd.)**
   a. Vegetation

   The following mitigation measures are recommended to reduce the likelihood of impacts to vegetation and vegetation communities (e.g., wetlands, woodlands, thickets, meadows):
   - The boundaries of the project limits, vegetation clearing and retention zones within the project limits, and natural areas adjacent to the project limits, shall be clearly delineated in plans/drawings and in the field.
   - In the case of unexpected vegetation removal or accidental damage to trees, vegetation shall be replaced and/or restored.
   - Access road upgrades, if required, will consider overhanging trees and avoid compression of critical root zones of adjacent features (i.e., woodlands and wetlands). The footprint of the road will be reduced to the greatest extent possible to avoid further encroachment to the adjacent natural features.
   - Vegetation removals shall adhere to applicable timing windows, December 1 to March 30 to accommodate most species.
   - Strict mitigation for dust suppression will be implemented as detailed in the Best Management Plan for Fugitive Dust: Anthony Pit Project (Stantec 2026).

   b. Invasive Species Management
   - Clean vehicles and equipment in an area that is free of mud, with a gravel surface, a hard surface, or a regularly mowed grassy area at least 30 m away from nearby watercourses and areas of natural vegetation in accordance with Clean Equipment Protocol for Industry (Halloran et al 2013)
   - European Buckthorn will be removed and stored in a manner that does not spread seeds. Buckthorn can be brushpiled and left as wildlife habitat in the area where it was removed, chipped and buried, or disposed of off-site at an appropriate facility.
   - Seeds being used for hydro seeding or revegetation shall be certified free of weeds or invasive species. Mulch should be weed free.

   c. Erosion and Sediment Control
   - Develop and implement an Erosion and Sediment Control Plan prior to construction to protect sensitive natural heritage features.
   - ESC measures shall be installed prior to vegetation removal and remain in place until vegetation has become established and soils re-stabilized.
   - Selection of ESC measures shall be appropriate for the site and extent of disturbance, and potential impacts to wildlife, such as entanglement and movement barriers.
   - Stockpiled materials shall be stored in areas where stormwater run-off will not drain directly into wetland and the woodlot areas being maintained at the Site.
   - Berms constructed at the Site shall be vegetated as soon as possible after placement, to help stabilize the berm side slopes.
   - ESC measures shall be inspected to confirm as part of construction monitoring activities.

   d. Spill Prevention
   - Develop and implement a Spill Prevention and Response Contingency Plan that includes measures for preventing, addressing, and reporting potential spills, in accordance with all applicable regulations, permits, and guidelines.
   - On-site hazardous materials, vehicle maintenance and refueling activities shall be properly stored and located at least 30 m away from wetlands, and other sensitive natural features.
   - Spill kits shall always be kept on-site and accessible at all times.
   - Control onsite activities, including equipment maintenance and re-fueling, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble, etc., into the natural environment.

   e. Environmental Monitoring
   - Regular inspections of sensitive features so that setbacks are adhered to and that damage/alteration to the demarcations or protective measures of these features is addressed.
   - Regular monitoring of erosion and sediment control, equipment refuelling activities, so that spills and sediment releases are prevented or addressed quickly and effectively.
   - Monitoring for dust as detailed in Best Management Plan for Fugitive Dust: Anthony Pit Project (Stantec 2026).
   - Specialized environmental monitoring programs shall be developed and implemented as it relates to:
     - Rehabilitation and enhancement
     - Permit and approval requirements, which will be confirmed as part of the permitting processes

   f. Turtle and Turtle Habitat
   - To supplement the proposed removal of existing turtle nesting habitat onsite to facilitate berm construction, the creation of a turtle nesting mound in the vicinity of removal (i.e., in proximity to MAMM1-12) in accordance with guidance provided by the Canadian Wildlife Federation (CWF) and Paterson et al. 2015, including:
     - Locate above the high-water mark
     - Locate in open areas to receive sun most of the day
     - Place geotextile cloth under the nesting area to prevent vegetation growth
     -Soil should be a mixture of fine gravel, sand, and existing soil
     -Site each mound facing south or south-west
     -Slope of no more than 30%
   - To avoid impacts to turtles nesting onsite, construction of the proposed nesting mound is to occur prior to removal of the existing nesting site so there is a continuous availability of nesting areas. Specific timing windows and exclusionary measures will (or concurrently) be required so that removal of the existing feature will not directly impact turtle eggs that could be in the feature to be removed. The following are recommended to reduce the likelihood of impacts to turtles during operation:
     -if there are repeat observations of turtles in the active pit (including nesting), barrier fencing may be used to direct wildlife away from the active work area(s) and toward natural wetland areas outside the Extraction Limit
     -all fencing materials shall be wildlife-friendly to prevent accidental entanglement
     -If a turtle nest site or evidence of a turtle nest (i.e., areas of fresh digging in loose gravel or sandy material) is found within the work areas, all work in that area shall cease. The nests shall be left undisturbed, flagged and a setback applied to protect against construction activities. If avoidance is not possible, egg salvage may be completed by a Qualified Biologist.

   g. Habitat for Species of Conservation Concern
   - Compensation for Midland Painted Turtle nesting habitat is discussed in Section f above and the rehabilitation planting plan will offset the loss of the edge of Eastern Wood-pewee habitat that is proposed for removal.
   - Common milkweed and nectar producing plants (e.g., serviceberry, dogwood, asters, goldenrods, blackeyed Susan, Joe Pye weed) will be incorporated into the rehabilitation seed mix described in the Rehabilitation Plan.

   h. Species at Risk

   The following are recommended compensation and mitigation measures (subject to appropriate regulatory consideration or approvals) for bat SAR:
   - Installation of artificial roosting structures (i.e. bat boxes) and woodland restoration.
     -The two-chamber Rocket Boxes that can accommodate an average of 250 bats (specifications available at the following website http://www.batcon.org/files/RocketBoxPlans.pdf) and is recommended for inclusion in the Rehabilitation Plan.
     -BrandenBarkTM features may also be used to supplement the Rocket Boxes
   - Include oak and maple in the replanting plan to support tree-roosting bats
   - To reduce the effects of light pollution on bats, it is recommended that permanent light fixtures installed near bat habitat be avoided, where feasible. If not feasible, reduce illumination and light spill through design (e.g. height of light, light shields, lighting intensity, direction and spectral composition).

3. **Archaeology: "Stage 1-2 Archaeological Assessment: Proposed Anthony Pit (formerly Proposed Tikal Pit Expansion)" December 10, 2024 (Source: Stantec Consulting Ltd.)**
   Review and Entry into the Ontario Public Register of Archaeological Reports: Archaeological Assessment Report Entitled, "Stage 1-2 Archaeological Assessment: Proposed Anthony Pit (formerly Proposed Tikal Pit Expansion), Part of Lot 22, Concession 8, Puslinch Township, Wellington County, Ontario", Dated Dec. 10, 2024, Filed with MCM on Dec 18, 2024, MCM Project Information Form Number P256-0721-2022, MCM File Number 0016690

4. **Hydrogeology: "Level I and II Water Report for Proposed Anthony Aggregate Pit" February 13, 2026 (Source: Stantec Consulting Ltd.)**
   g. Groundwater level monitoring shall continue at the Site on a semi-annual basis after the pit is licensed and continue until Site restoration is complete.
   h. Groundwater samples have been collected at the Property to establish baseline water quality conditions for shallow groundwater within the unconfined aquifer which is expected to be encountered during the aggregate extraction operation. Future water quality testing shall be undertaken on an annual basis for comparison to the background information presented in this report.
   i. Fuel storage, equipment filling, and equipment maintenance shall be carried out in accordance with best management practices outlined in Section 7.3, including designated fuelling locations and implementation of spills management response plans, as appropriate to reduce the potential and mitigate risks associated with the equipment operation.
   j. Prior to below water table extraction, a private well survey shall be completed within 120 m of the Site to identify any private water supply wells in use. If complaints are received from nearby or neighbouring property owners (within 120 m of the Site), the Water Supply Interference Protocols outlined in Section 7.1 shall be adhered to and followed.

   Maximum Predicted Water Table Report: "Maximum Predicted Water Table Technical Memorandum" February 13, 2026 (Source: Stantec Consulting Ltd.)
   k. It is estimated that the maximum predicted groundwater table within the limit of extraction at the Site is 322.7 m masl in the northeastern corner to 320.3 masl in the southwestern corner.

5. **Traffic: "Anthony Pit 4454 Victoria Road South Transportation Impact Study" October 7, 2025 (Source: CIMA+)**
   a. Remove the excess coverage located along the shoulder of the roadway to provide enough visual clearance at the site access on Victoria Road South. Vegetation clearance is recommended to meet required stopping sight distance standards, particularly for heavy vehicles.
   b. Install a "slippery when wet" road signs at key locations prone to adverse weather effects to warn drivers ahead of time about expected road conditions.

6. **Dust: "Best Management Plan for Fugitive Dust: Anthony Pit Project" January 22, 2026 (Source: Stantec Consulting Ltd.)**
   The pit shall be operated in accordance with the Best Management Plan for Fugitive Dust.

7. **Cultural Heritage: "Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment - Anthony Pit" September 22, 2025 (Source: Stantec Consulting Ltd.)**
   a. To assist in retaining historical information, a copy of this report should be deposited with a local repository of historical material. Therefore, it is recommended that this report be deposited at the following location:
      Puslinch Public Library
      29 Brock Road South
      Puslinch, Ontario N0B 2J0

8. **Agricultural: "Proposed Anthony Pit: Agricultural Considerations Review" January 5, 2026 (Source: MHBC)**
   a. Agricultural rehabilitation shall be in accordance with the agricultural rehabilitation sequence schematic on the Rehabilitation Plan (page 4 of 5) to ensure best practices are followed throughout the progressive rehabilitation of the pit.
   b. Progressive rehabilitation procedures that avoid substantial storage of topsoil and minimize the storage of subsoil shall be implemented. Stripped soils, not required for berm construction, shall be moved directly to depleted areas where they will be immediately used for agricultural rehabilitation. Stripping areas shall be limited to what is required for the season of operation.
   c. During pit operations, access to the agricultural rehabilitation area and undisturbed areas used for agricultural purposes will be maintained.
   d. Topsoil shall be replaced across the site at the same pre-extraction depths, as documented in the DBH Soil Report, 2024, which is approximately 15 centimeters for topsoil in accordance with the agricultural schematic on the plan. DBH's soil inspection sites were limited to shallow depths (topsoil, A horizon only) due to the stoniness of the soil materials.
   e. Soil will be handled under suitable conditions. Travel over soils and rehabilitated areas shall be minimized to reduce compaction. Ripping / tilling the soil will occur, where necessary, to alleviate soil compaction and shall avoid the mixing of soil materials / layers during the process.
   f. Once grading is completed, a vegetation cover (such as perennial crops) shall be immediately established within the agricultural rehabilitation area to reduce erosion, add organic matter to the soil and improve soil structure. A grass-legume cover crop shall be established throughout rehabilitation and maintained for up to five years and ploughed under annually to promote and increase organic matter. Alternatively, field crops (e.g. wheat, soy, corn, hay) shall be established immediately following rehabilitation grading.
   g. After final rehabilitation, soil testing shall be completed by a qualified professional to analyze soil conditions to demonstrate that pre-extraction soil capability has been restored. Adjustments to cropping practices and/or soil amendments may be required based on the results of the soil testing and shall be undertaken in consultation with the property owner. A report shall be submitted by a qualified professional following final rehabilitation and provided to MNR prior to Licence surrender to demonstrate that the agricultural area has been rehabilitated back to the pre-extraction soil capability (CLI Class 2 soil capability).
   h. Best management practices shall be implemented with respect to the storage and application of organic material, fertilizers, and pesticides.

Legal Description

PART OF LOT 22
CONCESSION 8
(Geographic Township of Puslinch)
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON

M. Variations from Control and Operation Standards

No.	O.Reg 244/97 Section 0.13	Variation	Rationale
1	(1)13i	Stockpiling of aggregate, topsoil or overburden may be located within 30m of boundary of the site other than part of the boundary described in (1)13iiA below.	Stockpiling may occur within any portion of the extraction area. Some areas adjacent to agricultural fields and the communal waste and wastewater system (Mini Lakes) have a 15m setback.
2	(1)13iiA	Stockpiling of aggregate, topsoil or overburden may be located within 90m of boundary of the site coincident with the rear property limits of #4436 Victoria Road South.	Stockpiling may occur within any portion of the extraction area. There is a 15m extraction setback from the site coincident with the rear property limits of #4436 Victoria Road South
3	(1)19i	Below water side slopes may vary from a slope that is at least three horizontal metres for every vertical metre (3:1). These will slope at minimum to the natural angle of repose.	Slopes will be no steeper than a 2:1 slope below water or the natural angle of repose.
4	(3)(a)	Fencing is not required where it is coincident with the limit of field verified wetlands along portions of the licence boundary (see Sequence of Operations diagram on page 2 of 5).	These boundaries will be demarcated by 1.2m high marker posts that are visible from one to the other. If conditions in or around the licensed pit change or if licence is surrendered, a 1.2m high fence will be installed.

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 | WWW.MHBCPLAN.COM

MNR Approval Stamp

MHBC Stamp

Applicant

VOTORANTIM cimentos cbm

Applicant's Signature

[redacted]

Andreanne Simard
Director of Lands, Resources and Environment
Votorantim Cimentos North America (VCNA)

Project

Anthony Pit

MNR Licence Reference No.

Pre-approval review:

For Submission to MNR - May 2026

Plan Scale **1:2,000 (Arch D)**

SCALE
0 25 50 100
METRES

Plot Scale 1:2 [1mm = 2 units] MODEL

Drawn By D.G.S.

Checked By N.D.

File No. Y321AU

File Name

OPERATIONAL NOTES PLAN

Drawing No.

3 OF 5

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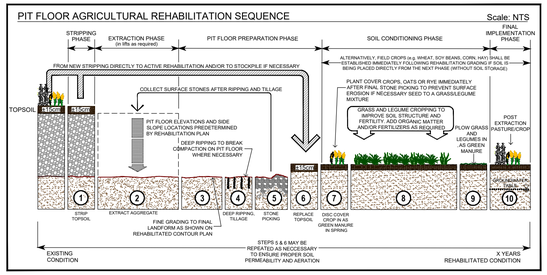
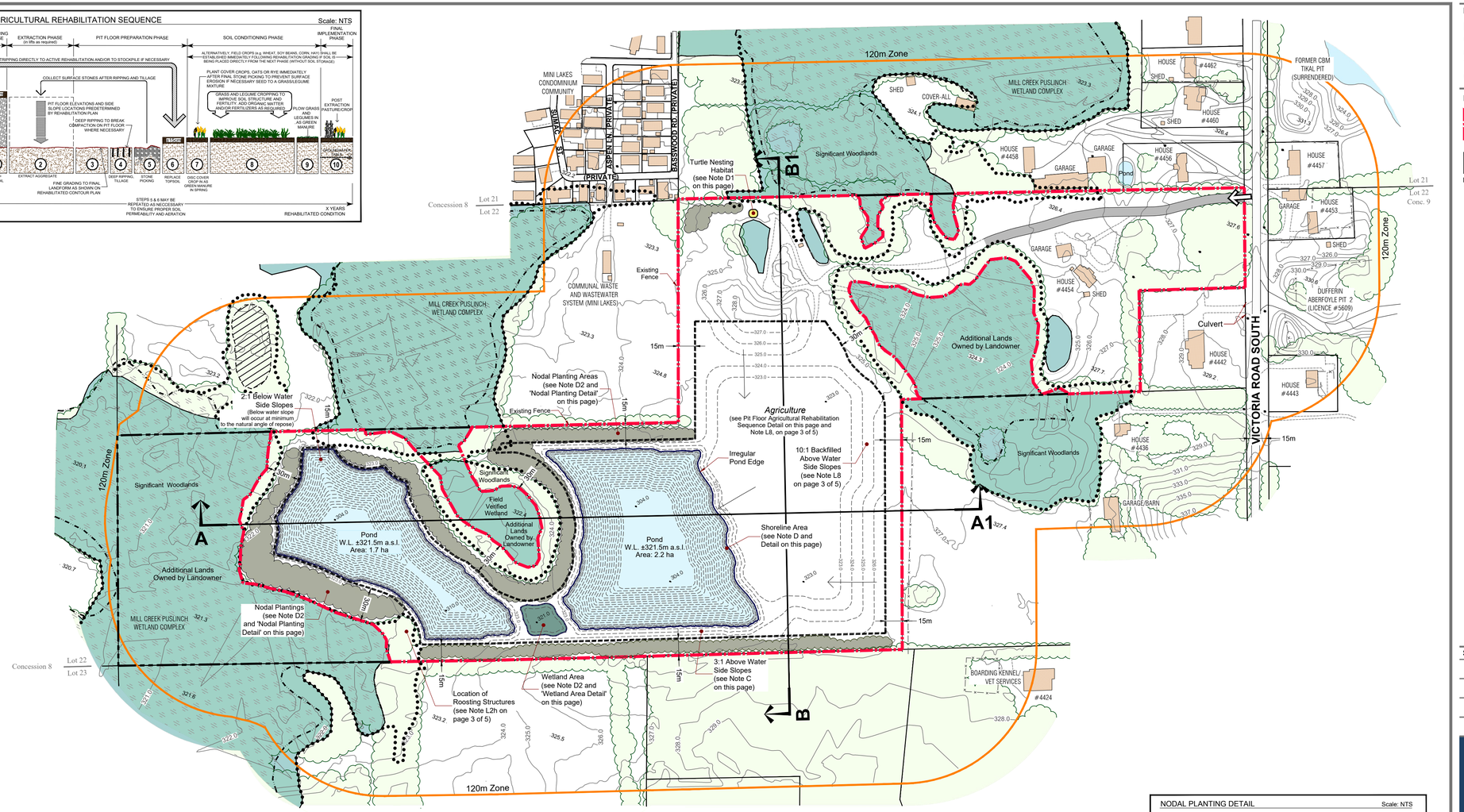




This page of the site plans is prepared under the Aggregate Resources Act (ARA) for a Class A licence for a pit below the ground water table and follows the Aggregate Resources of Ontario: Site Plan Standards August 2020, specifically Rehabilitation for all sites (Numbers 59-67 in the standards).

A. General

1. The rehabilitated landform of this site will include: ponds, shallow shoreline and wetland areas, reforestation, agricultural land and side slope treatments.
2. The existing wetlands adjacent to the proposed Boundary of Area to be Licensed are located outside of the Limit of Extraction and not expected to be directly impacted.
3. The house and associated buildings will remain on site after rehabilitation is completed.

B. Phasing

1. The proposed Anthony Pit will be rehabilitated on a progressive basis, corresponding to the operational progression of the pit excavation, to form two ponds and above water table area and reforestation at final rehabilitation.
2. As the pit is excavated to its maximum, or any other/lesser terminal limits, both horizontally and vertically on a lift-by-lift basis, progressive rehabilitation will follow provided the subject area is of an appropriate area to undergo rehabilitation (See Note G on page 3 of 5 for details).
3. The excavation perimeter will be fully side sloped at a maximum 2:1 below water (from original ground to floor) and a maximum of 3:1 for the above water portion. Sloping will occur as the limits of the pit excavation are reached. See Rehabilitation Plan drawing and Note D on this page.
4. Side slopes will be vegetated where located above the final water level of the pit pond and will include reforestation in setback areas and above water table final grades in order to enhance a diversity of native vegetation types and species that are anticipated to spread around the rehabilitated side slopes (see Note D and 'Nodal Planting Detail' on this page).

C. Slopes and Grading

1. Topsoil and overburden will be used in the progressive rehabilitation of the side slope areas. Overburden and/or unmarketable material will be used to backfill pit faces to create the topography of the side slopes (i.e. 3/2:1 slope). Above water side slope areas that will be vegetated, will be covered with a minimum 15 cm of topsoil/organic matter prior to planting. Areas along the south/southwest shoreline lower than 321.5 m a.s.l. will be sculpted to 1m above this elevation as part of progressive rehabilitation.
2. Importation of fill/excess soil:
   a. Excess soil, as defined in Ontario Regulation 244/97 may be imported to this site to facilitate the following rehabilitation:
      i. Creation of 3:1 and 10:1 slopes
      ii. Top dressing to establish vegetation
   b. Liquid soil, as defined in Ontario Regulation 406/19 under the Environmental Protection Act, is not authorized for importation to the site.
   c. 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.
   d. 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.
   e. 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.
   f. The cumulative total amount of excess soil that may be imported to this site for rehabilitation purposes is 350,000 m³

D. Proposed Vegetation and Rehabilitated Features

1. Progressive Rehabilitation
   a. Rehabilitation will be progressive following the direction of extraction and proceed as limits of extraction (area and depth) are reached. The sequence of rehabilitation will follow the "Sequence of Operations" diagram located on page 2 of 5. Minor deviations/variations in operational/rehabilitation sequence shall be permitted in order to adjust for any variable resource and market conditions.
   b. Topsoil will be used in the progressive rehabilitation of the above water side slope areas. Side slope areas will be covered with a minimum 15 cm of topsoil/organic matter. Overburden will be used to backfill pit faces to desired finished grades (i.e. 3:1 slope) and to enhance areas within the setback along the southwestern portion of the shoreline. This will be carried out prior to planting of trees/shrubs in this area.
   c. Setback areas will be planted with nodal planting cells (see the site plan and 'Nodal Planting Detail' on this page).
2. Final Rehabilitation
   a. The final rehabilitation plan includes the creation of two ponds, a wetland area, agricultural area and terrestrial habitats comprised of backfilled overburden side slopes and terrestrial nodal plantings. Shoreline widths and depths within the ponds will be varied to promote maximum diversity within the habitat for fish and wildlife.
   b. The new wetland area shall be created in accordance with the Wetland Area Detail. The wetland shall be created once below water extraction is complete in Phase 4 of Operations (Also see Note d below).
   c. Plantings (i.e., nodal plantings) included in the rehabilitation plan should focus on locally native, non-invasive species that create habitat in the short term and promote natural succession processes.
      i. Aquatic plants will include shrubs such as red-osier dogwood (*Cornus sericea*) and slender willow (*Salix petiolaris*), and herbaceous plants such as water plantain (*Alisma plantago-aquatica*), lake sedge (*Carex lacustris*), swamp milkweed (*Asclepias incarnata*), softstem bulrush (*Schoenoplectus tabernaemontani*), and common cattail (*Typha* spp.).
      ii. Shallow emergent marsh vegetation (i.e., herbaceous species listed above) will be planted in water ±0.15 m deep and extend ±5 m from the shore and be interspersed with cover structures (e.g., boulders and root wads) in the shoreline areas. Shallow shoreline/wetland areas may also be seeded by broadcast method to assist in establishing vegetation. Basking logs and nesting platforms will be created for turtles and waterfowl respectively.
      iii. Above-water side slopes adjacent to the pond areas will be graded to a 3:1 aspect to ensure stability. The slopes will be seeded with a mix of grasses and legumes consisting of native, non-invasive species. Common milkweed and nectar producing plants (e.g. serviceberry, dogwood, asters, goldenrods, blackeyed Susan, Joe Pye weed) will be incorporated into the rehabilitation seed mix. Seeds being used for hydro seeding or revegetation shall be certified free of weeds or invasive species. Mulch shall be weed free.
   d. Nodal plantings within the setback areas will also increase overall woodland cover and enhance the existing wildlife movement corridor. To facilitate a natural connection with the existing wetland area and significant woodlands, plantings shall include native species as well as a transitional upland / wetland interface, and that are suited to the planting conditions (i.e., soil texture and moisture). Species may include white cedar, white spruce (*Picea glauca*), sugar maple, red maple, white birch, and American basswood on the north-facing slope (which is expected to be cooler and more moist), and white pine, white cedar, Norway spruce (*Picea abies*), European larch (*Larix decidua*), trembling aspen, and balsam poplar on the south, east and west-facing slopes (see also 'Nodal Planting Detail' on this page).
   e. Shrubs such as serviceberry, nannyberry, ninebark (*Physocarpus opulifolius*), dogwoods, highbush cranberry (*Viburnum opulus*), elderberry, choke cherry (*Prunus virginiana*), chokeberry, willows and others may be used to add diversity and increase pollinator/wildlife diversity, particularly in the transition between wetland and upland areas.
   f. Installation of artificial roosting structures (i.e. bat boxes) will be included as part of rehabilitation (see Note L2h on page 3 of 5 for details)
   g. Side slope areas being rehabilitated back to agriculture will be sloped to a maximum of 10:1 (see Note L8 on page 3 of 5 for details)
3. Vegetation
   Ground covers on side slopes will be established as part of the phased stripping operations that proceed extraction and will be maintained and replaced should it fail to establish itself to control erosion.
4. Establishment of Slopes/Rehabilitated Areas
   Rehabilitation of this site involves the creation of 3.9 ha of pond, including shallow shoreline areas, 0.09 ha of wetland area, 1.8 ha of nodal planting areas and 4.7 ha of terrestrial landform comprised of above water overburden side slopes (0.8 ha) and an agricultural area (3.9 ha) in the northwest part of the site. The final pit landform will be in accordance with the drawing as shown on this page. Shallow shoreline widths and depths will be varied to promote maximum diversity within this habitat for fish and wildlife.

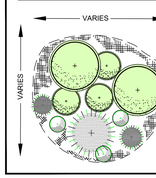
D. Drainage

1. Final surface drainage will follow the rehabilitated contours as shown.

F. Final Rehabilitation

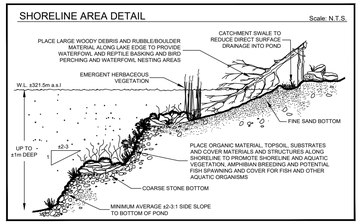
1. No buildings or structures associated with aggregate operations will remain on site.
2. The water level of the proposed ponds (±321.5m a.s.l.) and the post-extraction ground water table, are as shown on pages 1, 4 and 5 of 5 as per hydrogeological/ hydrological assessment.

NODAL PLANTING DETAIL — Scale: NTS

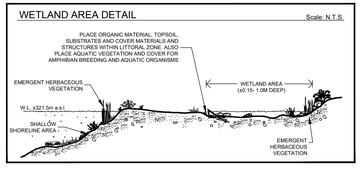


- Reforestation areas areas will consist of a number of nodal planting cells containing a mixture of coniferous and deciduous species planted as seedlings.
- Terrestrial plants of native, non-invasive species, may include a mixture of deciduous and coniferous species common to the local landscape, such as: Sugar Maple, Large Tooth Aspen, White Birch, White Cedar, White Spruce, White Pine, Red Oak, Bur Oak, Yellow Birch, Black Cherry, Choke Cherry, and Alternate-leaved Dogwood
- Shrub varieties may include: Smooth Serviceberry, Bush- Honeysuckle, Snowberry, Staghorn Sumac, Red Osier Dogwood and Nannyberry.

SHORELINE AREA DETAIL — Scale: N.T.S.



WETLAND AREA DETAIL — Scale: N.T.S.



Legal Description

PART OF LOT 22
CONCESSION 8
(Geographic Township of Puslinch)
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON

Legend

- Boundary of Area to be Licensed
- Additional Lands Owned by Landowner
- Existing Access
- Contour with Elevation — METRES ABOVE SEA LEVEL
- Existing Spot Height Elevation — METRES ABOVE SEA LEVEL
- Building/Structure — LOCATION AND USE FOR BUILDINGS ON-SITE AND WITHIN 120m ARE SHOWN ON THIS PAGE
- Existing Vegetation
- Provincially Significant Wetland — LIO/GEOHUB
- Field Verified Wetland — STANTEC 2025
- Unevaluated Wetland — LIO/GEOHUB
- Drainage Feature — AS INDICATED
- Significant Woodlands — WSP 2025
- Limit of Extraction — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Rehabilitated Contour — METRES ABOVE SEA LEVEL
- Rehabilitated Elevation — METRES ABOVE SEA LEVEL
- Post Extraction Pond
- Wetland Area — (SEE DETAIL ON THIS PAGE)
- Shoreline Area — (SEE DETAIL ON THIS PAGE)
- Tree Planting Areas — LOCATION APPROXIMATE
- Turtle Nesting Habitat — LOCATION APPROXIMATE
- Direction of Surface Drainage (IF ANY)
- Cross Sections — SEE PAGE 5 OF 5 FOR EXISTING AND REHABILITATED CROSS SECTIONS

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 | WWW.MHBCPLAN.COM

MNR Approval Stamp

MHBC Stamp

north

Applicant

VOTORANTIM cimentos | cbm

55 Industrial St. 4th Floor Toronto, Ontario M4G 3W9
Telephone: (416) 696-4411

Applicant's Signature

Andreanne Simard
Director of Lands, Resources and Environment
Votorantim Cimentos North America (VCNA)

Project

Anthony Pit

MNR Licence Reference No.

Pre-approval review:

For Submission to MNR - May 2026

Plot Scale **1:2,000 (Arch D)**

SCALE
0 25 50 100
METRES

Plot Scale 1:2 [1mm = 2 units] MODEL
Drawn By D.G.S.
Checked By N.D.
File No. Y321AU

File Name

REHABILITATION PLAN

Drawing No.

4 OF 5

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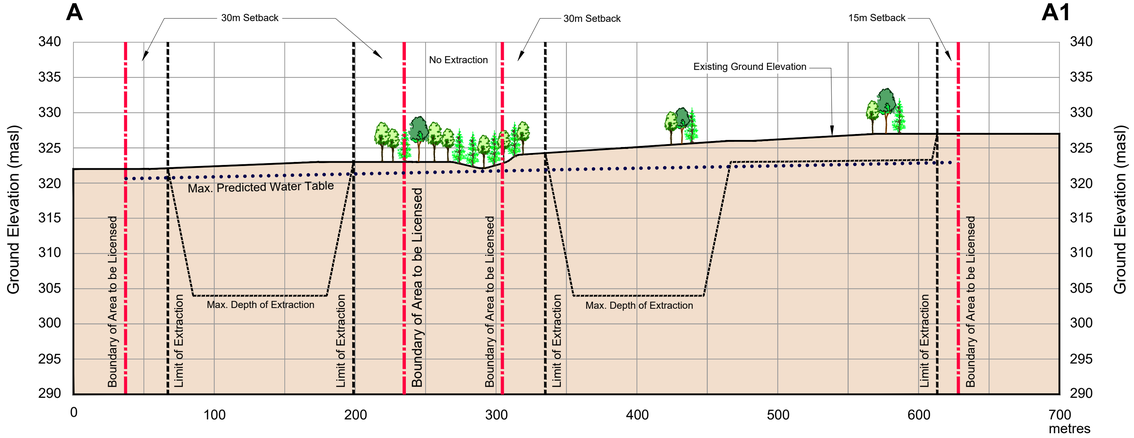
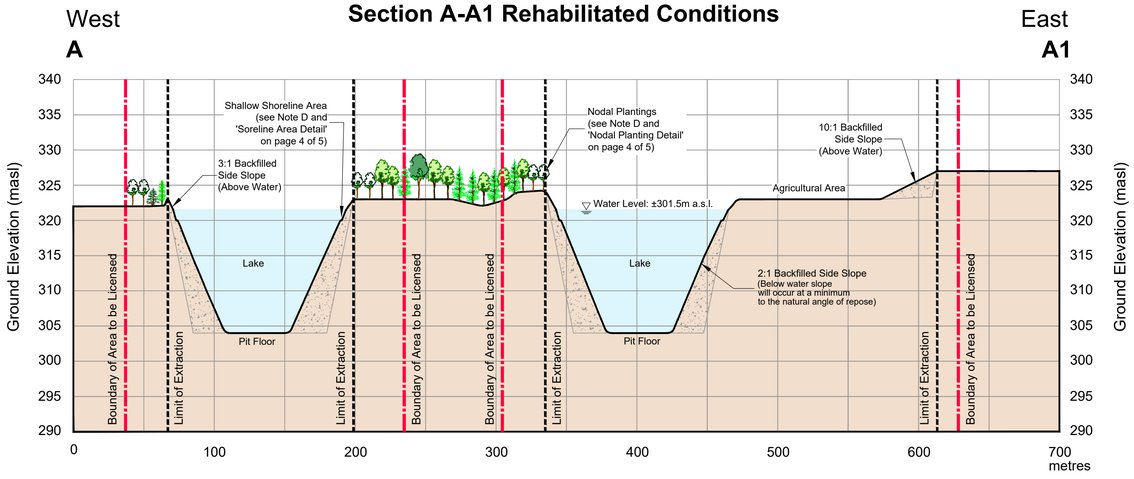
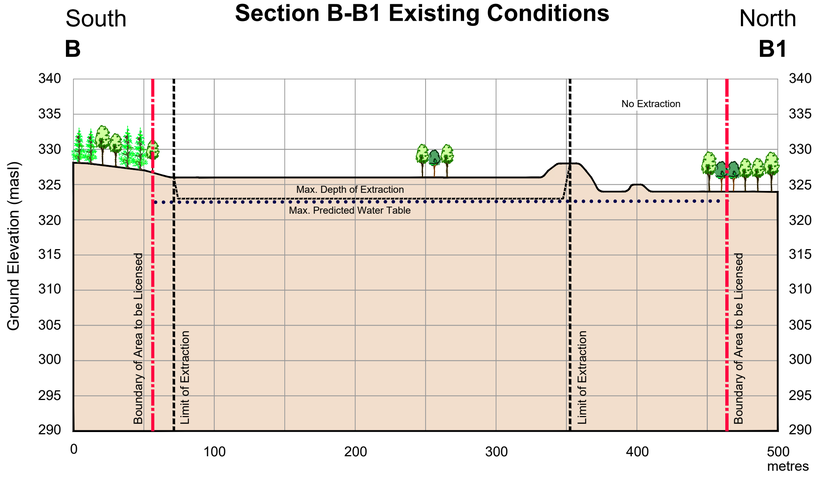
Section A-A1 Existing Conditions



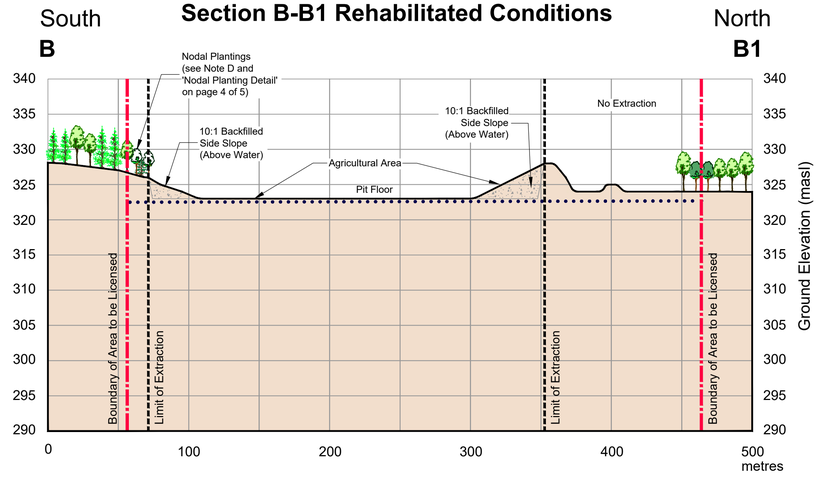
Section A-A1 Rehabilitated Conditions



Section B-B1 Existing Conditions



Section B-B1 Rehabilitated Conditions

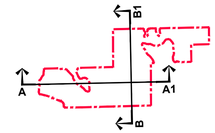


Legal Description

PART OF LOT 22
CONCESSION 8
(Geographic Township of Puslinch)
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON

Legend

- Boundary of Area to be Licensed
- Limit of Extraction
  ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Maximum Depth of Extraction
- Vegetation/Trees
  EXISTING AND/OR PROPOSED AS INDICATED ON CROSS SECTIONS
- Nodal Plantings
- Maximum Predicted Water Table
  (SEE NOTE D2 ON PAGE 1 OF 5 AND NOTE L4 ON PAGE 3 OF 5)



Cross Sections
SEE PAGES 1, 2 & 4 OF 5 FOR PLAN VIEW LOCATION OF CROSS SECTIONS

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR, KITCHENER, ON, N2B 3X9 | P: 519.576.3650 | WWW.MHBCPLAN.COM

MNR Approval Stamp

MHBC Stamp

[redacted]

Applicant

VOTORANTIM cimentos | cbm

Applicant's Signature

[redacted]

Andreanne Simard
Director of Lands, Resources and Environment
Votorantim Cimentos North America (VCNA)

Project

Anthony Pit

MNR Licence Reference No.

Pre-approval review:

For Submission to MNR - May 2026

Plan Scale: **Horizontal 1:2,000 Vertical:5x Exaggeration**

HORIZONTAL SCALE

0 25 50 100
METRES

Plot Scale	1:2 [1mm = 2 units] MODEL
Drawn By	D.G.S.
Checked By	N.D.
File No.	Y321AU

File Name

CROSS SECTIONS PLAN

Drawing No.

5 OF 5

K:\Y321AU-CBM-Anthony Pit\A\Y321AU_CBM Anthony Pit Xsecplan5of5_May2026.dwg

4454 Victoria Rd S (D14-CBM Anthony Pit) 1st Submission – Deem Complete Comment Summary

Consultant	Comments
GEI Engineering	See attached letter
Harden Environmental	See attached letter
Township Building Department	Deemed complete
Source Water	Sufficient information has been provided to deem the application complete. We will review and provide comments during the technical circulation.
GRCA	GRCA staff have reviewed the submission and are satisfied that it is complete. GRCA staff will provide additional comments during the technical circulation.
NRSI Ecology	Application complete from a natural heritage perspective, technical review of NER sufficiency to follow.
Township Noise Consultant	Deemed complete. Technical comments to be addressed in next circulation.
Township Traffic Consultant	A Transportation Impact Study prepared by a Professional Engineer has been submitted with the application so it can be deemed complete. I will provide technical comments on the study when I undertake my more technical review.
Township Public Works	No comments
Township Bylaw	No comments
Township Fire	No comments
Township Dust Expert	Deemed complete. Technical comments to be addressed in next circulation.

June 11, 2026
GEI Project No. 2600482-08

VIA CLOUDPERMIT: Township of Puslinch
Township Application No. D14-CBM Anthony Pit

Monika Farncombe
Township of Puslinch
7404 Wellington Road 34
Puslinch, ON N0B 2J0

Re: ZBA 1st Submission – Deeming Complete
4454 Victoria Road S
Puslinch, ON

Dear Ms. Farncombe:

GEI Consultants Canada Ltd. (GEI) have reviewed first submission documents for a Zoning By-Law Amendment application received on June 2, 2026, in support of a proposed aggregate pit operation on the subject lands located at 4454 Victoria Road South in the Township of Puslinch.

It is our understanding that the proposed aggregate pit operation includes a proposed licensed area of 18.0 ha, with 8.7 ha proposed for extraction. The extraction area has been delineated to avoid natural features. The lands will be accessed through the existing entrance along the eastern boundary of the subject lands on Victoria Road South. The proposed haul route is primarily heading north along Victoria Road South, west on Wellington Road 34, and south on Concession Road 7 to the CBM Aberfoyle Pit. Truck travel will not be permitted to head south on Victoria Road South or use Gilmour Road. The lands will be extracted to a maximum depth of 304 masl. The removal of aggregate resources from below the water table will result in the creation of two ponds that will be 3.9 ha in total size. Shallow shoreline areas are proposed around the perimeter of the created ponds. A wetland is proposed to be created in the area in-between the two ponds. In addition, approximately 3.9 ha of agricultural lands will be restored in the eastern portion of the extraction area, which is not proposed for below water extraction. An application for a Class A license has been submitted to the Ministry of Natural Resources.

1. Documents Received

All plans and studies required from an engineering perspective have been submitted.

The following documents were received as part of this submission and will be reviewed by GEI at a later date:

- Planning Act Applications Letter, prepared by MHBC Planning, Urban Design and Landscape Architecture, dated May 25, 2026.
- Existing Features Plan, Operational Plan, Operational Notes Plan, Rehabilitation Plan, and Cross Sections Plan prepared by MHBC Planning, Urban Design and Landscape Architecture, dated May 2026.
- Maximum Predicted Water Table Technical Memorandum, prepared by Stantec, dated February 13, 2026.
- Level I and II Water Report, prepared by Stantec, dated February 13, 2026.

The following documents were received as part of this submission and will be reviewed by Township staff and other consultants at a later date:

- Planning Report and Aggregate Resources Act Summary Statement, prepared by MHBC Planning, Urban Design and Landscape Architecture, dated May 2026.
- Transportation Impact Study, prepared by CIMA+, dated October 7, 2025.
- Review and Entry into the Ontario Public Register of Archaeological Report, dated January 6, 2025.
- Stage 1 and 2 Archaeological Assessment, prepared by Stantec, dated December 10, 2024.
- Complete Application Public Consultation Strategy Requirement, dated March 20, 2026.
- Natural Environment Report, prepared by Stantec, dated March 6, 2026.
- Noise Impact Assessment Report, prepared by Stantec, dated January 6,2026.
- Best Management Plan for Fugitive Dust, prepared by Stantec, dated January 22, 2026.
- Cultural Heritage Report, prepared by Stantec, dated September 22, 2025.
- Source Water Protection Screening Form, prepared by Stantec, dated April 17, 2026.

2. Additional Documents Required

All plans and studies required from an engineering perspective to support the zoning bylaw amendment application have been submitted and additional documents are not required at this time. We are in support of this application being deemed complete.

Technical review of the submitted documents will be completed at a later date.

If you have any questions or require additional information, please do not hesitate to contact us.

Sincerely,

GEI Consultants Canada Ltd.

Andrea Reed, P.Eng.
Senior Project Engineer

Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline
Moffat, Ontario, L0P 1J0
Phone: (519) 826-0099 Fax: (519) 826-9099

Hydrogeological Assessment

Geochemistry

Phase I / II ESA

Regional Flow Studies

Contaminant Investigations

OLT Hearings

Water Quality Sampling

Groundwater & Surface Water Monitoring

Groundwater Protection Studies

Groundwater Modelling

Groundwater Mapping

Permits to Take Water

Environmental Compliance Approvals

Designated Substance Surveys

Our File: 2629

June 10, 2026

Township of Puslinch
7404 Wellington Road 34
Puslinch, Ontario N0B 2J0

Attention: Monika Farncombe
Planning & Corporate Services Coordinator

Re: Proposed Anthony Pit - CBM
Hydrogeological Comments

Dear Monika,

Harden Environmental Services Ltd. (Harden) is pleased to provide hydrogeological comments for proposed zoning by-law amendment the Anthony Pit in Puslinch Township (the site).

The pit is the 3rd aggregate site accessed from Victoria Road within 500 metres of County Road 34 and the fourteenth pit application in the Aberfoyle Outwash deposits since the 1980s. The Aberfoyle Outwash is valued by aggregate companies for its richness in stone, gravel and sand. CBM has two other applications underway in the Aberfoyle Outwash area. All of the ongoing and historical aggregate license applications are for below water table extraction.

The proposed Anthony Pit has the least proposed below water table extraction than any other ongoing or historical aggregate license application in the Aberfoyle Outwash mining area. Two relatively small ponds are proposed for the site, one having an area of 2.65 hectares and the second 1.86 hectares. There are wetlands on-site but are located outside of the proposed extraction area.

The water table is relatively near to the ground surface and will be disturbed temporarily as the aggregate is extracted and permanently as a small disturbance in the natural flow system.

Mill Creek is located 600 metres north of the site and there are numerous private ponds within 500 metres of the site.

All neighbours to the proposed pit rely on groundwater for their water supply. Water supply is obtained from the overburden and bedrock aquifers.

General hydrogeological comments:

- **Wellington County OP:** The development must also adhere to Sections 4.9.3 (Groundwater), 4.9.4 (Policy Direction) and 4.9.5 (Source Water Protection).

- **Drainage and natural features:** The site is within the Mill Creek – Upper Grand River subwatershed and is within the jurisdiction of the Grand River Conservation Authority. Surface topography on the site is generally flat, with drainage directed to the onsite wetlands. The ponds will permanently remove runoff from the on-site and off-site wetlands. **Feature based water balances must be completed for the wetland features that now receive runoff from the site.**

- **Well decommissioning:** Any unused wells must be abandoned by a licensed well contractor in accordance with R.R.O. 1990, Reg. 903: Wells.

We agree with the proposed monitoring plan for the site.

Given the limited below water table mining, we are of the opinion that the proposed activity will have little impact on the quantity and quality of groundwater.

These hydrogeological comments are preliminary and may be amended as additional information is provided by the proponent.

Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Required Activity

- **Feature based water balances must be completed for the wetland features that now receive runoff from the site.**

Harden Environmental Services Ltd.

[redacted]

Stan Denhoed, P.Eng., M.Sc.
Senior Hydrogeologist

[redacted]