

December 8, 2020

Matrix 31319-504

**Mr. David N. Germain**  
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**Subject: Peer Review Report, Proposed Burlington Quarry Expansion, Fish Habitat Impacts Review Comments for Level 1 and Level 2 Natural Environment Technical Report, Burlington Quarry**

Dear Mr. Germain:

## **1 INTRODUCTION**

Matrix Solutions was commissioned by the Region of Halton in May 2020 to review the Level 1 and Level 2 Natural Environment Technical Report (NETR) that addresses a proposed extension to the Nelson Quarry, authored by Savanta (dated January 2020). Matrix is part of an extensive Review Team that includes several firms, each for different disciplines.

Reports reviewed as part of this Peer Review include the following:

### **Current Reports**

- Level 1 and Level 2 Natural Environment Technical Report, proposed Burlington Quarry Extension. Nelson Aggregates Co., prepared by Savanta Inc., (April 2020).
- Burlington Quarry Extension, Surface Water Assessment, Nelson Aggregate Co., prepared by Tatham Engineering (April 2020).
- Adaptive Management Plan, Proposed Burlington Quarry Extension (AMP) prepared by Earthfx Incorporated, Savanta Inc., Tatham Engineering, (April 2020).
- Progressive and Final Rehabilitation Monitoring Study, Burlington Quarry Extension, prepared by MHBC Planning, Urban Design and Landscape Architecture, (MHBC) (April 2020).
- Site Plan, Four Sheets, Burlington Quarry Extension, prepared by MHBC, (April 2020).

**Historical Reports- Historic Documents provided from Ecology 2000-2007 (Reprinted from Stantec Consulting Ltd) OCH Case No. 08-030 Re; Nelson Aggregate Co. containing the following documents:**

- Biological Inventory of Nelson Quarry and Adjacent Property, City of Burlington, Nelson Aggregate Co., prepared by ESG International Inc. (October 2000)

- Summary of Natural Heritage Features, Nelson Quarry Company- Extension Lands, Burlington, prepared by Stantec Consulting Ltd. (August 2004)
- Level II Natural Environment Technical Report, Nelson Aggregate Quarry Expansion. Prepared by Stantec Consulting Ltd. (October 2004)
- Level II Natural Environment Technical Report, Nelson Aggregate Co. Burlington Proposed Extension Prepared by Stantec Consulting Ltd. (Revised May 2006)
- Summary of Terrestrial and Aquatic Field Investigations 2006: Addendum to "Level II Natural Environment Technical Report, Revised May 16, 2006", dated September 29, 2006

This review provides general comments on the Level 1 and Level 2 Natural Environment Technical Report, followed by individual comments on specific sections. It should be noted that Matrix is providing comment primarily on aquatic habitat and fisheries. The review of other natural heritage issues is provided by another member of the Study Team.

Reports on Hydrogeology Impacts were not reviewed, as this is being completed by other members of the Study Team.

## 2 GENERAL COMMENTS ON NATURAL ENVIRONMENT REPORT

- 1) The Level 1 and Level 2 NETR describes the current fisheries inventories conducted within the existing quarry (Burlington Quarry) and proposed expansion lands and provides an assessment based on the proposed changes associated with extraction and future operations on those lands. Discussion is limited to within 120m of the proposed quarry expansion lands. Supporting studies, such as the Surface Water Assessment, as well as hydrogeology submitted as part of the application discuss potential fisheries impacts to surrounding areas beyond 120m. The aquatic impacts provided in the 2020 NETR do not appear to be integrated with surface and groundwater reports and impacts to fisheries from these studies are not well understood.
- 2) The inventories presented in the NETR describe the existing fisheries as consisting primarily of warm water species such as Largemouth Bass, which are commonly stocked in warm water ponds, as well as tolerant warm water fish communities typically found in intermittent tributaries. Given that the existing land uses consisted of a golf course and quarry operations, these results are not surprising for the most part, as the golf course has been in operation since the early 1960s and the lands have undergone ongoing disturbances. Since the existing quarry has been in operation, fisheries impacts have existed due to changes in drainage patterns from extraction activities.

As the initial placement of the quarry has irreversibly changed the fish habitat conditions within the headwaters, it is more relevant to focus on the effect of the proposed new quarry expansions on the surrounding fish habitat. The 2020 NETR does not include discussion of the cumulative impacts to the surrounding water bodies that have been described in historical studies as being important. The cumulative effect on the surrounding aquatic habitats from the incremental quarry footprint expansion should be included in the discussion.

- 3) The Level 1 and 2 NETR also states that although that ponds and drainage features within the existing quarry and proposed expansion lands contain fish, these systems are not really fish habitat due to their anthropogenic origin and their isolation from other features, and as a result support no recreational fishery. Given the extent of quarrying, the fish community within the quarry footprint is expected to consist of species that can persist within the changing aquatic habitat conditions that are artificially maintained. The NETR describes the ponds and drainage features as having a hydrologic connection to fish bearing waters in the surrounding watercourses immediately outside of the proposed quarry extension lands. As there are linkages to fish habitat downstream of these areas, it is not clear where does fish habitat begin and end, and if alterations within the quarry in terms of flow, thermal regime, water quality or quantity will affect the downstream fish bearing waters. A table describing the rationale for fish habitat designations, supported by *Fisheries Act* definitions for these habitats should be included. Consistency with the application of fish habitat designations should be demonstrated in this table.
  
- 4) Drainage and surface outflows of the existing quarry operations extend beyond the quarry footprints and are maintained through pumping operations, which are recommended to continue in perpetuity, long after the license for extraction has been surrendered. As long-term plans for the quarry contemplates changes to drainage conditions, along with the changes associated with climate change, understanding the effects on the surrounding fisheries habitat within the Niagara Escarpment is a key consideration in the proposed quarry expansion. The rationale for continued pumping operations should be supported by more detailed information on how fish habitats and linkages are to be maintained. Discussion on the existing flow regime and the form and function of watercourses and linkages should be included to determine how future changes with pumping and drainage will impact these watercourses. Hydrograph information and hydroperiods in relation to the surrounding fish habitat should also be included in the discussion.

### 3 SPECIFIC COMMENTS ON LEVEL I AND II NATURAL ENVIRONMENT TECHNICAL REPORT

#### 3.1 Section 2 Background Review

##### Subsection 2.1, 2.1.6 Federal Fisheries Act

The paragraph in Savanta's report in Section 2.1.6 indicates the following:

"Some projects may be eligible for exemption from the DFO review process, as specified under Step 3 of the DFO Fish and Fish Habitat Protection Program review process (DFO 2019b; e.g., artificial waterbodies with no hydrological connection to occupied fish habitat)."

In the Fish Habitat Discussion section in 7.2.4, it is mentioned that

"There is no direct or indirect fish habitat within the proposed Limit of Extraction within either the South or West Extension areas. Therefore, no direct encroachment into any watercourse providing fish habitat will occur and no direct impacts on fish habitat are anticipated within the Limit of Extraction, during any phase of the Project."

Since there is a hydrological connection by way of the outflows to direct and indirect habitat, it would seem that the irrigation ponds within the golf course have been ruled out as not fish habitat. This would suggest that the *Fisheries Act* does not apply to harmful alterations to these ponds. Unless the ponds are self-contained, pollutants could potentially be released into the discharges flowing out of these ponds to direct and indirect fish habitat. **It is unclear how the irrigation ponds would not be considered fish habitat if they are hydrologically connected to fisheries habitat and impacts from alterations to these ponds could have a downstream impact.**

#### 3.2 Subsection 2.2 Background Data Collection

This section provides a listing of the natural features within the defined Study Area and the Broader Landscape. The first paragraph in this section states that Savanta has relied, in part, on supporting background information from government agencies and previous site surveys/investigations to provide additional insight into the overall character of these Subject Lands. The second paragraph describes how Savanta was involved in the previous application and states that "given the period of time that has passed, changes in policies and the changes in both the footprint and field conditions, we have not relied on it but have considered the field data and information obtained during that process to enhance the background data collection review and establishment of the field program." **The lack of reference to previous historical work from 2004 and 2006 limits the understanding of the fisheries context regarding quarry operations and surrounding fish habitat.** The next sections describing the fish habitat in the 2020 NETR are therefore very limited, whereas the fisheries information from the previous work by Stantec is extensive.

### **3.3 Subsection 2.2, 2.2.9 Conservation Halton Long-Term Environmental Monitoring Program Data**

Discussion of the fisheries context is found in Section 2.2.9 Conservation Halton Long-Term Environmental Monitoring Program Data, where characterization of the Grindstone Creek Watershed and Bronte Creek Watershed from Conservation Halton in 2002 was used to describe fish habitat. **The fish habitat character from 2002 and fish species data in 2012 provided in this section from Conservation Halton provides a very limited background information despite the wealth of more detailed fisheries information contained in historical reports, which provide an indication of baseline conditions.**

This section confirms no fish community sampling is known to have been conducted in the unnamed tributary of Willoughby Creek downstream from the Subject Lands. Furthermore, no fish sampling has been completed on the West Branch of the Mount Nemo Tributary of Grindstone Creek. The Mount Nemo Tributary has been characterized as intermittent.

### **3.4 Subsection 4.4 Aquatic Survey Methodology, 4.3.3 Fish Community**

This section describes the fish community sampling that was completed on June 17 and 24, 2019. Backpack electrofishing (using a Halltech HT-2000 electrofishing unit) and seine netting (using a 30.5-m long by 1.83-m high, small mesh seine net) were used in combination to survey all habitats present. The other excavated golf course ponds were steep-sided and too deep to wade; therefore, visual observations of fish presence were recorded.

**As fish sampling methods are known to be selective to fish, discussion of biases associated with these methods should have been included in this section as the methodology used for fish sampling is biased to larger fish. No attempt was made for example, to use minnow traps in areas that are too deep to wade to obtain an understanding of smaller bodied fish species. Visual fish observations yield limited information and accuracy of fish identification is based on the experience of the observer. At the very least, the mesh size of the netting should have also been indicated as well as catch per unit effort to understand the relative abundance of fish.** If the objective of the fish sampling was to demonstrate an understanding of the fish community, including the presence/absence and types of fish inhabiting various watercourses in the study area, a discussion on gear selection and deployment should have been included. The presence or absence of fish is a useful indicator in determining a particular pond's potential to support other species such as the Jefferson Salamander.

### **3.5 Section 5 Field Survey Results, Subsection 5.3.1 Headwater Drainage Feature and Aquatic Habitat Results**

Headwater Drainage Features are discussed in a separate report by a member of the Study Team

### **3.6 Subsection 5.3.2 Fish and Fish Habitat Assessment Results**

The information provided in this section describes the watersheds associated with the West Extension and the South Extension of the Burlington Quarry. West Extension primarily affects the outflow to the Willoughby Creek Tributary and an unnamed tributary that comes from the Medad Valley which are both in the Bronte Creek Watershed. The South Extension primarily affects the outflow to the Mount Nemo Tributary, which is part of the Grindstone Creek Watershed. **The degree to which fish assessment is discussed is not only limited to within 120m, but the fish sampling is limited to areas where Savanta has been given land access, and where they have been able to sample. This not only provides a limited fish species list but also a much smaller sampling study area.** As the reach of Willoughby Creek north of Colling Road was not sampled or visited due to private ownership, characterization of fish habitat and fish presence was inferred from past reports. Given the magnitude of the proposed West Extension and implications on the downstream reaches, information regarding downstream effects is sparse. It is not surprising that only very few fish species are observed and reported in this section.

As access has presumably been granted to others such as Worthington to directly observe karsts within the Willoughby Tributary, the applicant should explain if landowner consent to enter private property for the purposes of sampling and investigation was attempted.

The baseline aquatic habitat for these receiving stream systems are described in historical ecological reports (e.g., 2004 and 2006 electrofishing surveys). The significance of the Willoughby tributary in terms of fisheries is highlighted within these historical reports. **These reports, completed by Stantec as 2004 Level 2 NETR (Stantec 2004) and 2006 Level 2 NETR (Stantec 2006) discuss natural features within a 5 km radius of the study area, and was focused on identifying ecological links to environments not immediately adjacent to the Subject Lands. These reports state that “these links are important to understand regional environmental features that could be impacted by on site operations”. Justification should be provided why a different approach was used in the 2020 Level 1 and 2 NETR.**

### **3.7 Section 6 Natural Heritage Feature Assessment**

This section discusses how the presence/absence of natural heritage features as defined in the PPS (MMAH 2020) within the Study Area is assessed. The NHRM (MNR 2010), NEP (2017), Halton Region OP (2018) and City of Burlington OP, which provide technical guidance for implementing the natural heritage policies of the PPS, were referenced to assess the potential significance of natural areas and associated functions. **Under Subsection 6.6 however, the discussion on Fish Habitat is only limited to what waterbodies are considered fish habitat under the *Fisheries Act*. Key pieces of policy information such as (a) identification of the connections and linkages between natural heritage features and areas, surface water features and groundwater features; and (b) how the diversity and connectivity of the natural features in an area and the long-term ecological function and biodiversity of the natural heritage system can be maintained, restored or where possible improved as they pertain to fish habitat is omitted from this discussion.**

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### 3.8 Subsection Section 6.6 Fish Habitat

This subsection starts with providing a definition of what is fish habitat. The paragraph goes on to state that “definition of fish habitat includes direct fish habitat (i.e., habitat that may be occupied by fish on a permanent or periodic basis) and indirect fish habitat (i.e., habitat that would not be used directly by fish, but that may be important for downstream direct fish habitat).” The rest of this section goes on to say that there is no fish habitat in the proposed limit of extraction. **The reasons provided for not considering these areas as fish habitat should include justification to explain why these habitats do not fit the definition of fish habitat.**

The rest of this section goes on to assign fish habitat categories based on their support function to fisheries. As the basis for fish habitat designations appear to be related to hydrologic connections rather than the fish occupancy, as well as origin, and whether the fish population is considered “natural” to the area, **this needs to be rationalized back to the *Fisheries Act* (i.e the basis under the Act that these habitat classifications are warranted).**

### 3.9 Section 7 Level 2 Impact Assessment

This section discusses the Level 2 evaluation of the potential impacts due to the quarry development and operation. The Level 2 assessment also includes recommendations regarding any mitigation and/or enhancement measures, as well as rehabilitation plans. The discussion pertaining to fish habitat is in Subsection 7.2.4 where the discussion pertaining to fish habitat impacts are simplified.

### 3.10 Subsection 7.2., 7.2.4 Fish Habitat

In Subsection 7.2.4 Fish Habitat, the potential direct and indirect impacts of the proposed development, including during the temporary construction phase, the long-term operations phase and the post-operations rehabilitation phase, are assessed based on direct impacts and indirect impacts. Direct are deemed non-existent in the proposed Limit of Extraction within either the South or West Extension areas as there is no fish habitat present there. Indirect impacts are dealt with as being minimal due to minimal construction work and lack of intrusion outside of the extraction area and continuing to pump quarry water to supplement flow as recommended by the Surface Water Assessment Report (Tatham 2020).

**The basis for flow supplementation in terms of volume, water quality and quantity should be explained in terms of its effects on fish habitat downstream of the quarry extension areas.** In 2006 Level 2 NETR Report (Stantec 2006) Willoughby Creek has been described in previous reports as “the watercourse of greatest ecological sensitivity” as this Bronte Creek tributary was noted to support critical brook trout spawning and rearing habitat, as noted with the presence of juvenile brook trout captured during 2003 surveys. The Level 2 Natural Environment Technical Report notes that Brook Trout are reliant on groundwater for virtually all portions of their life cycle: spawning, incubation, nursery refugia, and thermal refugia during summer. The loss of groundwater discharge to this system would represent a negative effect. The basis for the maintenance of the quarry water in terms of how flow regime quantity and water quality will be maintained is lacking in this section. In the 2004 Level 2 NETR



(Stantec 2004), fisheries inventory of the station (Station 1) reports a healthy population of juvenile Brook Trout in the reaches of Britannia Road and Cedar Springs Road Intersection and 80 m downstream, which is located approximately 1.2 km from the confluence of the Willoughby unnamed tributary to the mainstem of Willoughby Creek. This is consistent with the Bronte Creek Watershed Study, which noted extensive spawning activity in the area of the Cedar Springs community and Cedar Springs Road. The details for maintaining flow should be discussed in this section extending beyond 120m as the reports of the water levels in the Willoughby creek running dry were reported by conservation authority staff and maintaining flow during periods of drought is a concern (Bronte Creek, Urban Creeks and Supplemental Monitoring conducted by Conservation Halton 2012).

## Comments on Surface Water Assessment (Tatham 2020)

1. The surface water assessment establishes surface water drainage conditions across the Burlington Quarry, South Extension, and West Extension lands to assess impacts from the proposed quarry extension and provides context to surface water hydrology and hydrogeology, which is directly linked to fish habitat impacts. This assessment was completed primarily through identification of existing drainage patterns, water balance, and event based hydrologic modelling. **There is an overall lack of integration with the surface water report with regards to the 2020 NETR- this is primarily on the basis that the surface water discussion extends beyond the 120m limit of the extraction footprint.**
2. The surface water assessment acknowledges Willoughby Creek and West Arm as fish habitat, and that baseflows and water temperature are critical to the form and function of the watercourses from a natural heritage and fish spawning perspective. The proposed condition integrated surface water/groundwater analysis predicts a minor reduction in monthly streamflow due to the lowering of groundwater and suggests maintaining the discharge from the Quarry Sump 0100 to ensure that some reaches of Willoughby Creek does not run dry. Furthermore, it mentions that the predictive water/groundwater model predicts a measurable reduction in flow of the unnamed tributary of Lake Medad during operations and quarrying. For this reason, the surface water assessment report recommends that streamflow and water temperature thresholds be established from historic surface water monitoring completed in support of the proposed quarry extension. **The rationale for future management of quarry water as is lacking in critical details such as “how does the hydroperiods function in terms of downstream fisheries”. There is also no table or rationale illustrating how the reductions streamflow and lowering of groundwater as predicted by the groundwater models will be offset by pumping operations.**
3. Drainage to the South Extension is anticipated to be reduced in size as open extraction will intercept rainfall, groundwater, and surface runoff. To alleviate the reduced drainage, discharge to the West Arm from the Quarry Sump 0200 is proposed to continue throughout its operations in accordance with Nelson’s Permit to Take Water (PTTW) and Environmental Compliance Approval (ECA) that will require an amendment to include the discharge from the south extension. For the West Extension, extraction activities will reduce the size of the sub catchments draining to several of its existing outlets. Extraction and quarry dewatering are predicted to lower groundwater levels surrounding the west extension within 350 m of the extraction face. Similar to the West Arm discharges, discharge to the Colling Road roadside ditch and Willoughby Creek will be maintained from the Quarry Sump 0100 and is proposed to continue throughout the duration of quarry operations in accordance with Nelson’s PTTW and



ECA that will require an amendment to include the discharge from the west extension. **The runoff regime to the discharge outlets requires further detail. For example, how is the reduced drainage from quarrying balanced by the pumping? As it is understood that the Assessment of impact to Willoughby Creek is based on computer simulations and not real field measurements to verify existing conditions, how is the flow to the downstream reaches validated? If the discharge regime is set to mimic existing conditions, how will this be operationalized in terms of pumping rate?**

4. The other aspect of the surface water assessment that should be discussed is the water quality of the discharge waters. **If the extraction were to continue to occur in phases, is the water quality of the discharge assumed to be the same?** There is a possibility that excavation procedures including blasting may result in the release of contaminants. There is also a possibility that the Enbridge Pipeline which runs along Colling Road could be ruptured through blasting and could impact downstream fish habitat. The cumulative effects of the extraction with respect to water quality and quantity should be explained further in this section.
  
5. The approved rehabilitation plan envisions that the existing Burlington Quarry will be rehabilitated into a lake upon completion of extraction activities, which will result in no further discharges to both Willoughby Creek and West Arm unless water levels in the lake rise in response to wet conditions. This scenario is anticipated to reduce or eliminate baseflows to these systems. As this scenario is considered a negative effect, a new proposed rehabilitation plan proposes rehabilitation of the west extension into a lake (mentioned originally as part of the adaptive management plan) but in the surface water management plan, this has been changed to a conversion of the lands to a landform suitable for recreational, natural heritage and water management purposes. This scenario also includes maintaining the long-term offsite discharge from Quarry Sump 0100 and Quarry Sump 0200 to the tributary of Willoughby Creek and West Arm as part of the new rehabilitation plan for the Burlington Quarry and West Extension. **The discussion of continual pumping and controlled release of water coming from the lake should be explored further as there may be some benefit to having the lake discharge provide a more stable flow regime that is less susceptible to mechanical failure or disruptions. There is also a diversion from Colling Road that has been proposed and the resultant effects on downstream fisheries habitat along Willoughby Creek should also be discussed.**

## **Comments on the Adaptive Management Plan Version 1.0 (Earthfx, Savanta, and Tatham 2020)**

1. The purpose of the Adaptive Management Plan (ADM) was to provide Nelson Aggregate Co. with the information needed to verify that the quarry is operating without causing adverse impacts to the natural environment or private water supplies. The ADM states that the monitoring data to date shows that the tributary to Willoughby Creek and West Arm depend on quarry discharge for much of their flow. Recommendations from the ADM is to establish streamflow and water temperature thresholds from historic surface water monitoring. If baseflows are detected to drop below minimum thresholds, then applicable mitigation measures will be implemented while the cause for potential impact is evaluated to determine if these were related to quarry dewatering or extraction. Discharge rates will also be adjusted to compensate for the reduction of flow subject to permissible discharge rates in Nelson's PTTW.

When temperature thresholds are exceeded, the quarry discharges offsite will be reduced to reduce the influence of the discharge on the water temperature of the receiving watercourse.

This pumping scenario indicated above does not appear to be simple in terms of moving forward. If this is to be done in perpetuity, the following details should be clarified:

- (a) Are there assurances that trained operators will be available to apply the operational rules for pumping as noted in the ADM?
- (b) How will trigger levels detected in pumping be responded to as changes are experienced over time?
- (c) Based on the preferred rehabilitation scenario, potential to downstream fisheries impacts need to be clarified. **For example, when the when lake is filling up with water, how will flow supplementation with pumping be maintained for the downstream fish habitat? Another concern is how will the overflows from newly created lake be discharged into the downstream watercourses?**

## 4 CONCLUSIONS

1. With respect to the quarry expansion application, the applicant has assessed the fisheries habitat within 120m of the proposed expansion area. Other studies that relate to fish habitat that are submitted as part of the quarry application discuss impacts beyond 120m of the proposed quarry expansion area. To have a better understanding of the impacts to fisheries resources, the applicant needs to integrate the 2020 NETR with surface and groundwater studies which extend beyond 120m. Impacts to fisheries resources needs to be described in relation to future drainage scenarios associated with the changing nature of the quarrying activities over time, as well as the ultimate rehabilitation scenarios involving the creation of landforms, lakes, and changes associated with climate. The following provides a summary of the issues and concerns as they relate to fisheries:
  - (a) The fish information available in the downstream reaches such as in Willoughby Creek are based on older baseline data (2006) and no further recent information regarding the fish communities in these areas have been made available. The paucity of recent fish data is reflected by the limited study area, no sampling or surveys in private property, and of active sampling gear such as seining, electrofishing methods and visual observations.
  - (b) Predicted impacts to downstream watercourses are discerned from the surface water report which can only be based on older baseline data by collected by others, such as records from 2006. As the data has been collected over 14 years ago, changes that have occurred over time regarding the fish community and habitat changes are not accounted for in predictions related to surface water impacts.
  - (c) The 2020 NETR discusses what is impacted within the existing quarry and extension footprints, it does not provide a more fulsome picture of what happens to the downstream watercourses and particularly the Willoughby Creek system. The applicant should provide more discussion on specific effects to fish habitat as it relates to the receiving waters affected by future drainage and alterations to hydrology and hydrogeology from future

expansion. The surface water assessment report provides statements which affirms the sensitivity of Willoughby Creek to changes in baseflow, and the primary concern is that this feature, as well as the other watercourse will be maintained through pumping. **Should pumping be subjected to unexpected shutdowns or malfunctions, it is unclear what these effects would manifest to fish habitat.** For example, if fish populations are reliant on this flow to successfully spawn and rear their young, what happens during the coldest winters and summer drought conditions is of concern as a sudden withdrawal of flow in the upper reaches may result in fish mortality.

- (d) As extraction proceeds to its later stages and progressive rehabilitation takes place, it is unclear how this impacts fish habitat. It is not fully explained how the quality and quantity of discharge water will be maintained. It is anticipated that there will be a lowering of local groundwater and surface water levels from quarry operations and quarry dewatering. It would be good to understand how water quantities will be balanced and water quality will be maintained at various stages during blasting and quarry operations. Furthermore, it is uncertain if ground water conduit flow paths will be interrupted during quarrying operations.
- (e) There may be contaminants introduced into water bodies from blasting and quarry operations that can affect fish habitat. As blasting will be used for extraction, what is the potential for contaminants to be released or the event of a pipeline rupture from blasting (from the Enbridge Pipeline in Colling Road)?
- (f) Effects from pumping and lake creation, including shutdown of the pumps, malfunctions or spills at the quarry should be included in the discussion. Furthermore, temperature impacts from the creation of the lake, and other potential effects such as exotic species invasion/blue green algae should also be included in the discussion.

## 5 FUTURE GAPS TO BE ADDRESSED

1. The setting for the quarry extension takes place within the Niagara Escarpment Protection Area where the management focus is directed to maintaining the key natural heritage features and key hydrologic features for the movement of native plants and animals across the landscape. The natural feature of concern is in Willoughby Creek, where a remnant Brook Trout population exists. This remnant population presumably still occurs within a short distance within the Willoughby Creek Tributary kept separated from Bronte Creek through a dam from more aggressive migratory salmonid species. This current population is dependent on the existence of baseflows and groundwater discharges that occur in Willoughby Creek. During the previous quarry submission, the Joint Agency Review Team (JART) had requested that discussion of each watercourse should include a detailed description of each of the following:
  - (a) locations of groundwater upwellings (and their significance to fisheries), species composition, distribution, relative abundance, and life history of the fish inhabiting the creek.
  - (b) JART also requested identification of critical or sensitive habitat with reference to species distributions.

- (c) Considering the pumping which will be used to maintain the current baseflows to the Willoughby Creek and other tributaries, this strategy needs to be further understood with respect to future risks to the fish habitat downstream. For example, if a passive means of supplying water to these downstream systems is possible, this may be a safer alternative rather than relying on pumps that may be susceptible to mechanical failure and regular monitoring to ensure proper function.
- (d) Some of the information requirements that are relevant to the understanding of the potential impacts of the proposed extension raised by JART include:
- ◆ predicted flow rates for groundwater discharge for the tributaries
  - ◆ effects of groundwater and surface water changes on the fisheries in each tributary
  - ◆ groundwater disruptions may have a very large effect on fisheries and the effects should be further quantified
  - ◆ threshold flows and predicted effects on fisheries habitat
  - ◆ impact of shortened periods of groundwater contribution on fish productive capacity in intermittent streams
  - ◆ the relative contributions/effects to groundwater should be summarized in a table for each watercourse
  - ◆ potential thermal impacts on the watercourse and whether the quality of groundwater is affected (including thermal pollution)
  - ◆ effect of increased flows on channel stability, fisheries, and productive capacity in Willoughby Creek
  - ◆ effect of mitigation/pumping of water into the ground and the impact on watercourses

In addition to these, the applicant should discuss how the progression of quarrying (in various stages) impacts the water quality that is discharged to downstream systems.

I trust that this letter report suits your present requirements. If you have any questions or comments, please call either of the undersigned at 519.772.3777.

Yours truly,

**MATRIX SOLUTIONS INC.**

A handwritten signature in black ink, appearing to read 'Arnie Fausto', written in a cursive style.

J. Arnel (Arnie) Fausto, M.Sc.  
Senior Ecologist

JAF/vc

#### **DISCLAIMER**

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