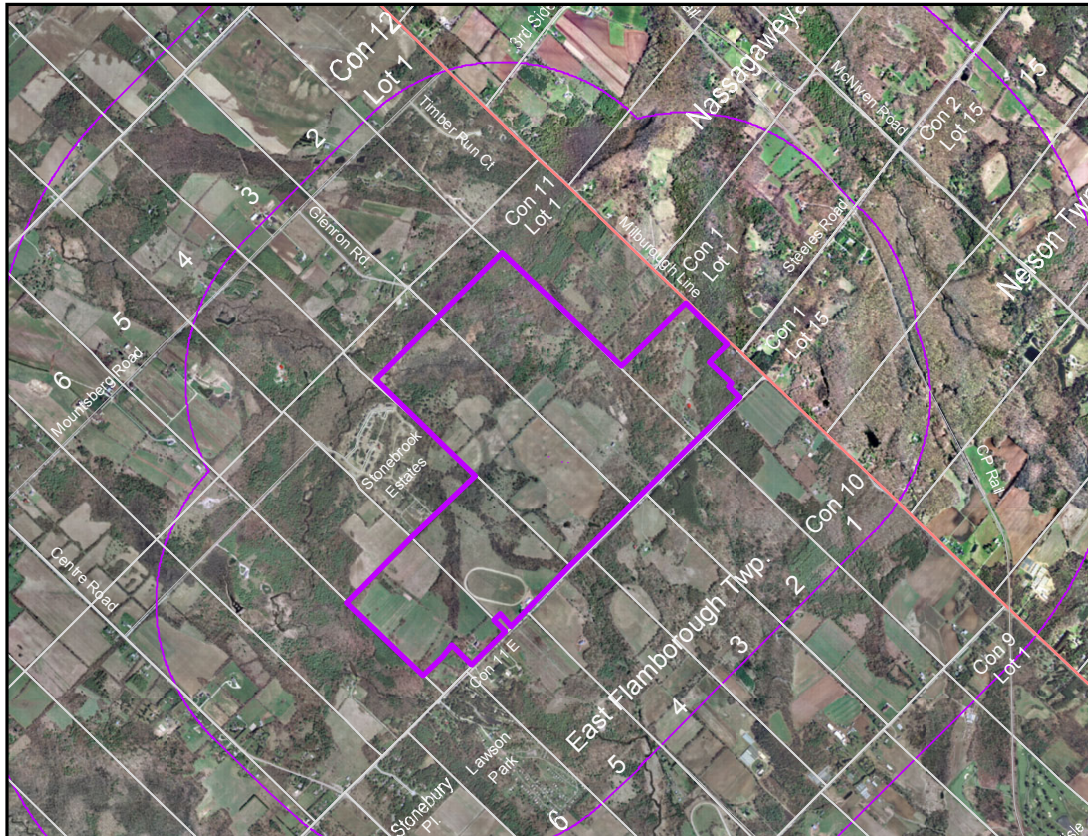


Part II – Aquatic Biology Review of the Preliminary Level 2 Natural Environmental Report (being part of Lowndes Holdings application for a Category 2, Class “A” Below Groundwater Quarry License)

December, 2005



Prepared For:

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PART II Aquatic Biology Component - Review of the Preliminary Level 2 Natural Environmental Report (being part of Lowndes Holdings application for a Category 2, Class “A” Below Groundwater Quarry License)

1.0 INTRODUCTION

Aquafor Beech Limited was retained by Friends of Rural Communities and the Environment (FORCE) in cooperation with its lead Natural Environment consultant, North-South Environmental Inc., to provide a review of the aquatic biology components of the Lowndes Quarry Application, specifically “Appendix 6 Preliminary Level 2 Environmental Report. 2004” as prepared by Stantec Consulting Ltd (Stantec). A number of other supporting documents for this application were also consulted. This included reviewing all background reports for information on hydrology / hydrogeology, quarry development and operations, and mitigation of impacts, specifically:

- Geological investigation, proposed dolostone quarry – prepared for Lowndes Holdings by John Emery Geotechnical Engineering Ltd. 2004
- Preliminary hydrogeological assessment, proposed dolostone quarry, township of Flamborough. Gartner Lee Ltd. 2004
- Proposed dolostone quarry, preliminary planning report. – prepared for Lowndes Holdings by Long Environmental Consultants Inc. 2004.

It is important to note that the Stantec report is not the final Level 2 /EIS report (noted in the conclusions of that document) and, therefore, some changes may occur when the report is finalized. In this regard, we reserve our final comments until such time as this document is available in final form.

2.0 APPROACH

This review was based on a review of background reports prepared in support of the application, as well as the Bronte Creek Watershed Study and consultation with MNR regarding available records for reddsides dace (*Clinostomus elongates*). In addition, a site visit was made in early June 2005 to all watercourses draining the site.

The review provided in Section 3 is organized according to key components of aquatic habitat, as well as impact characterization and mitigation. The sections are as follows:

- 3.1 Overview
- 3.2 General Comments
- 3.3 Stream Flow and Temperature
- 3.4 Water Quality
- 3.5 Stream Morphology
- 3.6 Riparian Habitats
- 3.7 Aquatic Communities
- 3.8 Mitigation

3.0 REVIEW

3.1 Overview

The Stantec report identifies that aquatic habitat/inventory work was completed during a number of site visits: October 30, 2003 – habitat assessment; November 25, 2003 – redd survey; January 15, 2004 – habitat assessment; and June 9 – 17, 2004 – benthic sampling, fish inventory and habitat assessment. A total of about 16 sites were investigated that included all drainage features on the property, as well as several sites downstream of the property on the main watercourses, Mountsberg and Flamboro Creeks. Fish were captured at 9 of these sites.

The watercourses, as referenced and defined by Stantec include the following (Figure 1, from Stantec 2004):

- Tributary A: a small tributary of Mountsberg Creek, draining the PSW in the north west corner of the Site;
- Tributary B: a small tributary of Mountsberg Creek, draining the western side of the Site;
- Tributary C: a small tributary of Mountsberg Creek, draining the southwestern side of the Site;
- Tributary D: a small tributary of Tributary C, draining a pond on the southwestern side of the Site;
- Flamboro Creek: a headwater tributary of Flamboro Creek draining the southeastern side of the Site
- Mountsberg Creek: a major tributary of Bronte Creek, a portion of which crosses the Site at the northwestern corner of the Site.

Based on their work and on background information available in the Bronte Creek Watershed Study, the Creeks, on and adjacent to the site were classified by Stantec as follows:

- Tributary A: potential coldwater stream;
- Tributary B: intermittent, potential coldwater stream;
- Tributary C: intermittent, potential coldwater stream;
- Tributary D: intermittent, potential coldwater stream;
- Flamboro Creek: potential coldwater stream;
- Mountsberg Creek: warmwater sportfish stream.

Stantec further noted that Flamboro Creek is classified as a warmwater forage fish stream downstream at Concession 10.

The Stantec report indicates that additional data on these watercourses has been collected but was not yet available for inclusion in the report, including:

- Temperature data from several dataloggers installed in the watercourses;
- Stream flow data from several gauges installed in the watercourses;

- Benthic invertebrate results from a number of the sites where fish habitat work was completed

Stantec completed their Level 1 and 2 environmental investigations, impact assessment and mitigation review without the benefit of this key data.

3.2 General Comments

The Stantec Level 1 and 2 environmental report provides a preliminary description of the aquatic environment. **For this particular site, given the key natural heritage and hydrologic features on site and on contiguous properties, the level of rigour is not congruent with the widespread and potentially severe impact of the proposed project. The presence of redbreasted dace habitat (a federally listed Species-At-Risk), the presence of a sensitive coldwater fishery and evidence that the site may be an important groundwater source to nearby streams are examples of the sensitive nature of the aquatic environment on and downstream of the site.** In addition, conclusions drawn in this report are premature and conjectural, given the fact that some key data, namely the temperature, benthic invertebrate and stream flow data were unavailable when the report was written. Furthermore, the report also states that “effects of pumping tests did not extend to the perimeter of the site, where wetlands and streams are located”, which suggests that hydrogeological investigations may not have adequately addressed potential impacts on streams and wetlands.

For this application, with the inherent environmental sensitivity of the surrounding lands, a more detailed and comprehensive inventory and assessment of the aquatic resources on and adjacent to the site is warranted. This would include but not be limited to elements such as the following:

- Study Design: The selection of aquatic inventory and assessment sites did not include comparable, un-impacted “reference sites” that could be used as benchmarks to provide context for characterizing the sensitivity of watercourses draining the site and to confirm that future impacts do not occur. These sites on nearby watercourses would exhibit similar characteristics to those inventoried in the study. Given the absence of reference sites, quantitative fish population data was not gathered for future comparison. At a minimum, this should include estimating total biomass per unit habitat or abundance of specific fish species per unit habitat. The use of the Index of Biotic Integrity as an indicator of stream health, based on the fish community, would also provide a basis for future comparisons or provide evidence of measurable change
- Field Investigations: The timing of field investigations (October, November, January and June) does not reflect the appropriate timing for aquatic field studies nor does it conform to any particular life cycle stages for various fish species and communities represented. Certainly, a multi-season study is warranted to capture life cycles, low flow conditions, and overwintering, among other factors.

In fact, a two year study may be appropriate given the unusual weather conditions over the past several years.

- Review of Background Information: It does not appear that MNR was consulted for any fish collection records that were available for these tributaries of Bronte Creek. For example, Figure 2 highlights MNR records for Redside Dace, a Species at Risk, within Bronte Creek and shows two locations upstream and downstream of the site on Mountsberg Creek. The references do not speak to prior fisheries assessments nor fish studies.
- Species at Risk: Given the fact that records of Redside Dace exist in the vicinity of the Site and that the Bronte Creek Watershed Study makes specific reference to the potential of tributaries of Mountsberg Creek to provide cold/cool water refugia to species such as brook and brown trout, greater efforts could have been made to confirm the presence of these species. There is no discussion in the report of potential Redside Dace habitat and the implications of the Species at Risk Act.
- Reference Photographs: No photographic record of each inventory site is available to provide a general indication of habitat conditions.
- Habitat Assessment forms: A qualitative assessment / description of stream habitats at each site is provided, however, this lack of standardization is insufficient to allow for future changes to be measured.
- Fluvial Geomorphology: No assessment of stream stability was completed. The Stantec report indicates that at the time the report was prepared, it was not known what watercourse(s) would be used for pumped discharge, however, the report does not recommend the need for fluvial geomorphic studies, nor does it prioritize watercourses in terms of their sensitivity to such a discharge from an aquatic environment perspective.
- Water Quality: Detailed water quality analyses for all streams should have been completed in order to assess the impact of any pumped water discharges from the proposed quarry. Without data on nutrients, chloride, suspended and dissolved solids, bacteria, trace metal and organics, as well as an ion balance (including alkalinity, hardness and major ions), no assessment of impacts on receiving waters can be made.

3.3 Stream Flow and Temperature

As noted above, stream flow and temperature were not reported in the Stantec report. Nevertheless, Stantec provides a classification of streams based on flow permanence and temperature. No rationale is provided although, presumably, this classification is based solely on observations made during the field surveys, as well as based on the Bronte Creek Watershed Study.

The Stantec report states “Hydrogeological investigation suggests that the PSW and streams on the north and southeastern portions of the property could be directly connected to the water table, because the water levels in the wetland fairly closely match the ground water table elevations (Gartner Lee 2004).” These streams would

include both Mountsberg Creek and Tributary A (north side) and Flamboro Creek (southeastern side). This indicates that groundwater discharge is occurring to these watercourses. Potential discharge areas here are also identified in the recent City of Hamilton Groundwater Management Strategy (2004). Yet as noted above, it appears that pumping tests conducted as part of the hydrogeological investigations did not extend to the perimeter of the Site where these features are located.

In general, we concur with the Stantec stream classifications for the watercourses draining the site in terms of temperature, however, we suggest that insufficient information may have been available to categorize these features in terms of flow permanence and the role of groundwater discharge as it affects fish habitat in these watercourses. Groundwater not only makes the fish habitat more valuable by contributing base flow but it also acts as an important mechanism for moderating water temperatures during the warm and extremely cold months of the year. We further note the value of intermittent fish habitat; depending on the time of year, this habitat can make a substantial contribution to the overall fisheries value of an area.

Mountsberg Creek and Tributary A: the Bronte Creek Watershed study suggests that local groundwater discharge in this area as well as tributary discharges (for example, Tributary A) contribute to localized cooling of the creek. This would suggest that Mountsberg Creek in this vicinity, as well as Tributary A may provide a local cold / cool water refugium for species such as brook and brown trout and reddsides. The Stantec report does not attempt to confirm or refute this statement, other than by undertaking a “redd survey” in November to identify possible evidence of brook / brown trout spawning. Therefore, although Mountsberg Creek is correctly classified as “warmwater sportfish”, the potential of a localized cold / cool water refugium was not adequately assessed (particularly in the absence of data from temperature recorders). It also appears that hydrogeological investigations did not investigate this in detail either.

Tributaries B and C: These tributaries are classed as potential cold water intermittent streams. While it is true that these tributaries were dry during the field investigations in June 2004, it is not clear for what portion of the year this condition exists. For example, during our field visit in June 2005, Tributary C was dry, however, Tributary B was flowing. This would support the Stantec statement that “Tributary B likely provides some groundwater input to Mountsberg Creek. Analysis of stream gauge data would have confirmed how “intermittent” these features are. Another key point in reviewing “dry weather” flow conditions is that until 2004, southern Ontario has experienced several dry years. It is reasonable to expect that groundwater table elevations may still be recovering and have not yet reached “normal” elevations. There is no discussion in the Gartner Lee hydrogeologic report or the Stantec report indicating whether observed groundwater conditions are typical of long term averages.

Tributary D: This tributary, which drains an existing pond, is classified as an intermittent coldwater stream.

Flamboro Creek: Flamboro Creek is classified as a “potential coldwater stream”, however, it is suggested that Flamboro Creek becomes intermittent downstream of concession 10 and is “limited” in terms of fish habitat. At this point, Flamboro Creek is classed as “warmwater forage fish”. It may be speculative to refer to this reach as intermittent, since it is possible that water taking is affecting flows here.

3.4 Water Quality

The Stantec report does not characterize water quality in the watercourses draining the site. The report makes several references to the occurrence of low dissolved oxygen levels and suggests that this is an indicator of poor habitat conditions. It is curious that there are no references to acceptable or high dissolved oxygen levels or specifics as to what was considered to be “low”. It should also be noted that while low dissolved oxygen levels can be stressful to fish, low dissolved oxygen levels can also be an indicator of groundwater. Some further discussion of these results is warranted.

The lack of information on existing water quality conditions in watercourses draining the Site does not permit any assessment of impacts of pumped discharges to be made. Some reference in the Stantec report is made to mitigating potential thermal and volume effects of pumped discharges only.

Data on nutrients, chloride, suspended and dissolved solids, bacteria, trace metal and organics, as well as an ion balance (including pH, alkalinity, hardness and major ions) needs to be completed for each watercourse in order to assess water quality impacts. A multi-season and multi-event characterization of water quality conditions is required. This assessment would also need to consider how the Mountsberg reservoir is affecting Mountsberg Creek from a water quality perspective and determine what cumulative changes might occur as a result of proposed quarry operations. A discussion of whether future operational changes to the reservoir are being considered and how these may affect Mountsberg Creek should also be identified.

Benthic invertebrate data was collected from each watercourse, however, detailed taxonomy was not available when the Stantec report was prepared. Various “biological indices” can be calculated using the diversity (variety), abundance and sensitivities of benthic invertebrate species. Such information would have been helpful in providing some insight into current water quality conditions.

3.5 Stream Morphology

The Stantec report does not address stream stability, as it relates to potential impacts from surface water discharges to these watercourses. The majority of the watercourses draining the Site are sensitive headwater (1st Order) streams that flow through wetland or alluvial soils. Such watercourses are generally highly sensitive to changes in the flow or sediment regime. For example, changes could include short and long term increases

in both sediment supply and runoff (either from site clearing or pumped discharges) and decreases in groundwater supply. The impact of these changes cannot be assessed without a detailed description of the fluvial geomorphology of downstream reaches of each watercourse.

3.6 Riparian Habitats

Although not specifically addressed in the Stantec report, all watercourses on the site would appear to have well vegetated riparian areas, with the exception of the reach of Mountsberg Creek traversing the site. This reach flows through wet meadow / riparian wetland habitats.

The ecological, water quality and hydrologic function of riparian habitats is not fully discussed in the Stantec report, other than to suggest that standard watercourse setbacks should be sufficient to protect these features. The actual extent of the riparian zone adjacent to each watercourse should be defined based on physical (soils, topography, resistivity to erosion), hydrologic (hydrologic soils group, flood storage, water table elevation) and ecological (vegetation, species, communities) characteristics.

3.7 Aquatic Communities

Redside Dace: As noted above, Redside Dace, have been recorded in Mountsberg Creek, however, the Stantec report concludes that they have likely been extirpated from the creek as a result of thermal warming subsequent to the creation of the Mountsberg reservoir. In our opinion, insufficient effort was devoted to documenting the presence/absence of Redside Dace or Redside Dace habitat in this study. The Species at Risk Act protects Species at Risk and their habitats (existing and potential) from the adverse effects of human activities. Based on the habitat information provided in the report, potential habitat exists in Tributary A and the reach of Mountsberg Creek in the immediate vicinity of its confluence with Tributary A. It is possible that inventory work may have missed this species because of the time of sampling (no temperature data available). If redside dace are present in very low numbers (which would be expected for a Species-At-Risk), the best sampling time would be close to the spawning period, which could be May not June at water temperatures of 15-20 C. Since Mountsberg Creek provided Redside Dace habitat prior to reservoir construction, any remaining stream reaches that offer cold / cool water refugia represent remnant habitat or potential areas for re-introduction of the species. Temperature monitoring could confirm this. A draft Redside Dace Recovery Plan has recently been prepared by MNR, but is currently not publicly available. The Plan was prepared by a technical committee chaired by MNR (Mr. A. Dextrase), and currently MNR and the conservation authorities are acting on some recommendations of the plan. For example, Aurora District (MNR) has undertaken specific habitat restoration projects for redside dace, and a number of Districts have implemented a specific construction window of July 1 - September 15 for any projects in the vicinity of redside dace populations. Any areas of existing or historic

redside habitat represent opportunities to rehabilitate this species to its former range, and such habitat represents “critical habitat” to be protected under the Species-At-Risk Act.

Redd Survey: the redd survey was limited to two locations in Mountsberg Creek, yet both tributary A and Flamboro Creek were identified as potential coldwater streams. The redd survey or an actual spawning survey should have been completed in these watercourses to identify possible spawning activity.

Reference Collection: There is no mention whether a reference fish collection has been kept, documenting the list of species found.

Quantitative Surveys: As noted previously, some stations should have been quantitatively sampled to document fish biomass, fish abundance, and/or to allow calculation of the Index of Biotic Integrity to provide a benchmark against which to measure future impacts. As noted previously, the results of benthic invertebrate taxonomy should be reported and assessed. Given the proximity of the Site to the Niagara Escarpment Biosphere Reserve, some additional inventory work should have been completed to confirm if other sensitive species or Species-At-Risk are present (aquatic vascular/non-vascular plants, invertebrates, other biota).

3.8 Mitigation

The mitigation section of the report is very general in nature. It has been noted that this section will be expanded in the final report. Based on the unreported data and data inadequacies identified in the previous sections, it is premature to provide detailed comments on this section. As it currently stands, in our opinion, the mitigation section underestimates the significance of a number of key aquatic features / resources, lacks supporting evidence in terms of effectiveness, and neglects to discuss any negative impacts of the measures themselves.

Given the deficiencies in the report, in particular, the fact that key collected data was not yet available, it is difficult to understand how the report can conclude in favour of the proposed application. This favourable conclusion is not consistent with current environmental management principles, which would employ a precautionary or “environment first” philosophy. Using this approach, the primary conclusion of the report, given the above deficiencies should be to collect additional data or at least to await analyses of collected data (temperature, hydrology, benthic invertebrates) before making any assessment of impacts.

4.0 CONCLUSIONS

Our conclusions are based on the Stantec report that is available, recognizing that the report is not considered by its authors to be the final report. However, even taking this into account, **we fail to understand how the report can conclude in favour of the application.** Even if the unreported data was available, there remain significant deficiencies in the report. The scope of the field program does not provide for a complete description of baseline conditions nor a full assessment of possible impacts. Based on this, the report cannot adequately make any conclusions with respect to mitigation, nor, in our opinion, conclude in favour of the application. **Based on the review we have provided above, it is our opinion that there is insufficient documentation of the existing aquatic conditions of the watercourses potentially impacted by the proposed operation to conclude that the quarry will not impact these resources. It would also appear that hydrogeologic and hydrologic investigations have not fully addressed potential impacts on the stream environments in and downstream of the site. There is sufficient information to suggest that sensitive coldwater streams exist on and downstream of the site, that the potential exists for Redside Dace habitat to be present (a Species-At-Risk), and the potential impacts from the quarry will negatively affect these resources.**

At this point in time, we conclude that more information is required in order to adequately assess the application. A summary of our review is itemized below.

1. Study Design: the selection of aquatic inventory and assessment sites did not include comparable, unimpacted “reference sites”. Such reference sites could be used as benchmarks to provide context for characterizing the sensitivity of watercourses draining the site and to confirm that future impacts do not occur.
2. Field Investigations: The timing of field investigations (October, November, January and June) does not reflect the appropriate timing for aquatic field studies, nor does it conform to any particular life cycle stages for various fish species. Certainly a multi-season study is warranted. In fact, a two year study may be appropriate given the unusual weather conditions over the past several years.
3. Species at Risk: Given the fact that records of Redside Dace exist in the vicinity of the Site and that the Bronte Creek Watershed Study makes specific reference to the potential of tributaries of Mountsberg Creek to provide cold/cool water refugia to species such as brook and brown trout, greater efforts could have been made to confirm the presence of this species. There is no discussion in the report of potential Redside Dace habitat and the implications of the Species at Risk Act.
4. Standardized Habitat Assessment forms: A qualitative assessment / description of stream habitats at each site is provided, however this is insufficient to allow for future changes to be measured. A standardized habitat assessment form would provide some level of quantification
5. Water Quality: detailed water quality analyses for all receiving streams should have been completed in order to assess the impact of any pumped water discharges from

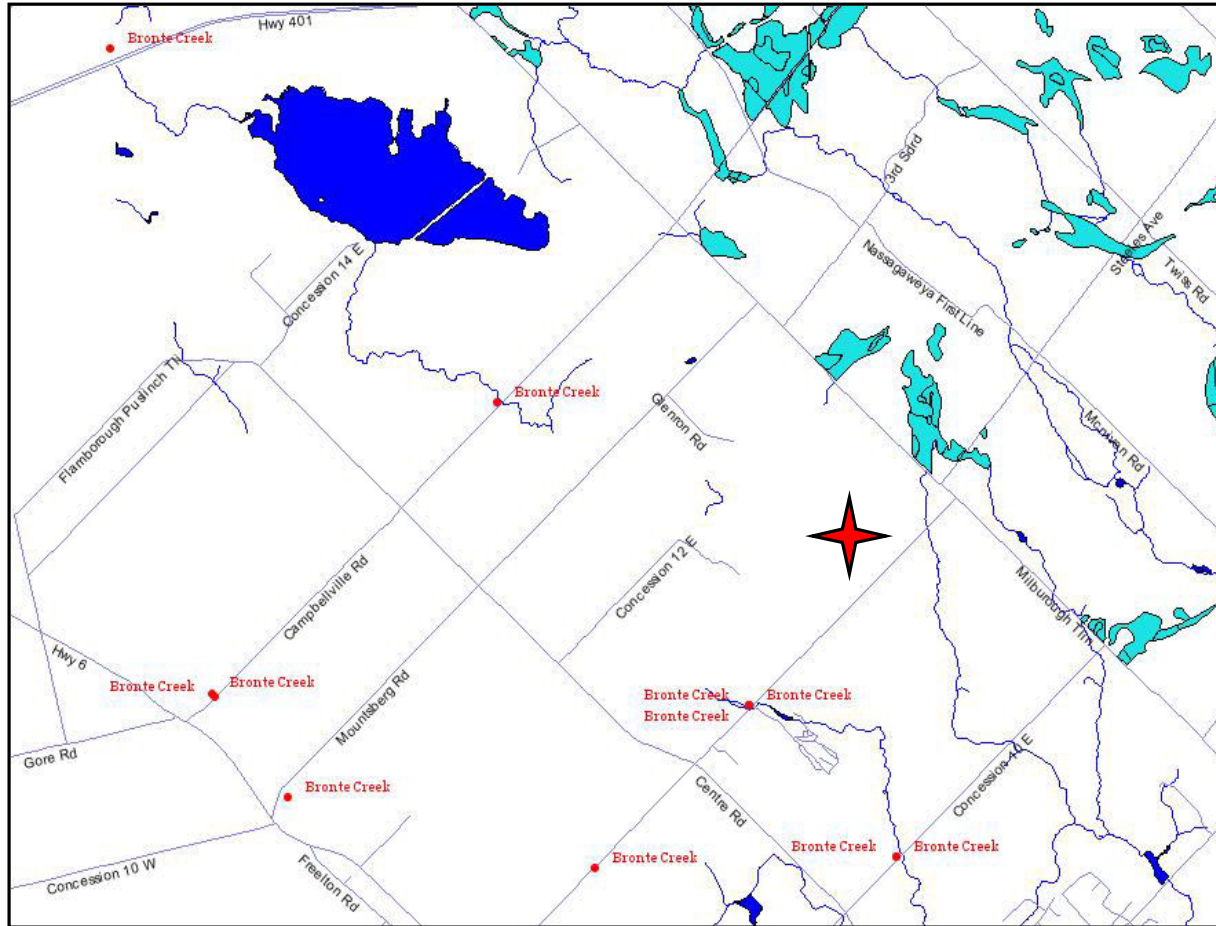
the proposed quarry. Without data on nutrients, chloride, suspended and dissolved solids, bacteria, trace metal and organics, as well as an ion balance (including alkalinity, hardness and major ions), no assessment of impacts on receiving waters can be made.

6. The Stantec report concludes that pumping tests conducted in support of hydrogeological investigations (Gartner Lee 2004) did not have impacts which extended to Mountsberg Creek, Tributary A or Flamboro Creek, yet it also concludes that these watercourses may be directly in contact with groundwater table elevations. Without further explanation, it cannot be concluded that proposed operations on the Site will not impact these watercourses.
7. The majority of the watercourses draining the Site are sensitive headwater (1st Order) streams that flow through wetland or alluvial soils. Such watercourses are generally highly sensitive to changes in the flow or sediment regime. For example, changes could include short and long term increases in both sediment supply and runoff (either from site clearing or pumped discharges) and decreases in groundwater supply. The impact of these changes cannot be assessed without a detailed description of the fluvial geomorphology of downstream reaches of each watercourse.
8. The ecological, water quality and hydrologic function of riparian habitats is not fully discussed in the Stantec report, other than to suggest that standard watercourse setbacks should be sufficient to protect these features. The actual extent of the riparian zone adjacent to each watercourse should be defined based on physical (soils, topography, resistivity to erosion), hydrologic (hydrologic soils group, flood storage, water table elevation) and ecological (vegetation, species, communities) characteristics.
9. The mitigation section of the report is very general in nature. It has been noted that this section will be expanded in the final report. Based on the unreported data and data inadequacies identified in the previous sections, it is premature to provide detailed comments on this section. As it currently stands, in our opinion, the mitigation section underestimates the significance of a number of key aquatic features / resources, lacks supporting evidence in terms of effectiveness, and neglects to discuss any negative impacts of the proposed measures themselves.

Figure 1: Aquatic habitat classification taken from Stantec (2004)



Figure 2. Location of Redside Dace capture records (MNR files, M. Heaton, pers. Com.)
Note: Red dots indicate location of records; Red star indicates Site



5.0 REFERENCES

- Conservation Halton. 2002. Bronte Creek Watershed Study. Prepared by the staff of Conservation Halton. Includes main report and 7 appendices.
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www.ontarionature.org

APPENDIX: CURRICULUM VITAE – BRIAN HINDLEY M.SC.

EXPERIENCE AND ACCOMPLISHMENTS

Brian Hindley has a Masters degree in Fisheries Biology and over 20 years of experience in aquatic ecology, water resources management, environmental planning, impact assessment and watershed management. His extensive experience includes senior watershed and water resources policy/planning positions with Ontario Hydro, the Ministry of Natural Resources, the Toronto and Region Conservation Authority and Beak International Inc. He has a strong background in fisheries/aquatic ecology, watershed/environmental planning, interdisciplinary project coordination skills and (water) resources management experience and provides client services in the following areas:

- watershed planning,
- policy development,
- stakeholder facilitation/mediation and issues management,
- natural area and aquatic habitat rehabilitation,
- environmental assessment,
- development capability mapping,
- environmental permitting,
- expert witness experience,
- receiving water assessment, and
- fish community assessment.

WORK CHRONOLOGY

- 2002 – present. Aquafor Beech Limited. Watershed Studies Specialist/Fisheries Biologist
- 1993-2002. Beak International Incorporated. Principal/Watershed Studies Specialist
- 1990-1993. Ontario Hydro. Environmental Studies Specialist, Hydroelectric Business Unit
- 1988-1990. Ontario Ministry of Natural Resources. Watershed Policy Specialist. Water Policy Branch.
- 1981-1989. Toronto and Region Conservation Authority. Watershed Specialist. Water Resources Division
- 1976-1981. Aquatic Biologist, Beak International Inc; Aquatic Biologist, Grand River Conservation Authority; Fisheries Biologist, Lake Simcoe Fisheries Assessment Unit

EDUCATION AND PROFESSIONAL MEMBERSHIPS

- York University, North York, Ontario, MSc. - Biology (part-time) Thesis: Survival of lake trout and lake whitefish eggs in Lake Simcoe. 1984. 78p. 1979 to 1984.
- University of Guelph, Guelph, Ontario, Hon. B.Sc. - Fisheries and Wildlife Biology. 1972 to 1976.

- Past President of the Southern Ontario Chapter of the American Fisheries Society

PROJECT EXPERIENCE - B. Hindley

During his career, Brian has managed and participated in a range of projects in both the private and public sector. Some examples by sector are listed below.

Watershed Studies

Watershed studies examine the cumulative effects of urban growth and other non point source land use practices on valued environmental features including aquatic/terrestrial habitats, fish communities, sensitive landforms, stream networks, rare/threatened/ endangered species, ground and surface water supplies and recreational opportunities. These studies require integrated understanding and assessment of the underlying processes which link these components of the ecosystem together: aquatic ecology, terrestrial ecology, hydrology, fluvial geomorphology, hydrogeology and water quality. Watershed plans provide an action plan which prescribes a variety of protective, restorative and enhancement measures to avoid, initiate or minimize cumulative effects and establish a healthy environment for plants and animals through economically viable development. Example studies which Brian has co-managed include:

- City of Toronto Wet Weather Flow Management Master Plan – Highland and Rouge Watersheds
- Lower Rideau River Watershed Management Strategy
- Carp Watershed Study, City of Ottawa
- Brookhill Subwatershed Study, Clarington
- Subwatershed 19 Study in the Credit headwaters. CVC
- Rouge River Watershed Management Strategy. TRCA
- Dingman Creek Subwatershed Study. City of London
- West Humber Subwatershed Study. City of Brampton
- Eramosa-Blue Springs Watershed Study. GRCA
- Kettle-Dodd Creek Subwatershed Study. City of London.
- Duffins Watershed and Seaton Lands Study. Ministry of Housing/TRCA
- Thames Valley areas Subwatershed Study. City of London.

Peer Reviews/Expert Witness

- Expert witness testimony at OMB Hearing on behalf of City of Toronto to address fisheries issues associated with a proposal to bury a tributary of Highland Creek
- Expert witness testimony at consolidated hearing to address fisheries and environmental planning issues associated with an industrial discharge to the St. Clair River. ICI Canada
- Peer review of a Class EA for a sewage treatment facility expansion in Alliston. T.R.U.C.E.
- Peer review of fisheries/hydrologic investigations to assess the effects of a release flow in the Jordon River to accommodate sports fishing interests. Nova Scotia

Power.

- Review of the Interim Waste Authorities environmental studies and site selection process leading to the selection of the M6 site in Markham. Town of Markham.

Government

- Preparation of a report: Watershed-Based Fisheries Management Guidelines, a technical background report for use in updating MNR District Fisheries Management Plans
- Preparation of a fisheries mitigation and compensation measures manual providing guidance on provincial highway construction projects. MTO.
- Assessment of the current and cumulative effects of ponds, water taking and diversions on the water resources of the Niagara Escarpment Plan area. CVC and NEC
- Preparation of two EARP screening reports for restoration projects in Hamilton Harbour/Cootes Paradise. Hamilton Harbour RAP.
- Review of Lake Ontario coastal shoreline treatment measures, their effects on fish communities and opportunities to provide habitat mitigation and enhancement. Waterfront Regeneration Trust.
- Class Environmental Assessment for the Brimley Road stormwater management facility - application of the Dunkers flow balancing system to treat stormwater. This EA involved developing a fish habitat compensation package for Fisheries Act authorization and creation of a wetland. City of Scarborough.
- Development of aquatic/terrestrial criteria and preparation of a sensitivity map for the lands within the Rouge Park North Park Master Plan. Town of Markham.
- Prepared amended conservation authorities' class environmental assessment to serve pending preparation of new class EA. ACAO.
- MNR draft discussion paper on ecosystem planning on a watershed basis.
- Prepared a draft discussion paper for a Provincial Water Conservation Strategy. MNR 1990
- Humber Watershed Rural Water Quality Study. Toronto Area Watershed Management Strategy. MOE
- MTRCA Rural Beaches Study. MOE
- MTRCA Waterfront Lakefill Park Environmental Monitoring Program. MTRCA.
- Developed and implemented environmental monitoring programs and a handbook of good design and construction practices for conservation authority undertakings. MTRCA.
- Designed and developed an urban fishing program for Metropolitan Toronto. MTRCA.

Habitat Assessment/Restoration

- Bowmanville Creek Restoration Plan, CLOCA
- Completion/Implementation of Fish Habitat Compensation Plans for several water control structure removal plans at the Stanleigh Mine, Elliot Lake. Rio Algom
- Completion of a Habitat Restoration Plan and Habitat Compensation Plan for Upper

Fletchers Creek. NW Sandalwood Landowners Group, Brampton

- Completion of several fisheries impact assessments and design input for stream erosion control projects on Tuck Creek, Redhill Creek, Rouge River, Snake Creek, Fletcher's Creek, Wilket Creek. Various municipalities/CAs.
- Development of aquatic habitat restoration plans for TooGood Pond. Town of Markham.
- Participation in a coastal wetland rehabilitation plan for Rondeau Bay. Rondeau Bay Watershed Steering Committee.
- Participation in the preparation of a restoration plan for Terraview Park/Taylor Creek. City of Scarborough.
- Comprehensive aquatic resources studies in support of the City of London Subwatershed studies

Power Generation

- Ontario Environmental Assessment and EARP Screening Reports for 7 small hydroelectric redevelopment projects. Ontario Hydro
- Fish Habitat and Hydro Power Working Group (MNR, DFO, OH).
- Baseline and environmental effects studies to identify siting constraints for a number of hydroelectric, thermal and nuclear generating stations in Ontario, Saskatchewan and Newfoundland. various clients
- Fisheries investigations to assess alternative sites for a thermal generating station in Lake Diefenbaker. Saskatchewan Power Corporation.
- Baseline fisheries study of the Chamouchuane River hydroelectric project. Hydro Quebec.
- Fisheries impact assessment and Atlantic Salmon population studies for the Upper Salmon Hydroelectric project. Newfoundland and Labrador Hydro.
- Baseline fisheries studies for the Lower Churchill-Gull Island hydroelectric project. Lower Churchill Development Corporation, Labrador.
- Fisheries habitat assessment and evaluations of heated water discharge effects on Lake Whitefish in the Abitibi-River. Northland Power.
- Evaluation of Atlantic Salmon passage facilities on the Exploits River, Newfoundland. Abitibi Price

Mining

- Receiving water and aquatic habitat assessment, North Porcupine River tributaries. Kinross Gold Corp.
- Fisheries and benthic invertebrate community investigations of tailings pond impacts in the Lightning River watershed. Hemlo Gold.
- Atlantic Salmon population studies to evaluate the effect of base metal mining activities in the Northwest Miramichi watershed. Heath Steele Mines.
- Development of an Environmental Manual for complying with Fisheries Act Authorization for Mine Closure activities at the Stanleigh Mine, Elliot Lake. Rio Algom
- Completion/Implementation of Fish Habitat Compensation Plans for several water

- control structure removal plans at the Stanleigh Mine, Elliot Lake. Rio Algom
- Completion of comprehensive environmental baseline studies of two arctic lakes containing Kimberlite deposits, NWT. BHP Diamonds
 - Completion of an environmental assessment of impacts from the Winston Lake mine on the Whitesand River watershed, Schreiber, Ontario. INMET Mining Inc.