ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT

Town of Shelburne Long-Term Well for Additional Water Supply Project

February 2013

Town of Shelburne Long Term Well for Additional Water Supply Project Environmental Assessment/Environmental Impact Statement

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EXECUTIVE SUMMARY

Introduction

Project Summary

In order to accommodate future growth in the Town of Shelburne, a new water supply source must be identified in or adjacent to the Town. This source of water must result in a safe, secure, and sustainable water supply system for the Town that meets Ontario Drinking Water Quality Standards, including anticipated new Provincial arsenic standards. The Town of Shelburne carried out the following environmental assessment (EA) under both the federal and provincial environmental assessment processes to identify the preferred alternative for developing additional municipal groundwater supply and to assess the potential environmental effects associated with the Project's activities. As a result of the EA, the preferred alternative for developing the additional municipal groundwater supply consists of the installation of a new production well with a backup well, located approximately 3 km west of the Town's municipal boundary on 2nd Line Southwest in the Township of Melancthon.

As part of the environmental assessment field studies, a test production well ("TW7-10") was installed to a total depth of 86.5 metres below ground surface and performance tested. Future operation of this well would draw water from a regionally extensive bedrock formation (the Gasport Formation), which is encountered from approximately 61 to 89 metres below ground surface. Groundwater will be pumped from TW7-10 at a rate of 1,635 m^3/d. This pumping rate would result in an additional 568 m^3/d beyond the required 1,067 m^3/d (J. Graham, P.Eng. Genivar-Town Engineer, personal communication, September 2012). This additional supply will result in a greater overall water supply security for Town of Shelburne by reducing demand from existing production wells, as the supply from some of these wells is not considered "firm", as no backup well or generator is present.

Pumped groundwater will be conveyed from the well site along an existing right-of-way to a connection point with the Shelburne water supply system. The proposed watermain route is approximately 4 km in length and follows 2nd Line southwest to Provincial Highway 89, then proceeds eastward along Highway 89 to the connection point with the existing Shelburne water supply system.

Federal Regulatory Context

As indicated under section 5 of the *Canadian Environmental Assessment Act* (CEAA), an environmental assessment is required before a Federal authority can provide funding for the purposes of enabling a Project to be carried out in whole or in part. Since the provision of funding is being considered by Infrastructure Canada, the Canadian Environmental Assessment Agency determined that CEAA is triggered for the proposed Project. In addition, part III, section 10 of the schedule within the Comprehensive Study List Regulations under the CEAA states:

> *"The proposed construction, decommissioning or abandonment of a facility for the extraction of 200,000 m^3/year or more of groundwater or an expansion of such a facility that would result in an increase in production capacity of more than 35 percent."*

Since, the Town anticipates that an additional 1,067 m^3/d of water supply capacity will be required by the year 2032 (J. Graham, P.Eng. Genivar-Town Engineer, personal communication, September 2012), the Comprehensive Study List Regulations apply to the Project, and comprehensive study, detailed in an environmental impact statement (EIS), is required.

Provincial Regulatory Context

As a municipal undertaking, the Town is subject to the requirements of the Ontario *Environmental Assessment Act* (EAA) as set out in part I, section 3. The Town is fulfilling the requirements of the EAA through the Municipal Class EA process, which applies to municipal water, wastewater and traffic projects.

The Municipal Class EA has been completed as a Schedule B process, which requires the completion of Phase 1 and Phase 2 of the Municipal Class EA process. The Municipal Class EA planning process is a proponent led process that places emphasis on project assessment and public input rather than on agency review and approvals.

The Municipal Class EA process requires the identification of a problem/opportunity statement for the project, which has been identified as follows:

In order to accommodate future growth in the Town of Shelburne, a new water supply source must be identified in or adjacent to the Town. This source of water must result in a safe, secure, and sustainable water supply system for the Town that meets Ontario Drinking Water Quality Standards, including anticipated new Provincial arsenic standards. An increase of 1,067 m^3/d is required to supply the projected increase in the Town's population by 2032 (J. Graham, P.Eng. Genivar-Town Engineer, personal communication, September 2012).

Alternatives Considered

The EA/EIS has evaluated alternatives to the Project as a means of addressing the Municipal Class EA problem/opportunity statement and as a requirement of a Comprehensive Study. The project alternatives considered included:

- Do nothing;
- Implement water conservation;
- Limit community growth;
- Develop a new well; and
- Implement arsenic treatment at existing water sources.

The assessment documented in this EA/EIS concluded that the development of a new well was the project alternative that best addressed the problem/opportunity statement.

The EA/EIS also considered alternative means of delivering the project. Five separate well locations were considered. With the exception of the well located at existing wells 5 and 6, the remaining 4 well locations were assessed including a watermain terminating at existing wells 5 and 6.

Based on the assessment documented in this EA/EIS, well location D was the project alternative that best addressed the problem/opportunity statement. The well site is located approximately 3 km west of the Town of Shelburne Ontario, on 2nd Line Southwest.

Scope of the Project

The scope of the project refers to the components of the proposed undertaking that are considered as part of the Project for the purpose of the EA/EIS. This includes all works and activities required for the construction and operation of the well site, pumphouse and watermain. Major project components include the installation of the production well, a new pumphouse housing equipment to extract and convey raw water to the existing water supply system and a new watermain, covering a distance of approximately 4 km along existing right-of-ways (2nd Line Southeast and east along Highway 89).

The scope of works and activities identified for the Town of Shelburne Long Term Well for Additional Water Supply (the Project) includes the following:

- Construction phase:
  - Stripping of topsoil at the well site and along the watermain route (if not installed by directional drilling);
  - Construction equipment delivery and laydown areas;
  - Installation of concrete foundation and construction of well house;
  - Construction of a new well and back-up well;
  - Installation of fencing (as warranted);
  - Installation of pump systems and components;
  - Excavation and backfilling for watermain installation;
  - Inspection and testing of project components;
  - Site restoration including topsoil cover and re-vegetation; and
  - Installation of a backup generator.
- Operations phase:
  - Routine operations and maintenance at the well site and along the watermain route.

Description of Existing Environment

The test production well is located on elevated terrain (approximately 500 metres above sea level), in proximity to a regional drainage divide between the Nottawasaga and Grand River watersheds. Overburden soils within the vicinity of the test production well are thin (i.e., less than 10 m) and predominantly comprised of glacial till. Overburden soils are underlain by Silurian dolostones of the Paleozoic Era (Guelph, Eramosa, Goat Island and Gasport Formations). These Silurian dolostones form a regionally extensive aquifer system that supplies water to many domestic and municipal water supply wells.

The majority of the study area is used for agriculture. The proposed well location is located on a privately-owned property that is zoned as rural. The main natural feature in the vicinity of the well site is a wetland complex, a non-Provincially Significant Wetland complex made up of the former Willow Brook Swamp and Melancthon #38 wetlands.

Assessment of Likely Environmental Effects and Mitigation Measures

Groundwater Quality and Quantity

Production pumping from TW7-10 will effect groundwater levels in the vicinity if the production well. Performance testing results indicate that future operation of TW7-10 (at 1,635 m^3/d) is not likely to adversely affect the operation of local domestic wells or adversely affect flow conditions in nearby surface water courses. Potentially adverse effects to groundwater quality during construction of the well house and watermain will be temporary.

In order to minimize adverse effects, the following mitigation measures will be employed:

- Standard construction best management practices, including:
  - Refuelling and maintenance;
  - Disposal;
  - Drainage and water control;
  - Dust control;
  - Site clearing;
  - Sedimentation and erosion control, including:
    - Silt fencing along watercourses to avoid sedimentation;
    - Culverts and sediment traps or straw bails to filter runoff;
    - Covering stockpiles to avoid erosion and runoff into watercourses;
    - Erosion blankets;
    - Dust control measures including sprinkling water on stockpiles;

- Emergency response and spills contingency plan; and
- Operations and contingency plan.

With the implementation of mitigation measures identified above, including monitoring, follow-up and any necessary adaptive management, the implementation of the Project is not likely to have an adverse effect on groundwater quality and quantity.

Surface Water Quality and Quantity

The construction activities listed above may cause degradation to surface water quality as a result of increased suspended solids loading from soil erosion, as well as the potential for accidental spills of hazardous materials (i.e., oil, gas, lubricants, etc.).

Due to the proximity to the regional watershed divide, surface water courses in the vicinity of the well have limited catchment areas. As such, the water surpluses of local surface catchments are sensitive to seasonal weather trends. Relative to this seasonal variability, seepage losses from surface catchments (in response to TW7-10 pumping) should have no discernible effect on the variation of streamflow rate or temperature currently observed within local drainage features.

Local wetland areas are underlain by glacial till soils and drained by engineered trenches at surface. Water levels in these areas did not respond to groundwater pumping from TW7-10 (over a 72 hour period). Since wetland areas are located towards the edge of TW7-10 zone of influence, seepage losses will be insignificant.

Groundwater level drawdown in shallow and deep bedrock aquifers should not affect the operation of local private well owners. Further, based on water samples collected during performance testing of TW7-10, the quality of the groundwater is suitable for development of municipal supply.

Groundwater pumped from TW7-10 is interpreted to be not under the direct influence of surface water (i.e., non-GUDI).

In order to minimize adverse effects, mitigation measures identified above for groundwater quality and quantity will be employed. Due to the distance of the Amos Drainage Works from the proposed well site and the minimal drawdown that is expected during operation of the well, no residual adverse effects on surface water quantity are expected during the construction and operations phases of the well.

Soils and Terrain

Construction activities may result in the temporary disturbance and/or removal of soils along the watermain route and in the vicinity of the well site. In addition, soil quality could be affected as a result or accidental spills or leaks during construction and operations.

In order to minimize adverse effects, the following mitigation measures will be employed:

- Standard construction best management practices, described above;

- Striping of topsoil and vegetation will be restricted to designated areas and along right-of-ways;
- All disturbed areas shall be restored with topsoil, hydroseeding or sod as soon as possible; and
- Monitoring and site checks of trenches at the end and start of each working day.

Due to the small footprint of the Project components, short-term duration of the construction activities and mitigation measures applied, no residual adverse effects on soils and terrain are expected during the construction and operations phase of the well.

Fish, Fish Habitat and Aquatic Ecosystems

The potential for effects on fish and fish habitat during construction specifically relate to the installation of the watermain under watercourses. For the purposes of this assessment, two methods of constructing these watercourses crossings are considered. The first method is the open cut method wherein the channel is dry or dewatered and the trench is excavated through the channel. The second crossing method is by tunnelling or directional drilling underneath the channel bed so as not to disturb the channel bed and banks and riparian vegetation,

The potential environmental effects to fish and fish habitat relate to the open cut watercourse crossing works and activities:

- Clearing of riparian vegetation and stripping of topsoil at the watercourse crossings;
- Disturbance of the channel bed and banks for the excavation of the watermain trench;
- Accidental spills of hazardous materials from the construction equipment.

The potential environmental effects to fish and fish habitat relate to the tunnelling method of watercourse crossing:

- Clearing of riparian vegetation and stripping of topsoil at the entrance and exit locations for the tunnelling equipment;
- Accidental spills of hazardous materials from the construction equipment.

The construction activities listed above have the potential to alter fish habitat and change the water quality as a result of disturbances to the banks and channels of watercourses at crossing locations or adjacent to watercourses, potential increase in suspended sediments from erosion of disturbed soils , as well as the potential for accidental spills of hazardous materials (i.e., oil, gas, lubricants, etc.).

During operation of the well, the radius of the predicted deep aquifer drawdown zone extends approximately 1.0 km. The predicted seepage losses from the surface catchments also correspond to the 1.0 km zone around TW7-10. The predicted drawdown zone encompasses Reaches 1, 2 and 3 of the Amos Drain. In Willow Brook wetland, near Reach 2, no measurable changes to shallow groundwater levels were observed from the steady state pumping of TW7-10 during the test period. On the basis of these results, long term operation of TW7-10 at a rate of 1,635 m^3/d should not affect the normal variation in water levels in the wetland or fish bearing reaches of Amos Drain. The seepage losses may alter the flow regime in Amos Drain

by extending the low flow period. However, the system contains intermittent flow (low to no flow in summer) and the seepage losses will not affect the seasonal habitat in these intermittent reaches. There is sufficient storage in the wetland to maintain the permanent aquatic habitat in Reach 2 of Amos Drain. Correspondingly, the productive capacity and habitat availability within Amos Drain are not expected to be adversely affected.

In order to minimize the adverse environmental effects of the Project on fish and fish habitat, the following mitigation measures will be employed at the open cut watercourse crossing:

- Limit the amount of clearing of riparian vegetation and where possible avoid grubbing the roots of woody vegetation to maintain bank stability;
- Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation,
- Use the Fisheries and Oceans (DFO) operating statement for *Isolated or Dry Open Cut Stream Crossings*. Follow the *Measures to Protect Fish and Fish Habitat*.
- Time the crossings to coincide with the dry channel period. If the channel is not dry and it is necessary to isolate the section to be crossed, undertake a fish rescue operation;
- Protect sensitive fish life stages by adhering to fisheries timing windows;
- Re-instate the channel bed and banks to previous condition (channel profile) using stockpiled channel materials from the excavation;
- Site specific erosion and sediment control plans;
- Installation and maintenance of silt fences adjacent to watercourses throughout the construction period;
- Site specific waste management, spill prevention and emergency response plans (construction and operation phases); and
- In the event that a spill occurs, and containment and clean-up is not effective before spilled materials dissipate into the environment, a habitat quality assessment will be completed to evaluate the need for restoration activities.

In order to minimize the adverse environmental effects of the Project on fish and fish habitat, the following mitigation measures will be employed with the tunnelling method of watercourse crossing:

- Limit the amount of vegetation clearing and where possible avoid grubbing the roots of woody vegetation to maintain bank stability;
- Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation,
- Use the Fisheries and Oceans (DFO) operating statement *Punch and Bore Crossing* or *High Pressured Directional Drilling*. Follow the *Measures to Protect Fish and Fish Habitat*.
- Site specific erosion and sediment control plans;
- Installation and maintenance of silt fences adjacent to watercourses throughout the construction period;

- Site specific waste management, spill prevention and emergency response plans (construction and operation phases); and
- In the event that a spill occurs, and containment and clean-up is not effective before spilled materials dissipate into the environment, a habitat quality assessment will be completed to evaluate the need for restoration activities.

A positive effect on fish and fish habitat may occur as a result of site restoration. Planting native vegetation along riparian areas will decrease erosion and sedimentation in nearby watercourse which will improve fish and fish habitat.

Due to the distance of the Amos Drainage Works from the proposed well site and the minimal drawdown that is expected during operation of the well, no residual adverse effects on fish and fish habitat are expected during the operation phase of the well.

Vegetation

Construction activities will result in the removal of existing vegetation along the watermain route and in the vicinity of the well site. The construction of the watermain will result mainly in the disturbance of herbaceous vegetation within the road right-of-way which will be immediately re-vegetated upon construction completion. The watermain will also cross a few watercourses and as such may require the removal of bank vegetation. This vegetation is herbaceous and will be immediately seeded and re-vegetated after construction disturbance. The construction of the wellhouse includes the permanent removal of 2,500 m^2 of herbaceous vegetation within a fallow field.

In addition, toxic effects to vegetation could occur as a result from accidental spills or leaks during construction and operations.

During operation of the well, the radius of the predicted deep aquifer drawdown zone extends approximately 1.0 km. The predicted drawdown zone encompasses portions of the Willow Brook wetland. During the pumping test, no measurable changes to shallow groundwater levels in the wetland were observed from the steady state pumping of TW7-10. On the basis of these results, long term operation of TW7-10 at a rate of 1,635 m^3/d should not affect the normal variation in water levels in the wetland. Correspondingly, the plant species and wetland vegetation communities are not expected to be adversely affected.

In order to minimize the adverse environmental effects of the Project on vegetation, the following mitigation measures will be employed:

- Tree removal and vegetation clearing zones will be restricted to those identified on the contract drawings and delineated in the field;
- Vegetation retention zones will also be identified on contract drawings and delineated in the field;
- Employ appropriate vegetation clearing techniques;
- Striping of topsoil and vegetation will be restricted to designated areas and along right-of-ways;
- Excavated material stockpiles shall not be placed within driplines of trees not designated for removal;

- Damaged branches and roots of trees not designated for removal will be trimmed back properly and cleanly; and
- All disturbed areas shall be restored with topsoil, hydroseeding or sod as soon as possible.

The vegetation communities identified within proximity to the Project site during the field survey are not considered to be rare. With the implementation of the mitigation measures listed above, no residual effects are anticipated.

Wildlife and Wildlife Habitat

The removal of vegetation and topsoil during clearing and grubbing has the potential to alter wildlife habitat. The habitat along the watermain route consists of herbaceous plant communities that are regularly disturbed to maintain a right of way along the roadways. The disturbance created by the clearing of vegetation and excavation and installation of the watermain will be temporary and will be restored to existing conditions. The culvert at Hwy 89 and 4th Line will not be altered and thus effects on Barn Swallow nests are not anticipated. The disturbance of the pumphouse will be a permanent 10 m by 10 m alteration of wildlife habitat, specifically habitat that was determined to be *Probably Breeding* habitat for Bobolink and Eastern meadowlark. The effect on this habitat removal are expected to be minor as the footprint is small compared to the amount of habitat available, the site is close to 2nd Line SW and a gravel road has already been installed at this location.

The installation of fencing may potentially fragment terrestrial wildlife habitat. Delivery of construction equipment may cause vehicular collisions with wildlife. In addition, there may be disturbance to wildlife, including SAR, due to noise, dust and the physical presence of construction equipment. Wildlife may also become trapped in unattended ditches or excavated areas, specifically outside of regular working or daylight hours.

In order to minimize or eliminate adverse environmental effects of the Project on wildlife and wildlife habitat, including nesting migratory birds in accordance with the *Migratory Birds Convention Act* , SAR in accordance with the ESA as well as wildlife generally, the following mitigation measures will be employed:

- Limiting clearing to only those areas absolutely necessary to safely install, maintain and operate the new well site and watermain;
- Where practical, retain riparian vegetation along watercourses;
- Avoid vegetation clearing and heavy construction works during the bird breeding season (May 1st to July 31st);
- In addition to the above, SAR species-specific mitigation for Bobolink, Eastern meadowlark and Barn swallow will be outlined in the *Information Gathering Form* and through negotiations with the MNR;
- Installing exclusion fences (e.g. silt fences) in advance of work to clearly mark sensitive areas (i.e., riparian areas) and to prevent wildlife from entering the Project site;
- Use of dust prevention measures (i.e., watering);
- The contractor will be advised that harassing or harming wildlife is prohibited;

- Wildlife incidentally encountered during construction will not be knowingly harmed;
- Restoring lands upon completion of the project with native vegetation, including re-seeding exposed areas; and
- Monitoring and site checks of trenches at the end and start of each working day.

Construction activities will be restricted to a footprint of approximately 2,500 m^2 for the well site and approximately 4,000 m^2 for the watermain route, which is only a small portion of the study area. In addition, construction activities will be contained within existing right-of-ways; therefore, minimal vegetation removal will be required. The project footprint will not be located within rare vegetation communities as identified during the field survey. Based on the assessment above and the implementation of the mitigation measures listed above, no residual adverse effects on wildlife and wildlife habitat are expected.

Air Quality

There is potential for degradation of air quality as a result of increased emissions and dust from construction vehicles and activities. The increase in emissions and dust will be temporary as they will mainly occur during the construction phase of the Project.

Electricity is used to power the system. However, during emergencies, the system can be powered by a portable diesel generator. The potential effects would be temporary as they would only occur during the use of the emergency generator.

In order to minimize adverse effects, the following mitigation measures will be employed:

- Ensure all construction equipment is in good working condition;
- Ensure all staff are adequately trained in the proper use of the construction equipment;
- Use appropriate dust suppression materials and measures; and
- Minimize the use of the standby diesel generator.

The potential effects mentioned above will only be temporary during the construction and operation phases. In addition, with the implementation of the mitigation measures listed above, no residual adverse effects are expected on air quality as a result of project work and activities.

Noise and Vibration Levels

Effects on noise and vibration levels are a result of the use of construction vehicles and equipment. An increase in noise levels will be temporary and will only occur during the construction phase of the Project. The effects on noise levels are not expected to be substantially different from those currently generated by common agricultural practices and routine road maintenance. Under normal operating conditions, the well and watermain will not generate noise.

In order to minimize adverse effects, the following mitigation measures will be employed:

- Ensuring equipment is in good working condition and operating quietly prior to accessing the site;
- Regular maintenance of equipment during the construction phase;
- Minimize use of portable standby generator during power failures; and
- Only operate equipment during daylight hours to be in compliance with noise by-laws 45-2004, 43-2004 and 31-2002 from the Town of Shelburne, Township of Amaranth and Township of Melancthon, respectively.

Based on the above assessment of noise levels during the construction and operation phases of the Project and with the implementation of the mitigation measures listed in Section 7.4.2.2, no residual adverse effects are anticipated.

Human Health

Environmental effects to human health relate to potential effects on water quality, air quality and noise. An interaction is therefore identified from routine operations. However, because no residual adverse effects are identified in this EA/EIS on water quality, noise or air quality, no potential effect on human health should occur.

As noted in this EIS, the project will meet all Provincial Water Quality Objectives and Guidelines for Canadian Drinking Water Quality and Recreational Water Quality. All phases of the project will also adhere to relevant standards and guidelines for noise and air quality. Therefore no potential adverse effects on human health are identified.

Construction safety is regulated by the Ontario Ministry of Labour. All relevant standards and guidelines will be adhered to for the construction phase of this Project.

Mitigation measures described for effects on groundwater quality and quantity, noise and/or vibrations and air quality will be applied to ensure that effects on human health are minimized.

Assessment of Cumulative Effects

Cumulative effects are those incremental effects caused by the Project when added to, or combined with effects from other projects or activities on both on-site and off-site. Certain or reasonably foreseeable projects and activities are considered in the cumulative effects assessment if they are likely to involve or represent one or more of the following:

- An activity that occurs immediately adjacent to the Project site;
- Additional sectoral projects and activities largely relating to groundwater extraction and municipal infrastructure and additional sources of drinking water consumption.

Well TW7-10 is located outside of the Town boundary, within a rural area with no known permitted groundwater users. No residual adverse effects are predicted for the biological environment and local wells

as a result of the proposed Project. As such, there are no known cumulative effects identified within the TW7-10 pumping zone of influence.

Public Consultation and Aboriginal Engagement

Stakeholder consultation and Aboriginal engagement is a two-way process by which the proponent and stakeholders/Aboriginal communities share information, with the intent of developing a Project that is environmentally sound and socially acceptable. Stakeholder consultation and Aboriginal engagement has been carried out to meet the requirements for both a Schedule B Municipal Class EA and the EIS Guidelines. Since the Provincial and Federal EA processes were carried out in parallel, some activities were combined.

The Municipal Class EA process identifies mandatory points of contact with the public for Phases 1 and 2 are as follows:

- Review and obtain input about the problem or opportunity, environmental issues, alternative solutions and preliminary determination of a preferred solution; and
- Notice of completion submitted to review agencies and the public, followed by a period of at least 30 calendar days.

The Federal comprehensive study process includes three mandatory points of contact with the public as follows:

- Public comment on Project and conduct of the comprehensive study;
- Public participation during conduct of the comprehensive study; and
- Public comment period on the comprehensive study report.

A public open house was held in the Town of Shelburne on October 22, 2012 to present and receive input on the problem or opportunity, environmental issues, alternative solutions and preliminary determination of a preferred solution.

Other consultation as part of the EA process included:

- Presentations to Town Council to describe the Project (December 2009);
- Letters presenting overview of the Project to Mayor and Council of Township of Amaranth, Mayor and Council of Township of Melancthon, and the Town of Shelburne Council (October 2009);
- Email correspondence with Ministry of Transportation Ontario to inform the agency of the Project and requested feedback on Ministry of Transportation Ontario right of way on Highway 89 (May 2011);
- Email correspondence with Ontario Geologic Society on the Town's investigation of the new OGS well "10A", which became the preferred well location for the Project (February 2010);
- Email correspondence with Ministry of Natural Resources, Grand River Conservation Authority and Nottawasaga Valley Conservation Authority to obtain biological information such as wetland habitat, and fish, invertebrate and terrestrial biota mapping (August 2009 to December 2011);

- Meeting with Ministry of the Environment to discuss intra-basin transfer from Grand River watershed to Natawasaga River watershed (April 2011); and
- Meeting with Ministry of the Environment and Ministry of Natural Resources to discuss intrabasin transfer and water quality of the new well, particularly relating to concentrations of arsenic (November 2011).

The Canadian Environmental Assessment Agency (CEAA) and the Federal Economic Development Agency of Ontario met with representatives of the Six Nations of the Grand River Territory on February 9, 2012 to discuss the Town of Shelburne Long-Term Water Well Project, the associated environmental assessment process and proposed Aboriginal consultation activities.

Follow-up Monitoring Program

Several plans and procedures will be implemented as part of the Project as follows:

- Groundwater and surface water monitoring plan;
- Emergency response and spills contingency plan;
- Erosion and sediment control plan;
- Traffic management plan;
- Health and safety plan;
- Hydrostatic pressure testing plan;
- Operations plan, including well maintenance and pumphouse monitoring;
- Contingency plans, which will be implemented in case of disruptions to normal operating conditions.

To confirm the groundwater withdrawals at the proposed municipal well site have negligible effects on existing groundwater supplies and surface water resources and to confirm no additional mitigation measures are required, a groundwater and surface water level monitoring program will be implemented for the operations phase of the project. The monitoring program includes the development of a rating curve and stream flow monitoring at the Willow Brook crossing of Highway 89, and continuous groundwater elevation monitoring in nearby observation wells (MW6/10-9, OGS 10A). As standardized construction measures will be implemented, no additional monitoring is recommended during the construction phase.

This program would be initiated and funded by the Town in advance of the well operation to establish background levels. As a minimum, an on-site monitoring well, a second monitoring well in the vicinity of existing municipal Wells 5/ 6, and Willow Brook wetland at Highway 89 will be included in this monitoring program (see Table 3 of Appendix D for recommended locations). Automated water level recorders will be installed at these locations so that a continuous record of data can be developed. Manual measures at these locations should be recorded on a monthly basis for the first full year of operation and then semi-annually for subsequent years. Water levels in the production well will also be recorded frequently as part of the operations monitoring program.

The Town will finalize the details of the follow-up monitoring program after designs for the project are completed. It is expected that the groundwater and surface water level monitoring program will be a condition of a PTTW for the proposed production well, and reporting on the status of the well and identified effects will be documented and submitted to the MOE. An annual report will be prepared by the Town's engineer and submitted to the Agency and INFC for a period of two years following the construction phase. The annual report will be posted on the CEA registry to provide an opportunity for stakeholders to review the outcome of the project and verify predicted effects.

Assessment Summary and Conclusions

Table E-1 summarizes the potential environmental effects, mitigation measures and residual adverse effects from the Project, including malfunctions and accidents, effects of the environment on the Project and cumulative effects.

Taking into consideration the existing environmental conditions, the potential environmental effects, mitigation measures to minimize, reduce or eliminate potential adverse effects and the evaluation of significance of residual adverse effects, the EA/EIS does not identify any likely significant adverse environmental effects as a result of the Project.

Public consultation and Aboriginal engagement conducted for the Project did not identify any concerns that are not addressed and/or mitigated by measures presented in the EA/EIS.

A concordance table for the EIS guidelines is provided in Table E-2.

Table E-1: Environmental effects summary Checklist

Environmental Component	Potential Project Effects				Residual Adverse Effects	
	Potential effects?		Can it be mitigated?		Is it significant?	
	Yes	No	Yes	No	Yes	No
Physical environment						
Groundwater quantity and quality	✓		✓			✓
Surface water quantity and quality	✓		✓			✓
Terrain and soils	✓		✓			✓
Biological environment						
Fish and fish habitat, aquatic ecosystems	✓		✓			✓
Vegetation	✓		✓			✓
Wildlife and wildlife habitat	✓		✓			✓
Atmospheric environment						
Noise and/or vibration levels	✓		✓			✓
Air quality	✓		✓			✓
Socio-economic environment						
Human health	✓		✓			✓
Aboriginal land use and resource use	✓		✓			✓
Physical and cultural heritage (archaeological)	✓		✓			
Malfunctions and accidents						
Construction and operations phase malfunctions and accidents	✓		✓			✓
Cumulative effects						
Cumulative effects	✓		✓			✓

Table E-2: EIS Guidelines Concordance Table

Information Requirement	Section of EA/EIS
The Proponent	1.1
Project Overview	1.2
Project Location	1.3
a. Existing environmental sensitive areas, Provincial and/or national parks, ecological reserves, species at risk (SAR) and other sensitive areas	6.2
b. Current land use	3.2
c. Local communities	3.2
d. Aboriginal lands	6.4
e. UTM co-ordinates of the main project site	1.3
f. Environmental significance of surrounding area	3.2
Participants in the Environmental Assessment	1.4
Regulatory Framework and the Role of the Government	1.5
a. Specific regulatory approvals and legislation at the Federal, Provincial, regional and municipal levels	1.5
b. Government policies, resource management, planning initiatives	1.5
c. Policies and guidelines for consultation with Aboriginal groups	1.4.3
d. Land use plans, land zoning, community plans	3.2
e. Major project components being applied for and constructed within the duration of approvals under Provincial and Federal legislation	3
f. Regional, Provincial and/or national objectives, standards or guidelines	6
Project Description	3
Need for the Project	3.1
Project Setting	3.2
Project Scoping	2
Scope of the Project	1.6
Factors to be Considered	1.7
Scope of the Factors	1.8
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Spatial Boundaries	1.9
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APPENDIX E
Town of Shelburne Administrative Structure and Responsibilities

ACRONYMS

Acronym	Definition
AANDC	Aboriginal Affairs and Northern Development Canada
BMP	Best management practice
CA	Conservation authority
CofA	Certificate of approval
CEAA	*Canadian Environmental Assessment Act*
COIP	Canada-Ontario Infrastructure Program
EA	Environmental assessment
EAA	*Environmental Assessment Act* (Ontario)
EAAB	Environmental Assessment and Approvals Branch
EIS	Environmental impact statement
ELC	Ecological Land Classification
EPA	Environmentally protected area
ESA	*Endangered Species Act* (Ontario)
FA	Federal authority(s)
GGHGP	Greater golden horseshoe growth plan
GRCA	Grand River Conservation Authority
GUDI	Groundwater supply under direct influence of surface water
INFC	Infrastructure Canada
LSW	Locally significant wetland
MAA	Ministry of Aboriginal Affairs
MOE	Ministry of the Environment (Ontario)
MNR	Ministry of Natural Resources (Ontario)
MTCS	Ministry of Tourism, Culture and Sport
MTO	Ministry of Transportation (Ontario)
NHIC	Natural heritage information centre
NVCA	Nottawasaga Valley Conservation Authority
OBBA	Ontario breeding bird atlas
OCWA	Ontario Clean Water Agency
ODWQS	Ontario Drinking Water Quality Standards
OGS	Ontario Geology Survey
O. Reg.	Ontario Regulation
PNC	Prior notice of commencement
PPS	Provincial policy statement
PTTW	Permit to take water (Ontario)

Acronym	Definition
RA	Responsible Authority
SAR	Species at risk
SARA	*Species At Risk Act*
SARO	Species at Risk in Ontario
VEC	Valued ecosystem components

UNITS

Unit	Definition
dB	Decibel
L_{eq}	Energy equivalent sound level
km	Kilometre
km/h	Kilometres per hour
m^3/yr	Cubic metre per year
m^3/d	Cubic metre per day
masl	Metres above sea level
mgbs	Metres below ground surface
µg/L	Micrograms per litre

1.0 INTRODUCTION AND PROJECT BACKGROUND

The Town of Shelburne ("Shelburne"), located in south-western Ontario (Figure 1-1), is proposing to develop a new water supply production well that will result in a continued, safe and sustainable drinking water source for the Shelburne Water Supply System (SWSS). The Town of Shelburne Long-Term Well for Additional Water Supply Project (the Project) requires both an Environmental Impact Statement (EIS) under the Canadian Environmental Assessment Act (CEAA), and a Class Environmental Assessment (EA) under the Ontario Environmental Assessment Act (EAA). This EA/EIS report is intended to meet the requirements of both Federal and Provincial EA requirements. Note the CEAA has recently undergone revisions, which have been approved by the Parliament of Canada in 2012. This EIS was completed according to the CEAA in effect prior to the revisions that have recently been made to the Act. The EA/EIS was prepared in accordance with the CEAA (2010), the Comprehensive Study List Regulations (2006) and the EIS Guidelines prepared by the Canadian Environmental Assessment Agency (the Agency) [CEAA, 2012a] and the Municipal Class EA requirements set out in the Municipal Engineers Association Class Environmental Assessment document [MEA, 2011].

1.1 The Proponent

The Corporation of the Town of Shelburne is the proponent for the Project. The Town is a lower-tier municipality within the County of Dufferin. The Town is the owner of the SWSS, which is operated by the Ontario Clean Water Agency (OCWA).

The Town administers the SWSS on behalf of a population of approximately 5,846 people residing in Shelburne [Statistics Canada, 2012]. The Town is responsible for the development, management, and operation of the Project.

The contact person for further information about the Project is as follows:

John Telfer, CAO/Clerk
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1SO

In addition to the Town's staff, the Project team responsible for the preparation of the EA/EIS includes Golder Associates Ltd., Banks Groundwater Engineering Limited and Gerrit's Drilling and Engineering Ltd .

Additional information regarding the Town of Shelburne's organization and roles and responsibilities related to the Project is provide in Appendix E.

1.2 Project Overview

In order to accommodate future growth in the Town of Shelburne, a new water supply source must be identified in or adjacent to the Town. This source of water must result in a safe, secure, and sustainable water supply system for the Town that meets Ontario Drinking Water Quality Standards, including anticipated new Provincial arsenic standards. An increase of 1,067 cubic metres per day (m^3/d), at a minimum, is required to supply the projected increase in the Town's population by 2032 (J. Graham, P.Eng. Genivar-Town Engineer, personal communication, September 2012).

The well extends to a total depth of 86.5 metres below ground surface (mbgs). Future operation of this well would draw 1,635 m^3/d of groundwater from the Gasport Formation, which is encountered from approximately 60.7 to 89.1 mbgs, equivalent to 435.9 to 407.5 metres above sea level (masl). This pumping rate would result in an additional 568 m^3/d beyond the required 1,067 m^3/d. This additional supply will result in a greater overall water supply security for Town of Shelburne by reducing demand from existing production wells, as the supply from some of these wells is not considered "firm", as no backup well or generator is present.

Water will be conveyed from the well site along an existing right-of-way to a connection point with the SWSS. The proposed watermain route is approximately 4 km in length following 2nd Line Southwest to Provincial Highway 89, and eastward along Highway 89 to the connection point with the existing SWSS.

LEGEND

- Utility Line
- Highway
- Road
- First Nations Land (Reserves)
- Municipal Boundary
- Waterbody
- Study Area

25 12.5 0 25 50 75

SCALE 1:1,500,000 KILOMETRES

PROJECT

TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT
FOR ADDITIONAL WATER SUPPLY

TITLE

PROJECT LOCATION

REFERENCE

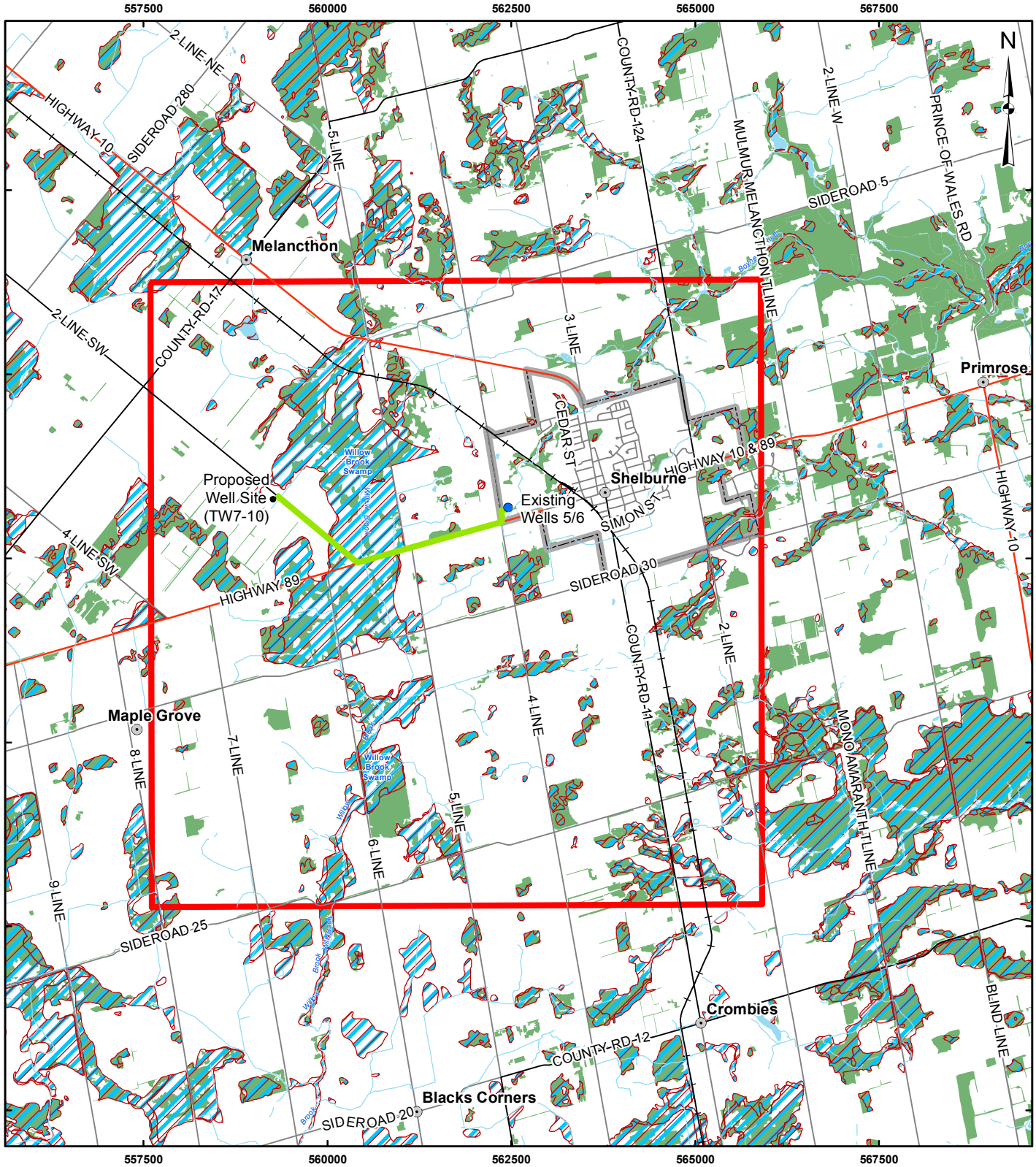
Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	RPM	17 Feb. 2011		
GIS	BC	9 Jul. 2012		
CHECK	MK	9 Jul. 2012		
REVIEW	MK	9 Jul. 2012		

FIGURE: 1-1

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\Draft\EISReport\ProjectLocation.mxd



LEGEND

- Proposed Well Site
- Existing Well 5/6
- City / Town
- Railways
- Highway
- Major Road
- Local Road
- Watercourse, Permanent
- Watercourse, Intermittent
- Proposed Watermain
- Waterbody
- LIO Wetland
- Town Boundary
- Wooded Areas
- Study Area

1,000 500 0 1,000 2,000 3,000

SCALE 1:75,000 METRES

PROJECT

TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT
FOR ADDITIONAL WATER SUPPLY

TITLE

PROJECT LAYOUT

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	RPM	17 Feb. 2011		
GIS	BC	9 Jul. 2012		
CHECK	MK	9 Jul. 2012		
REVIEW	MK	9 Jul. 2012		

FIGURE: 1.2-1

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

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1.3 Project Location

The well site is located approximately 3 km west of the Town of Shelburne Ontario, on 2nd Line Southwest (UTM coordinates 559305, 4880862), and is shown on Figure 1.2-1.

The proposed watermain route is approximately 4 km in length following 2nd Line Southwest to Highway 89, and eastward along Highway 89 to the connection point with the existing SWSS.

1.4 Participants in the Environmental Assessment

1.4.1 Federal Comprehensive Study

As stated in the EIS Guidelines, the Agency will carry out the duties of the responsible authority (RA) according to the CEAA by using information contained in the EIS to develop a Comprehensive Study Report that is submitted to the Minister of the Environment for approval.

The EIS Guidelines state that Infrastructure Canada (INFC) is considered an RA for the Project as a result of the potential provision of funding that will enable the Project to proceed. The Federal Economic Development Agency (FedDev) for Southern Ontario, as a result of a service agreement with INFC, are also involved as a Federal Authority (FA) for the purposes of the EIS.

Health Canada, Environment Canada, and Natural Resources Canada are participating in the EIS as FAs, as they have indicated they possess expert information that could be useful to the EIS.

1.4.2 Municipal Class Environmental Assessment

The Project is also subject to the EAA, and is required to fulfill the requirements of a Schedule B Municipal Class EA. The Ministry of the Environment (MOE), Ministry of Natural Resources (MNR), Ministry of Transportation (MTO), Grand River Conservation Authority (GRCA) and Nottawasaga Valley Conservation Authority (NVCA) and the Ministry of Tourism, Culture and Sport (MTCS) have been consulted during the Municipal Class EA process.

1.4.3 Aboriginal Communities

Aboriginal engagement is an essential requirement of both Federal and Provincial EA processes. The Town has sought feedback on the Project from Aboriginal groups throughout the EA/EIS process, and incorporated values and concerns expressed, as documented in this report (Section 5.3).

The Town has engaged with Aboriginal groups that may be affected by the Project and/or have asserted or established Aboriginal or treaty rights at the Project site. When the Crown contemplates conduct that may have potential adverse effects on established on Aboriginal and treaty rights, it has a legal duty to consult with Aboriginal groups before making a decision to proceed with the proposed Project [CEAA, 2012a]. As noted, the Project is situated within the boundary of the Haldimand Tract, as defined by the Six Nations of the Grand River First Nation, and Treaty 18 of the Williams Treaty lands. The Canadian Environmental Assessment Agency and the Federal Economic Development Agency of Ontario met with representatives of the Six Nations of the Grand

River Territory on February 9, 2012 to discuss the Town of Shelburne Long-Term Water Well Project, the associated environmental assessment process and proposed Aboriginal consultation activities.

1.5 Regulatory Framework and the Role of Government

1.5.1 Federal Roles and Authorizations Required

As indicated under section 5 of the CEAA (2010), an EA is required before an RA can provide funding for the purposes of enabling a Project to be carried out in whole or in part, unless the source of the funding is specifically excluded from this requirement under certain circumstances, which do not apply to the Project.

Since the provision of funding is being considered by INFC, the Agency determined that the proposed Project is described in part III, section 10 of the schedule within the Comprehensive Study List Regulations under the CEAA, which states the following:

> *"The proposed construction, decommissioning or abandonment of a facility for the extraction of 200,000 m^3/yr or more of groundwater or an expansion of such a facility that would result in an increase in production capacity of more than 35 percent."*

The Town anticipates that an additional 1,067 m^3/d of water supply capacity will be required by the year 2032 (J. Graham, P.Eng. Genivar-Town Engineer, personal communication, September 2012); therefore, the Comprehensive Study List Regulations apply to the Project, and comprehensive study, detailed in an EA/EIS, is required.

The installation of a watermain as part of the proposed Project would require two watercourse crossings. It is proposed that the watermain would follow existing right-of-ways, which already cross these two watercourses. There is the potential for riparian vegetation removal in localized areas during construction activities to access the area for installation of the watermain.

Consultation with the GRCA and NVCA with regards to these activities and acquiring the necessary permits from the GRCA and NVCA will be completed. The GRCA has a Level III Agreement with DFO under the *Fisheries Act*, which is included in the Law List Regulations under CEAA. The Level III Agreement allows the GRCA to conduct an initial review to identify impacts to fish and fish habitat. If there are impacts to fish and fish habitat, the GRCA can also determine how these impacts can be mitigated and would issue a letter of advice to the Town, if necessary. Mitigation measures may include measures following the DFO's Operational Statements [DFO, 2012a; 2012b; 2012c; and 2012d]. In addition, under a Level III Agreement, the GRCA can work with the proponent to develop a fish habitat compensation plan if it is determined that mitigation measures cannot completely alleviate the impacts to fish habitat. The Project is then forwarded to the DFO for approval. The NVCA has a Level II Agreement under the *Fisheries Act*. The Level II agreement allows NVCA to perform the same duties as the GRCA (initial review and letter of advice); however, if impacts to fish and fish habitat cannot be mitigated, the Project is forwarded to DFO without NVCA participation in the completion of the habitat compensation plan.

The *Navigable Waters Protection Act* is also listed in the Law List Regulations under CEAA (2010). Section 5(1) of the *Navigable Waters Protection Act* states that "*no work shall be built or placed in, on, over, under, through or across any navigable water without the Minister's prior approval of the work, its site and the plans for it*".

"Navigable water" as defined under the *Navigable Waters Protection Act* includes "*any body of water capable of being navigated by floating vessels of any description for the purpose of transportation, commerce or recreation*". The ultimate authority to determine the navigability of a particular waterway is with the Federal Minister of Transport or their designated representative (typically the local Navigable Waters Protection Officer). Recent amendments to the *Navigable Waters Protection Act* came into force June 7, 2009 and created classes of "minor works" and "minor waterways". The Town anticipates that it will be determined that the proposed works fall under the category of a "minor work"; therefore, submission of an application and approval under the *Navigable Waters Protection Act* is not required. The specific design and placement criteria for pipeline crossings outlined in section 7 of the Minor Works and Waters Ministerial Order *(Navigable Waters Protection Act)* will be followed.

1.5.2 Provincial Roles and Authorizations Required

As a municipal undertaking, the Town is subject to the requirements of the EAA as set out in part I, section 3. The Town is fulfilling the requirements of the EAA through the Municipal Class EA process, which applies to municipal water, wastewater and traffic projects [MEA, 2011].

The proposed undertaking has been completed as a Schedule B Municipal Class EA. A Schedule B Municipal Class EA requires the completion of Phase 1 and Phase 2 of the Municipal Class EA process, which are described in Table 1.5.2-1, below.

Table 1.5.2-1: Municipal Class EA Process - Phase 1 and Phase 2 Descriptions

Phase 1 – Problem or Opportunity	Identify the problem (deficiency) or opportunity.
Phase 2 – Alternative Solutions	Identify alternative solutions to the problem, by taking into consideration the existing environment, and identify the preferred solution by taking into account public and agency review and input. Determine the appropriate Schedule for the undertaking and document decisions in a Project File for Schedule B projects.

The Municipal Class EA process places emphasis on project assessment and public input rather than on agency review and approvals.

The Project will require:

- An Ontario Ministry of Environment Permit To Take Water (section 34 of the *Ontario Water Resources Act*);
- An Ontario Ministry of Environment Sewage Works Approval (section 53 of the *Ontario Water Resources Act*);
- An Environmental Compliance Approval.

Contact has been made with the MTO with regards to the Project. The MTO has advised that an Encroachment Permit issued from the Owen Sound Office will be required for construction of the watermain along Highway 89

(see Section 5.2.2). The MTO will be kept advised by the Town of its plans for the watermain along the MTO right of way.

Watershed based source protection plans required under the *Clean Water Act* are in preparation by conservation authorities. The Town has consulted with the GRCA and NVCA on the proposed Project and source protection consideration.

The well site is situated on privately owned land zoned as rural and is not located on prime agricultural land. The Project will adhere to the requirement of the Melancthon Township Official Plan and Zoning By-Laws.

1.5.3 Summary of Objectives, Standards and Guidelines

The following sections summarize the regional, provincial, and national objectives, standards, or guidelines used in the development of the Project and in the assessment of effects described in this report.

Table 1.5.3-1: Regional, Provincial and/or National Objectives, Standards, Guidelines, Legislation or Policies Used to Assist in Evaluation of any Predicted Environmental Effects

Environmental Consideration	Objective, Standard, Guideline or Policy
Air Quality	O.Reg. 419/05 Air Pollution - Local Air Quality - Standards, Point-of-Impingement (POI) Guidelines and Ambient Air Quality Criteria (AAQC) National Air Quality Objectives (NAAQOs) and Canada-Wide Standards for Air Quality
Water Quality	O.Reg. 459/00 - Drinking Water Protection Regulation (under the Ontario Water Resources Act) O.Reg. 169/03 - Ontario Drinking Water Quality Standards; Objectives and Guidelines (June 2003) Guidelines for Canadian Drinking Water Quality and Recreational Water Quality
Noise	Ontario Model Municipal Noise Control By-Law Noise Emission Standards

Other regional, provincial and/or national objectives, standards, guidelines, legislation or polices followed included:

- Melancthon Township Official Plan and Zoning By-Laws;
- Ontario Ministry of Labour Standards and Guidelines for Construction Safety;
- MOE Design Guidelines for Watermain Installation; and
- Ontario Ministry of Tourism, Culture and Sport - Standards and Guidelines for Consultant Archaeologists (Government of Ontario 2011; under the Ontario Heritage Act).

Additional authorizations that may be required prior to construction include:

- Permits from the GRCA and NVCA (conservation authorities) regarding watermain crossing two watercourses; may involve participation from the Department of Fisheries and Oceans;
- Ontario Ministry of Environment Permit To Take Water (section 34 of the Ontario Water Resources Act);
- Ontario Ministry of Environment Sewage Works Approval (section 53 of the Ontario Water Resources Act);
- MTO encroachment permit for construction of the watermain along Hwy 89; and
- Ministry of Natural Resources *Endangered Species Act Permit.*

1.6 Scope of the Project

The scope of the project refers to the components of the proposed undertaking that are considered as part of the Project for the purpose of the EA/EIS. This includes all works and activities required for the construction and operation of the well site, pumphouse and watermain (as described in Section 3).

Specifically, the scope of works and activities identified for the Town of Shelburne Long Term Well for Additional Water Supply (the Project) includes the following:

- Construction phase:
  - Stripping of topsoil at the well site and along the watermain route (if not installed by directional drilling);
  - Construction equipment delivery and laydown areas;
  - Installation of concrete foundation and construction of well house;
  - Construction of a back-up well;
  - Installation of fencing (as warranted);
  - Installation of pump system and components;
  - Excavation and backfilling for watermain installation;
  - Inspection and testing of project components;
  - Site restoration including topsoil cover and re-vegetation; and
  - Installation of a backup generator.
- Operation phase:
  - Routine operations and maintenance at the well site and along the watermain route.

1.7 Factors to be Considered

The CEAA requires that the following factors be considered in the EA pursuant of paragraphs 16(1)(a) to (d) and subsection 16(2):

- The environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- The significance of the effects referred to in the previous paragraph;
- Comments from the public that are received during the review;
- Comments from Aboriginal groups that are received during the review;
- Measures that are technically and economically feasible and that would accommodate adverse environmental effects with an impact on potential or Established Aboriginal Treaty rights;
- Measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- The purpose of the project;
- Alternative means of carrying out the project that are technically and economically feasible and the environmental effects of the alternative means;
- The need for, and the requirement of, any follow-up program in respect to the project;
- The capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future;

As well, three additional factors are required pursuant to paragraph 16(1)(e) of the CEAA (2010):

- The need for the project;
- Alternatives to the project; and
- Benefits to Canadians.

1.8 Scope of Factors Considered

This EA/EIS is designed to identify and predict the effects of the Project on all components of the environment, including biophysical and socio-economic components, the interactions among these components and on the relations of these components within the environment. As advised in the EIS guidelines, after considering all potential interactions between the components of the Project and the environment, the assessment should focus on those which are likely to be measureable. Project scoping establishes the boundaries of the EA and focuses the EA on relevant issues and concerns.

For the purposes of this EA/EIS, the environmental components are presented as follows :

- Physical Environment – represents groundwater and surface water quality and quantity, as well as soils and terrain;
- Biological Environment – represents terrestrial and aquatic biota and habitat;
- Atmospheric Environment – represents air quality, noise and vibrations; and
- Socio-Economic Environment – represents human health and safety of workers and the public, physical and cultural heritage resources, and Aboriginal land and resource use.

These environmental components represent all aspects of the environment that are potentially affected by the Project and provide the general framework for identifying and assessing those effects.

1.8.1 Valued Ecosystem Components (VECs)

The EA focuses on the components that have the greatest relevance in terms of value and sensitivity and which are likely to be affected by the Project. To achieve this focus, valued ecosystem components (VECs) are identified for the purposes of the EA/EIS. VECs are features of the physical, biological and socio-economic environment, which are considered important by the proponent, public, scientists and government involved in the assessment process.

The EA/EIS is designed to determine likely environmental effects of the Project on VECs through Project-environment interactions. Project-environment interactions relate to those Project works and activities that are likely to have a mechanism through which the environment, represented by VECs, may be affected. Based on the initial screening, identified Project-environment interactions are then further screened to determine whether they are likely to result in measurable changes to the environment. The Project works and activities represent the source of a change, the likely measurable change to the environment represents a pathway for change and the VECs represent the receptor.

The study team developed a preliminary list of VECs for the Project through a review of previous environmental investigations on the study area, review of similar water supply projects completed by the Town and other municipalities, any feedback received from the public, technical expert judgement and in consultation with the Agency during the development of the project description at the outset of the Federal EA process. The VECs were subsequently confirmed at the commencement of the EA/EIS during further consultation with the Agency.

The VECs identified for assessment by the EA/EIS are presented in Table 1.8.1-1. The VECs were determined and are focused to reflect the nature of the Project and its potential effects.

Table 1.8.1-1: Valued Ecosystem Components (VECs) Identified for Assessment of the Project

VEC	Rationale for Selection of VEC
Physical Environment	
Groundwater quantity and quality	■ Human health ■ Socio-economic importance

VEC	Rationale for Selection of VEC
Surface water quantity and quality	■ Human health ■ Ecological health ■ Recreation ■ Traditional and current Aboriginal use
Terrain and soils	■ Ecological health ■ Socio-economic importance ■ Traditional and current Aboriginal use
Biological Environment	
Fish, fish habitat and aquatic ecosystems	■ Native species ■ Ecological health ■ Socio-economic importance ■ Recreation ■ Traditional and current Aboriginal use
Vegetation	■ Native species ■ Ecological health ■ Conservation status of protected species
Wildlife and wildlife habitat	■ Native species ■ Ecological health ■ Conservation status of protected species
Atmospheric Environment	
Noise and/or vibration levels	■ Human health ■ Ecological health
Air quality	■ Human health ■ Ecological health
Socio-Economic Environment	
Human health	■ Human health

VEC	Rationale for Selection of VEC
Aboriginal land use and resource use	■ Traditional and current Aboriginal use
Physical and cultural heritage (archaeological)	■ Cultural and heritage significance ■ Traditional and current Aboriginal use

1.9 Spatial Boundaries

Spatial boundaries for the EA/EIS are defined as the geographical extent within which environmental effects are assessed. These assessment boundaries establish the study area used for the EA/EIS. In general, the study area encompasses the environment that can reasonably be expected to be affected by the Project, or which may be relevant to the assessment of cumulative effects. By defining spatial boundaries, a frame of reference for identifying and assessing the potential environmental effects of the Project are established.

Spatial boundaries for the EA/EIS are defined by taking into account (where applicable) the spatial extent of potential environmental effects on VECs, traditional and local knowledge, current and proposed land use by Aboriginal groups, ecological, technical and social and cultural considerations. These boundaries also indicate the range of appropriate scales at which particular baseline descriptions and the assessment of environmental effects are presented.

1.9.1 Study Areas

In general, the study area for the Project encompasses any area that is directly or indirectly affected by the components of the Project, which include the proposed well site and the watermain.

Table 1.9.1-1: Study Areas for VECs

VEC	Study Area Definition
Physical Environment	
Groundwater quantity and quality	The groundwater quantity and quality study area encompasses an area up to 1.5 km from the Project site.
Surface water quantity and quality	Waterbodies affected by the project are assessed up to 1.5 km from the Project site. As the well site is near the surface water divide of the Grand River and Nottawasaga Valley watersheds, the regional study for surface water quantity and quality takes into consideration the possible influence of the well within parts of both watersheds. The well head protection areas (WHPA) for the existing SWSS currently extend into the Grand River watershed.

VEC	Study Area Definition
Terrain and soils	The terrain and soils study area encompasses the Project site, including the well site and right-of-ways affected by the watermain route.
Biological Environment	
Fish and fish habitat, aquatic ecosystems	The fish and fish habitat and aquatic ecosystems study area encompasses an area up to 1.5 km from the well site and within the right of way for the watermain route.
Vegetation	The vegetation study area encompasses an area up to 1.5 km around the well site and the right-of-way for the watermain route.
Wildlife and wildlife habitat	The wildlife and wildlife habitat study area encompasses an area up to 1.5 km around the well site and the right-of-way for the watermain route.
Atmospheric Environment	
Noise and/or vibration levels	The noise and/or vibration levels study area encompasses an area up to 1.5 km from the Project site.
Air quality	The air quality study area encompasses an area up to 1.5 km from the Project site.
Socio-Economic Environment	
Human health	The human health study area include the Town of Shelburne approximately 4 km from the well site.
Aboriginal land use and resource use	The study area for Aboriginal land use and resource use covers the area evaluated for alternative wells sites.
Physical and cultural heritage (archaeological)	The study area for physical and cultural heritage covers the area evaluated for alternative wells sites.

1.10 Temporal Boundaries

The temporal boundaries for the assessment define the time periods for which likely environmental effects of the Project are considered. The Project consists of two phases:

- Construction phase (2013 to 2014) – Following the successful completion of necessary approvals, it is assumed that the site preparation and construction works and activities will be carried out in 2013 and/or 2014; and

- Operation Phase (beyond 2014) – It is anticipated that the new production well will operate from 2014 and beyond, according to the needs of the Town.

The baseline conditions of the existing environment are generally considered to be those existing prior to 2012/2013. Where appropriate, relevant historical data have been used to supplement current data.

2.0 ENVIRONMENTAL ASSESSMENT OBJECTIVES, GENERAL APPROACH AND STUDY METHODS

2.1 Objectives and General Approach

The objectives of the EA/EIS are defined as follows:

- Identify the need and purpose for the Project;
- Identify and evaluate the alternatives to the Project and the alternative means of carrying out the Project;
- Provide a summary of public consultation and Aboriginal engagement, and liaison with government agencies, undertaken for the Project;
- Characterize the existing environment of the Project area, including the physical, biological and socio-economic environments.
- Evaluate potential environmental effects that could result from the construction and operation activities, including potential malfunctions and accidents;
- Evaluate the effects of the environment on the Project
- Evaluate the cumulative effects to the environment from other past, current or future projects and activities;
- Recommend mitigation measures for the Project;
- Recommend follow-up monitoring to confirm accuracy of EA predictions and the need if any to implement further mitigation measures;
- Evaluate the capacity of natural resources to be significantly affected by the Project; and
- Discuss the benefits to Canadians.

2.2 Assessment Methods

2.2.1 Identify and Evaluate Alternatives Solutions

The problem/opportunity could potentially be resolved or taken advantage of using a number of alternatives to the Project and alternatives means of carrying out the Project. As part of the EA process, alternative solutions are initially evaluated to arrive at a preferred alternative.

The method used by the Town to evaluate alternative solutions was to conduct a screening assessment to identify the preferred alternative to the Project and the preferred alternative means of carrying out the Project. This method consists of the following steps:

- Identify a range of alternatives, which are reasonable, to meet the need for the Project;
- Prepare a brief description of each alternative and predict what would like occur if the alternative was implemented;

- Conduct screening analysis to determine if the alternatives are feasible, reasonable and practicable and to identify a preferred alternative(s).

2.2.2 Characterize the Existing Environment

In this step of the assessment, the existing environment (baseline conditions) is described. The baseline description of the environment focuses on VECs selected for the assessment of the Project, which is presented at the relevant spatial and temporal scales.

The EA/EIS provides a baseline description of the environment in sufficient detail to permit the identification, assessment and determination of significance of potentially adverse environmental effects that could be caused by the Project. The description of the existing environment is also required to adequately identify and characterize cumulative effects and benefits of the Project as well as the effects of the environment on the Project.

The description of the baseline environment is primarily based on background information gathered from previous hydrogeologic and other environmental and planning studies related to the Town's SWSS. In addition, a variety of analysis techniques are incorporated into the identification of baseline conditions and evaluation of potential effects, including spatial analysis, field reconnaissance, field investigations, consultation with government agency staff, as well as review of background material, which are described in Section 6.

2.2.3 Conduct Assessment of Potential Effects

An initial screening of Project-environment interactions is carried out to determine the Project construction and operation works and activities that have the potential to interact with each VEC. The determination of whether or not there is a Project-environment interaction is made by technical specialists in conjunction with input received from CEAA on potential interactions at the outset of the EA process. Section 7 presents the assessment of potential effects.

In predicting and assessing the Project's effects, the elements and functions of the environment that could be affected are described, specifying the location, extent and duration for these effects and their overall impact. The operation phase is assessed at the maximum pumping rate that could be implemented.

2.2.3.1 Indicators for Potential Effects on VECs

Table 2.2.3.1-1 presents the indicators of potential environmental effects identified for each VEC for the purposes of the EA/EIS. Indicators were selected based on expert judgement, previous EAs conducted for similar projects and requirements for the assessment provided by the EIS guidelines.

Table 2.2.3.1-1: Environmental Effect Indicators for VECs

VEC	Indicator(s)
Physical Environment	
Groundwater quantity and quality	■ Predicted effects to groundwater quality at the site ■ Predicted groundwater quantity and flows ■ Availability to local users ■ Changes in discharge to streams ■ Wetland water level flows
Surface water quantity and quality	■ Predicted effects to surface water quality ■ Predicted surface water and groundwater interactions ■ Potential erosion from construction site
Terrain and soils	■ Potential changes to soil quality ■ Predicted erosion and stability of soil
Biological Environment	
Fish and fish habitat, aquatic ecosystems	■ Predicted changes in water quality and quantity ■ Predicted habitat loss or alteration ■ Predicted impact to aquatic biota
Vegetation	■ Predicted changes to vegetation extent and composition (including those important to Aboriginal peoples or groups.
Wildlife and wildlife habitat	■ Predicted change to wildlife habitat (including wetland features and functions) ■ Predicted disturbance to wildlife (including noise and air quality)
Atmospheric Environment	
Noise and/or vibration levels	■ Predicted noise and vibration levels ■ Proximity of off-site receptors
Air quality	■ Predicted air emissions ■ Off-site receptors

VEC	Indicator(s)
Socio-Economic Environment	
Human health	■ Drinking water quality ■ Air quality ■ Duration of noise
Aboriginal land use and resource use	■ Potential social and/or economic effects to Aboriginal groups, including hunting, fishing, trapping, cultural and other traditions ■ Potential effects on archeological resources ■ Potential vegetation removal used by Aboriginal groups
Physical and cultural heritage (archaeological)	■ Potential effects on-site or off-site

2.2.4 Identify Mitigation Measures and Determine Residual Effects

Where a likely adverse effect on the environment is identified, possible means to mitigate (i.e., eliminate, reduce or control) the likely adverse effect are identified and considered. Mitigation measures are considered for all likely adverse effects of the Project. As part of the Project, measures will be implemented as best management practices to avoid or reduce the effects of the Project.

Following the implementation of feasible mitigation measures for the Project, each likely adverse effect is re-considered to identify whether a residual adverse effect is likely. Residual effects are effects that remain after the implementation of the identified mitigation measures. If residual adverse effects on the VECs are identified, then they are subject to further assessment including formal consideration of their significance.

2.2.5 Determine Significance of Residual Effects

An evaluation of the significance of residual adverse effects as resulting from the Project is provided for each of the environmental components. Only those effects identified as being 'residual adverse effects' are considered for their significance in Section 7. All other effects are judged not to be significant based on the mitigation measures applied to reduce, minimize or eliminate the potential adverse effect. Malfunctions and accidents identified as having the potential to occur are considered in Section 8. Any residual adverse effects identified as a result of the environment on the Project are described in Section 9. The Project's effects on the capacity of renewable resources, and from the assessment of cumulative effects are also assessed for significance in Sections 10 and 13.

The significance of each residual adverse effect is established within a framework of criteria and effect levels. To ensure consistent and reproducible evaluation, common criteria are used for each residual adverse effect on each VEC. The criteria include the following:

- Magnitude – the size or degree of the effect compared to the baseline conditions;
- Geographic extent – the area over, or throughout which, the effect will occur;
- Timing, duration and frequency – the time period for which the effect will last and the rate of reoccurrence of the effect;
- Degree of irreversibility – the degree to which the effect can be or will be reversed (typically measured by the time it will take to restore the environmental feature);
- Ecological and social context – how common and/or abundant a VEC is within the study area; and
- Existence of environmental standards, guidelines or objectives – applicability of existing regulatory documents, environmental standards, guidelines or objectives for assessing the effect.

Each residual adverse effect identified is evaluated using applicable assessment criteria and assigned a significance level (low, moderate or high) that reflects the degree of effect that could reasonably be expected. The criteria used for judging and describing significance are shown in Table 2.2.5-1 below.

Table 2.2.5-1: Effects Criteria and Significance Levels

Effects Criteria	Effects Level Definition		
	Low	**Moderate**	**High**
Magnitude	Effects may be measureable, but are not likely to exceed applicable reference criterion or guideline value.	Effects are likely to be measureable, representing a small change relative to existing conditions. Adverse effects may exceed a reference criterion or guideline value on occasion and/or only at a specific location.	Effects are likely to be measureable, representing changes relative to existing conditions. Adverse effects would likely result in a reference criterion being exceeded on an ongoing basis.
Geographic extent	Effect is limited to the Project site.	Effect extends up to 1.5 km from the Project site.	Effect extends into the regional area, beyond 1.5 km.
Timing, duration and frequency	Effect is evident only during the construction phase and is very infrequent in occurrence (several times per year).	Effect is evident only during the construction and operations phases and is infrequent in occurrence (several times per month).	Effect extends beyond the operations phase and occurs in frequent intervals (daily).
Degree of irreversibility	Effect is readily reversible during the construction phase.	Effect is reversible within the operations phase.	Effect is not reversible and remains beyond the life of the Project.
Ecological and social context	The VEC(s) being affected is common and abundant.	The VEC(s) being affected is less common and of limited abundance within the study area.	The VEC(s) being affected is recognized as being a threatened or rare or endangered species.
Existence of	Limited environmental	Some aspects covered by	Extensive coverage by

Effects Criteria	Effects Level Definition		
	Low	Moderate	High
environmental standards, guidelines or objectives	standards, guidelines or objectives	environmental standards, guidelines or objectives	environmental standards, guidelines or objectives

2.2.6 Malfunctions and Accidents

The probability of possible malfunctions and accidents associated with the Project during construction and operations and the potential adverse environmental effects of these events are identified and described. These potential effects are assessed using the methods presented above. The description includes accidental spills and contingency plans and measures for responding to emergencies.

2.2.7 Effects of the Environment on the Project

The EA/EIS considers how the environment could adversely affect the Project. The environmental conditions that are considered include seismic activity, climate change and the effect of winter weather on the Project. For each environmental condition that could potentially affect the Project, the mitigation measures incorporated into the Project design are identified and evaluated for effectiveness. Their likely effectiveness is evaluated based on past experience on similar projects. Residual adverse effects, if identified, are evaluated for significance using the method described above. This evaluation is based on the available data and the experience and judgement of the Project team.

2.2.8 Cumulative Effects

The effects of the proposed Project are considered with the effects of other projects or activities that have been, or will be carried out, and for which the effects are expected to overlap with those of the Project (i.e., overlap in time and geographic area). The effects of the Project may overlap with other projects' effects, even though the activities causing them do not. Projects with additive effects are also considered in the cumulative effects assessment (e.g., vegetation removal). These effects are referred to as cumulative effects.

2.2.9 Capacity of Renewable Resources

Effects of the Project on the capacity of renewable resources are assessed to determine if the resources are still able to meet the needs of the present and those of the future. One goal of the assessment is to determine whether renewable resources would be affected by the Project to the point where they are not sustainable (including the sustainability of the groundwater system). Potential Project-environment interactions identified in the effects assessment are reviewed to determine the likelihood of interactions between the Project and resource sustainability.

3.0 PROJECT DESCRIPTION

The following section describes the 'need for' and 'purpose of' the Project , as well as the Project setting and the description of project works and activities.

3.1 Need and Purpose of the Project

The terms 'need for' and 'purpose' of the Project are described below:

> *"The 'need for' the Project is defined as the problem or opportunity that the proposed Project is intending to solve or satisfy. That is, 'need for' established the fundamental justification or rationale for the Project. The 'purpose of' the Project is defined as what is to be achieved by carrying out the Project. The 'need for' and 'purpose of' the Project should be established from the perspective of the Project proponent and provide the context for the consideration of alternatives."* [CEAA, 2007]

The Town is located in the County of Dufferin, Ontario, approximately 25 km northwest of Orangeville and 70 km northwest of Toronto (Figure 1-1). The Town is located within the designated Greater Golden Horseshoe Growth Plan (GGHGP) area under the *Places to Grow Act* [Ministry of Public Infrastructure Renewal, 2006]. The Greater Golden Horseshoe is one of the fastest growing areas in Canada and the GGHGP was developed to guide decisions on transportation, infrastructure planning, land use planning, urban form, housing, natural heritage and resource planning.

The GGHGP considers policies specifically focusing on water supply. In order to address deficits in infrastructure for water supply, which prevents the opportunity for future growth, the GGHGP recommends directing policies to sustainable water use and improving infrastructure that allows future growth. In addition, the GGHGP focuses on directing major growth to settlement areas that offer municipal water, such as the Town, and away from settlement areas that are serviced privately. The Town of Shelburne Official Plan (2006) predicts an average population growth rate of 2.2% per year through 2024. As a result of this rapid growth in population, expanding water supply from municipal water services is necessary to accommodate future growth for the Town, as indicated its Official Plan.

The GGHGP builds upon the Provincial Policy Statement (2005), which was issued under the *Planning Act*. The Provincial Policy Statement (PPS) was developed to provide direction on Provincial interests on land use planning and development, while considering public health and safety, and the natural environment. The Town has made an effort to be consistent with the policies of the PPS, including those related to water supply and water infrastructure projects. The Town's Official Plan maintains water-related policies with the objectives to:

- Ensure that land use planning within the Town contributes to the protection, maintenance and enhancement of water and water-related resources and aquatic ecosystems, on an integrated watershed management basis;
- Ensure that growth and development within the Town occurs in a manner that will minimize public health and safety issues, including the protection of human life and property from water related hazards, such as flooding and erosion; and

- Ensure that all land use decisions promote water conservation and support the efficient use of water resources on a watershed basis.

As mentioned above, the Town's Official Plan with consideration of the PPS focuses on public health and safety to prevent water related hazards. This also includes ensuring adequate water quality for supplying the Town's drinking water.

The SWSS currently services approximately 2,120 customer accounts (approximately 5,846 people in the communities), the majority of which has been unmetered usage [Watson, 2010]. The SWSS is owned by the Town and is operated by the Ontario Clean Water Agency (OCWA). The current SWSS consists of four groundwater supply wells (PW1, PW3, PW5 and PW6), three pumphouses, an elevated storage reservoir ("water tower"), and a distribution system [Town of Shelburne, 2009]. Well PW2 was recently abandoned due to declining performance.

Regular monitoring of water quality of the Town's water supply has indicated elevated concentrations of naturally-occurring arsenic in the raw water from the existing production wells ranging up to 14 and 22 micrograms per litre (µg/L). Although the Town is currently in compliance with the ODWQS of 25 µg/L for arsenic under Ontario Regulation (O. Reg.) 169/03, the MOE has indicated that the ODWQS for arsenic will be reduced from 25 to 10 µg/L. If the ODWQS for arsenic is lowered to 10 µg/L, the Town would be out of compliance in some of their wells. Accordingly, the Town needs to find an alternative water supply source that could provide reduced levels of arsenic and lower the overall arsenic concentration in the Town's drinking water to meet anticipated future standards.

It is estimated that by 2032, the Town's water supply requirements of 5,983 m^3/d (J. Graham, P.Eng. Genivar-Town Engineer, personal communication, September 2012) will exceed the current capacity of 4,916 m^3/d, resulting in a shortfall of 1,067 m^3/d.

3.1.1 Problem/Opportunity Statement

In order to accommodate future growth in the Town of Shelburne, a new water supply source must be identified in or adjacent to the Town. This source of water must result in a safe, secure, and sustainable water supply system for the Town that meets Ontario Drinking Water Quality Standards, including anticipated new Provincial arsenic standards. An increase of 1,067 m^3/d is required to supply the projected increase in the Town's population by 2032 (J. Graham, P.Eng. Genivar-Town Engineer, personal communication, September 2012).

3.2 Project Setting

The ground surface elevation around the Town is approximately 500 metres above sea level, with elevated areas representing the regional watershed divide between the Grand River and Nottawasaga River. The overburden thickness in the vicinity of the Town of Shelburne varies from less than 10 m in the areas west and northeast to over 30 m beneath the central portion of Shelburne. The overburden in the Town consists of glacial formations from glacio-lacustrine (lakes) sediments, fluvial (river) and glaciofluvial deposits and ice-deposited drift. The Town's underlying bedrock deposits consist of Silurian dolostones of the Paleozoic Era [Guelph, Eramosa, Goat Island and Gasport Formations). The Guelph and Gasport Formations represent regionally

extensive aquifers that typically yields sufficient quantities of water for domestic use and in some cases, such as in the Cities of Guelph and Cambridge, can support large municipal water takings. These Siluruan dolostones are underlain by a low permeability shale deposit known as the Cabot Head Formation The Cabot Head Formation is generally recognized as the base of the active groundwater flow system locally.

The proposed well location is located on a privately-owned property that is zoned as rural.

The installation of the watermain in existing right-of-ways of local and provincial roads would require two watercourse crossings. However, the watermain crossings would follow an existing right-of-way, which already crosses these two watercourses. There is the potential for riparian vegetation removal during construction activities to access the area for installation of the watermain.

3.3 Project Works and Activities

The proposed works will include the development of a new production well and a backup well, with a permitted capacity of 1,635 m^3/d. The raw water pumped from the well will be conveyed to the existing water supply system. The extension of the water supply system to the well site requires that a new 12-inch diameter watermain be installed for a distance of approximately 4 km along right-of-ways. The new watermain would terminate at existing wells 5/6.

3.3.1 Construction Phase

The construction phase of the Project will be completed as follows:

- Stripping of topsoil at the well site and along the watermain route – Minimal stripping of top soil will occur at the pumphouse location and equipment laydown and parking area. The total area of the well site will likely be approximately 2,500 m^2. Limited clearance of about 1,000 m^2 at the test well site has already taken place; therefore, an additional 1,500 m^2 may be required for equipment laydown, materials storage and parking. Disturbance of land along the watermain route will also occur during the construction phase. The disturbed area will be approximately 1 m wide along the 4 km watermain route (4,000 m^2 of total disturbed area).
- Construction equipment delivery and laydown areas – Equipment required for construction of the pumphouse and installation of production well equipment will be delivered and stored as needed at the well site until construction and commissioning activities are complete.
- Installation of concrete foundation and construction of pumphouse – There will be one enclosed single-storey pumphouse building located at the well site. The building will occupy approximately 100 m^2 (10 m x 10 m) and will have an attractive architecture. Minor excavation will be required to install the concrete foundation and footings as necessary.
- Development of a new production well – This includes minor modifications to the existing test well such that it will be suitable for production.
- Construction of a back-up well – The backup well will be drilled at the well site within the defined well site area, adjacent to the existing well. Associated pumping and connection equipment will be installed on-site.

- Installation of fencing – A fence will be installed around the well site perimeter to secure the pumphouse and protect public health and safety.
- Installation of pump system and components – Installation of all mechanical, electrical and other components of the pumphouse will be completed as part of the construction phase sequence. Limited trenching may be required for pumphouse services. Construction activities will occur between the hours of 7:00 a.m. and 7:00 p.m. The pumphouse will have a standby diesel generator room where the standby generator will be located. The construction contractor will be required to adhere to spills mitigation plans and best management practices to ensure the construction phase of the Project does not accidentally result in a spill of construction related fluid such as lubricant, oils or fuel to the environment.
- Excavation and backfilling for watermain installation – The watermain will be placed at least 1.8 m below ground surface, at a depth that ensures that freezing does not occur. The watermain will be required to cross streams to connect with the existing SWSS. The watermain will be place along existing road allowance right-of-ways to reduce likelihood of disturbance to terrestrial and aquatic habitat. The watermain route will cross roads and will avoid interfering with existing utilities in place along the road allowances. The watermains will be constructed of PVC or polyethylene at a diameter suitable for potential future pumping rate requirements.
- It is anticipated that the treatment (chlorination) of the raw water from the new well site will be undertaken at the existing treatment facilities at well 5/6. Therefore, upgrading of the chlorination facilities at well 5/6 will need to be upgraded. Also, at wells 5/6, it is anticipated that a new water storage facility will be constructed to blend the water from the new well with the treated water from wells 5/6.
- As part of the construction project, a new high lift pumping facility and new backup generator will be required at the wells 5/6 site.
- Inspection and testing of project components – Inspection will take place as needed throughout the construction phase. Pre-construction locates along the watermain route will be completed to confirm no interference of existing utilities along the planned route. The pumphouse structure will be inspected following completion of construction. All pressure testing, flushing and chlorination procedures will be followed during commissioning of the well, and required water quality testing will be completed, including bacteriological tests.
- Site restoration – Following completion of construction activities, disturbed areas will be restored to a vegetated state with top soil covering, and seeding and planting as needed. The watermain route will be re-vegetated with native grass seed and mulch covering.

3.3.2 Operations Phase

The operations phase of the Project will be carried out as follows:

- Operation and maintenance – The well site will be operated in accordance with MOE requirements as part of the SWSS requirements, including reporting requirements. Water treatment for drinking water will occur at the existing treatment facility at Well 5/6. The watermain will be operated based on MOE regulatory

requirements. Water in the distribution system will be sampled and tested as required under O. Reg. 170/03 for Drinking Water Systems under the *Safe Drinking Water Act*.

- Production – The production well will have a permitted capacity of 1,635 m^3/d and will be operable up to 365 days per year. In total, the production well may take up to 447,910 m^3 per year. The PTTW will be issued over five year periods. The decommissioning of the well is not expected for 50 to 100 years.

3.3.3 Potential Waste Generated by the Project

Potential waste materials will only be generated during construction activities. There will be minor quantities of constructed-related waste produced when the pumphouse and watermain are constructed. Waste will not be hazardous. All debris and other material that is unsuitable for reuse will be disposed of at an approved facility. Best Management Practices (BMPs) will be implemented to reduce the risk of a spill of oils, lubricants or chemicals used during the construction activities.

3.4 Future Phases of the Project

Groundwater pumping tests at the well location have suggested that proposed well could be successfully pumped at higher rate than the 1,635 m^3/d that is assessed in this EA/EIS. As the Town may want to investigate the feasibility of pumping at a higher rate at a later date, the Town is choosing to oversize the watermain. Should the Town choose to pursue a higher pumping rate at this location, this would be assessed through a separate EA process.

4.0 PROJECT ALTERNATIVES

Several options were evaluated to determine the best means of addressing the water supply and water quality needs of the Town of Shelburne. These a described in the following sections as "Alternatives to the Problem", referring to the Problem Statement defined in Section 3.1.1. Once the preferred project is determined through this evaluation, "Alternative Means" of carrying out the project are then evaluated to come up with a "Preferred Project".

4.1 Alternatives Solutions to the Problem

Five alternatives were evaluated to determine the best means of addressing the water supply and water quality needs of the Town of Shelburne, as describe in the Problem/Opportunity Statement. The alternative are described in more detail in the following sections. The consideration of these project alternatives will result in the selection of a preferred Alternative Solution to the Problem/Opportunity Statement.

4.1.1 Do Nothing

This alternative would involve no improvements, changes or additions to the existing SWSS. The result of this alternative is that only the four current wells would continue to service the Town. The "Do Nothing" alternative would leave the Town with a limited water supply to sustain existing development and projected growth of the Town by 2032. In addition, naturally occurring arsenic concentrations in the Town's water supply could potentially be elevated above the future ODWQS for arsenic of 10 µg/L. The "Do Nothing" alternative would have no effects on the surrounding natural environment since no new construction activities would occur; however, this alternative would not meet the problem/opportunity of improving drinking water quality in the municipal water supply.

4.1.2 Implement Water Conservation

O. Reg. 387/04 Water Taking and Transfer (as amended in O. Reg. 451/07 Water Transfer), which came into effect on January 1, 2005, expands from O. Reg. 285/99. In section 4 of O. Reg. 387/04, the MOE Director of Environmental Assessment and Approvals Branch (EAAB) must consider when approving a new PTTW whether water conservation has been considered or will be implemented according to best management practices in the corresponding industry or sector. As a result, future water projects in Shelburne requiring a new or modification to an existing PTTW may also require a corresponding water conservation strategy.

Before the spring of 2011, the population of Shelburne was paying a flat rate for water use. "Low water users" were paying the same flat rate that "water wasters" were paying meaning that people who were conserving water were subsidizing water use by "water wasters". In 2010, as part of water conservation initiatives, the Town Council made it mandatory that every home and business be equipped with a water meter. Installation of the water meters began in April 2010 on an area by area basis and installation was completed in fall 2010. Approximately 2,200 new water meters were installed and 800 existing water metres were replaced. A six month testing period took place and billing based on the meter commenced in spring 2011.

The Sensus SR-ECR water meter was chosen for the water meter program because of its reliability, accuracy, ease of installation and the meter specifications met the American Water Works Association (AWWA) standards. In addition, a meter reader is not required since the meter is wired to a radio transmitter box. The Town is able to collect readings from the meters using a remote receiver. Therefore, there is no need to enter a resident's property unless maintenance is required. The cost of installation and maintenance is covered by the Town.

According to the Canada Mortgage and Housing Corporation (CMHC), metered households in Canada use 39% less water than non-metered households [CMHC, 2005]. This is because a flat rate for water consumption has no financial incentive for consumers to fix leaks, install water efficient appliances or practice general water conservation methods. In addition to the water meter program the Town initiated, the brochures detailing the water meter program included water conservation tips for outdoor water use such as landscaping, as well as indoor water conservation tips such as using front load washers and installing low flow toilets and showerheads.

Strategies and programs including those listed above may be implemented to reduce water demand in Shelburne. In addition, Ontario Regulations may require that a water conservation program is initiated.

This alternative alone does not address the problem of the need to increase water supply to meet projected growth. In addition, water conservation would not meet the problem/opportunity of improving drinking water quality in the municipal water supply. Water conservation would have a net positive effect on the natural environment since less water would be extracted from groundwater resources and discharged to the sanitary sewer system.

4.1.3 Limit Community Growth

Limiting community growth in Shelburne would involve fixing the current town boundary and preventing any new development in the Town. Limiting community growth would have a net positive effect on the natural environment since natural areas would not have to be cleared for development and the current water system would be suitable to meet the current needs of the Town. However, this alternative would not meet the problem/opportunity of improving drinking water quality in the municipal water supply. In addition, it does not meet the Town's objective for economic growth and the objectives of the Greater Golden Horseshoe Places to Grow initiative. Therefore, there may be significant adverse effects on the socio-economic environment.

4.1.4 Develop New Well

This alternative requires installation of a new well and watermain. Developing a new well is the only alternative that will resolve the water supply problem in both the short and long-term, and also satisfy the future ODWQS for arsenic. This alternative has the potential to have the most effects on the environment of the local area. However, the severity of the environmental effects is dependent on the selected location of the new well and watermain. Three alternative well locations have been assessed in Section 4.2.

4.1.5 Arsenic Treatment of Existing Water Sources

Regular monitoring of water quality of the Town's water supply has indicated elevated concentrations of naturally-occurring arsenic in the raw water from the operating wells ranging up to as much as 14 to 22 µg/L.

This currently meets the ODWQS for arsenic of 25 µg/L. However, the MOE may reduce the ODWQS for arsenic to 10 µg/L, making these municipal wells non-compliant. As a result, the Town has considered a number of arsenic treatment technologies, including:

- Coagulation/Filtration;
- Lime softening;
- Activated alumina;
- Ion exchange;
- Reverse osmosis;
- Electrodialysis reversal; and
- Nanofiltration.

These arsenic removal technologies are useful for large scale water supply plants. However, the cost of implementing one of these arsenic removal technologies for the Town is approximately $6 million and not feasible for the Town. The high cost of implementing arsenic treatment technology is the reason the Town is considering an additional well location, which would also alleviate the pressure of future growth in the Town.

The treatment of existing water supply sources would not address the need for additional supply.

4.1.6 Preferred Alternative Solution To The Project

The preferred "Alternative To" was a combination of continuing with the current water conservation program and securing a new well supply. This combination addressed long-term water supply requirements, as well as addressed the need to meet the potential change in the ODWQS for arsenic. The construction of the new well would provide immediate and long-term relief to the potential future water supply problem in the Town and the continued implementation of a water conservation program would contribute to the sustainable use of the resource.

4.2 Alternative Means of Carrying Out the Project

Four alternatives were considered for the construction of a municipal well and associated watermain, which would connect into the pumphouse 5/6 located north of the corner of Highway 89 and 4th Line on the west side of Shelburne. In order to determine the potential target test well locations, the following criteria were considered:

- The test well is within a 5 km radius of the Town due to the feasibility of installing the watermain to the Town;
- The location of the potential target well to have a potential yield that meets or exceeds a flow rate of 1,067m^3/d;
- Location to be in an area that avoids overlap with municipal well capture areas;

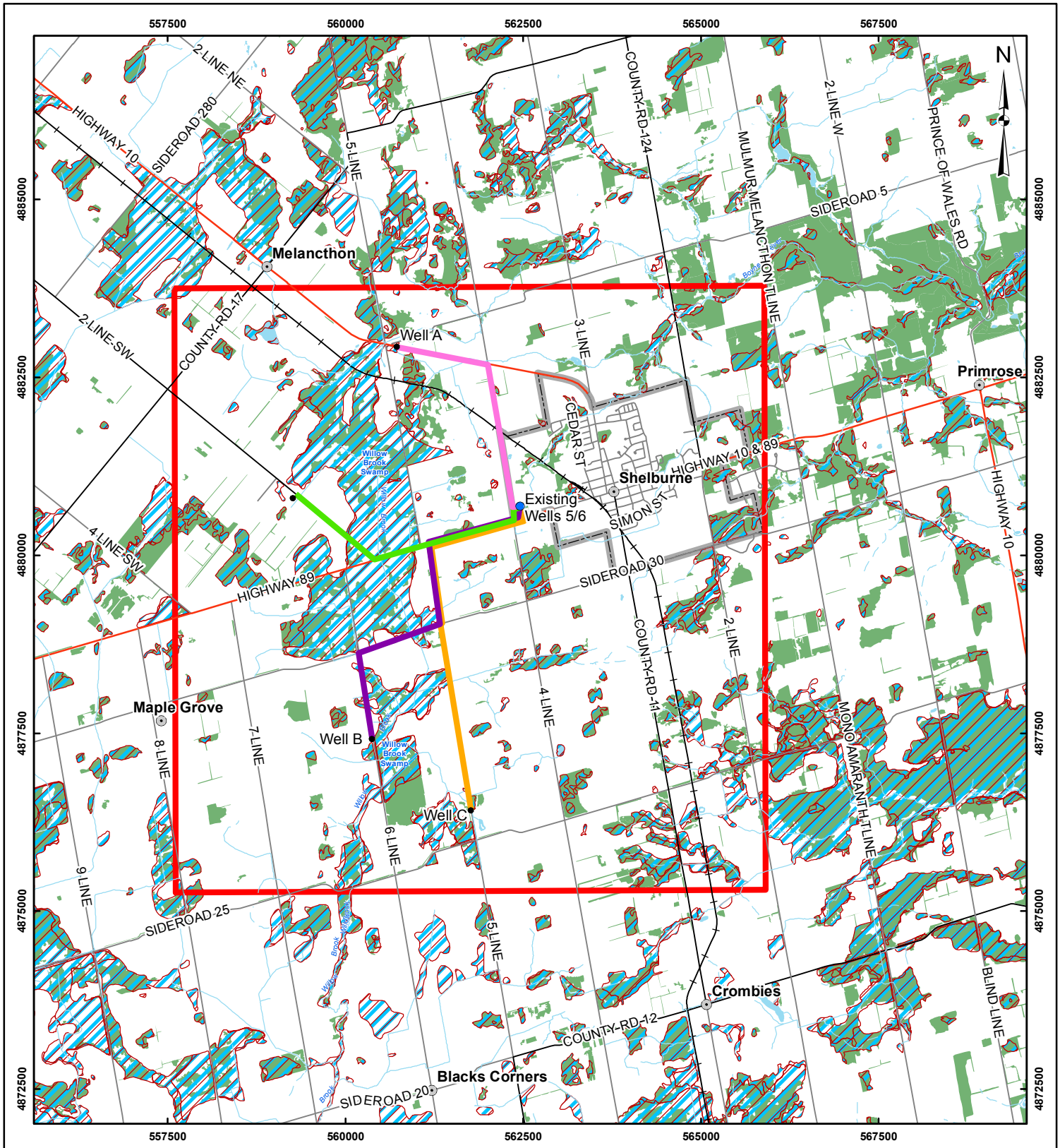
- Potential test well location to minimize interference with existing wells;
- Provides potable water, preferably with negligible arsenic concentrations; and
- Do not have a negative impact on ecological and surface water features.

Applying the above criteria resulted in identifying five potential test well areas. Initially three potential test well areas were chosen based on the above criteria, in consideration of the Groundwater Management and Protection Study Report [Burnside, 2002], and based on the experience of Gerrits Drilling & Engineering. These three areas were presented to the Town on November 23, 2009 as possible targets for test wells. In each of these areas, it was expected that a suitable municipal water supply source could be developed from the shallow bedrock aquifer.

On December 7, 2009, the Project Steering Committee and the Project Team met with staff from the OGS to discuss the project. During this meeting, the OGS staff presented an overview of their research conducted to-date along the Niagara escarpment and that based on this work, it was possible that a well completed in a deeper bedrock formation may meet the needs of the Town. The OGS also explained that the arsenic levels in existing shallow bedrock wells may be a result of the microbial degradation of pyrite under aerobic conditions. The presence of pyrite in some areas, while not present in others would account for some of the variability in arsenic levels [Town of Shelburne, 2010].

Early in 2010, the OGS agreed to drill two deep test wells (OGS Test Well 10A and 10B), and prospective production wells adjacent to these test wells were considered as two new alternative solutions for the Project. The two well locations were selected based on the criteria listed above and on the availability of test drilling sites within the target areas. The test drilling locations were approved by the Town for investigation on February 22, 2010. Following geophysical logging of OGS Test Well 10B, results indicated a small number of fractures in the bedrock over the depth of this borehole. This observation indicates very few water bearing zones within the profile. Subsequent testing of the borehole with a small pump indicated a very low yield. Therefore, OGS Test Well 10B did not warrant further assessment. The four remaining alternative well locations and associated watermains are described and assessed in the following sections.

Alternative well sites and watermain routes are presented on Figure 4.2-1.



LEGEND

- City / Town
- Railways
- Highway
- Major Road
- Local Road
- Watercourse, Permanent
- Watercourse, Intermittent
- Waterbody
- LIO Wetland
- Alternative Watermain A
- Alternative Watermain B
- Alternative Watermain C
- Alternative Watermain D
- Town Boundary
- Wooded Areas
- Study Area

1,000 500 0 1,000 2,000 3,000

SCALE 1:75,000 METRES

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT
FOR ADDITIONAL WATER SUPPLY

TITLE
ALTERNATIVE WELL LOCATIONS AND WATERMAIN ROUTES

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	RPM	17 Feb. 2011		
GIS	BC	9 Jul. 2012		
CHECK	MK	9 Jul. 2012		
REVIEW	MK	9 Jul. 2012		

FIGURE: 4.2-1

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\Draft\EISReport\AlternativeWellLocations.mxd

4.2.1 Alternative A

Alternative Well Location A is located at the intersection of Highway 10, 5th Line and Side Road 5 (Figure 4.2-1), approximately 1.8 km northwest of the Town of Shelburne. The hydrogeology of this area was interpreted to have the potential for development of a well that could yield greater than 1,067m^3/d from the shallow bedrock aquifer. It was also interpreted that the area has an overburden depth of 11 to 17 metres below ground surface (mbgs), which is suitable for groundwater protection.

As shown on Figure 4.2-1, the watermain would start at the Highway 10 and 5th Line intersection. The watermain would likely travel southeast along Highway 10 toward 4th Line. At Highway 10 and 4th Line intersection, the watermain would travel south along 4th Line and connect at the well house of municipal wells 5/6 (see Figure 4.2-1). The watermain length for Alternative Well Location A would be approximately 3.4 km.

4.2.2 Alternative B

Alternative Well Location B is located approximately 1.5 km south of Highway 89 on 6th Line and 3.0 km west of the Town. The hydrogeology of this area was interpreted to have the potential for development of a well that could yield greater than 1,067m^3/d from the shallow bedrock aquifer. It was also interpreted that the area has a overburden depth of 4 to 14 mbgs, which is suitable for groundwater protection.

As shown on Figure 4.2-1, the watermain would begin approximately 1.0 km south of Side Road 30 on 6th Line. The watermain would travel north 6th Line. At the 6th Line and Side Road 30 intersection, the watermain would travel east along Side Road 30 to avoid the wetland and wooded area to the north of Side Road 30. At the Side Road 30 and 5th Line intersection, the watermain would travel north along 5th Line and then at Highway 89 travel along Highway 89 crossing 4th Line. The watermain would then travel north along 4th Line and connect at Well5/6 (shown on Figure 4.2-1). The watermain length for Alternative Well Location B would be approximately 5.1 km.

4.2.3 Alternative C

Alternative Well Location C is located approximately 4.0 km southwest of the Town on 5th Line and 4.0 km south of Highway 89. The hydrogeology of this area was interpreted to have the potential for development of a well that could yield greater than 1,067m^3/d from the shallow bedrock aquifer. . It was also interpreted that the area has a suitable overburden depth of 4 to 17 mbgs, which is suitable for groundwater protection.

The watermain would begin approximately 0.75 km north of Side Road 25 on 5th Line (see Figure 4.2-1). The watermain would travel north along 5th Line to Highway 89. The watermain would cross Side Road 30 and then travel west along Highway 89. At the 4th Line and Highway 89 intersection, the watermain would travel north along 4th Line and connect into the well house at Well 5/6. The watermain length for Alternative Well Location C would be approximately 5.3 km.

4.2.4 Alternative D

Alternative Well Location D is located approximately 3 km west Shelburne on 2nd Line Southwest in Melancthon Township. The OGS Test Well 10A was drilled at this location using a continuous coring technique to 95 mbgs, which was terminated in the Cabot Head Formation. Geophysical logging of the test hole indicated that a number of fractures in the various bedrock formations are present. Fractures are a good indication of water bearing zones within the bedrock formations. Preliminary results of a packer test indicated favourable conditions for developing a test well and possibly a municipal supply at this location.

The watermain route would travel southeast along 2nd Line Southwest to Highway 89 (see Figure 3.3-1). From the Highway 89 and 2nd Line Southwest intersection, the watermain would travel east along Highway 89 toward 4th Line. From the 4th Line and Highway 89 intersection, the watermain would travel north along 4th Line and connect at municipal well 5/6. The watermain length for Alternative Well Location D would be approximately 3.7 km.

4.2.5 Alternative E

Alternative Well Location E is located immediately adjacent to existing municipal wells 5 and 6. The OGS Well 10B was drilled at this location using a continuous coring technique to 75.3 mbgs, which was terminated in the Cabot Head Formation. This test well did not encounter conditions in the deep bedrock formations that were suitable for developing a municipal water supply. As a result, this site was not considered further as an alternative location for an additional municipal well.

4.2.6 Evaluation of Alternatives

4.2.6.1 Natural Environment

Table 4.2.5.1-1 presents the short-listed alternatives and a discussion of the effects on the specific evaluation criteria associated with the natural environment.

Table 4.2.5.1-1: Potential Effects of the Alternatives on the Natural Environment

Specific Evaluation Criteria	Alternative A	Alternative B	Alternative C	Alternative D
Degradation of groundwater quality	Low potential.	Low potential.	Low potential.	Low potential.
Changes to groundwater flow	Local effects.	Local effects.	Local effects.	Local effects.
Degradation of surface water quality	Low potential during construction activities with mitigation measures applied. Watermain would cross one watercourse.	Moderate potential during construction activities with mitigation measures applied. Watermain would cross four watercourses.	Moderate potential during construction activities with mitigation measures applied. Watermain would cross four watercourses	Low potential during construction with mitigation measures applied. Watermain would cross two watercourses.

Specific Evaluation Criteria	Alternative A	Alternative B	Alternative C	Alternative D
Changes to surface water quantity and flow	Low potential.	Low potential.	Low potential.	Low potential for interference due to greater depth.
Changes to vegetation, including wildlife habitat and biodiversity	Moderate potential. Well would be adjacent to a locally significant wetland (LSW) Willow Brook Swamp, and area which contains headwater areas of the Boyne River (cold water fishery). Potential impact to surface water features within adjacent Environmentally Protected Areas (EPAs). Watermain will follow existing public right-of-ways to avoid vegetation removal.	Low potential. Well would be adjacent to a locally significant wetland (LSW) Willow Brook Swamp. Potential impact to surface water features within adjacent EPAs. Watermain will follow existing municipal right-of-ways to avoid vegetation removal.	Low potential. Well would be adjacent to a locally significant wetland (LSW) Willow Brook Swamp. Potential impact to surface water features within adjacent EPAs. Watermain will follow existing public right-of-ways to avoid vegetation removal.	Low potential. Well would be adjacent to a locally significant wetland (LSW) Willow Brook Swamp. Low potential to impact surface water features within adjacent EPAs because of greater depth. Watermain will follow existing public right-of-ways to avoid vegetation removal.
Disturbance to terrestrial and aquatic wildlife	Moderate potential. Well would be located at the headwaters of the Boyne River (cold water fishery). Watermain will follow existing right-of-ways to avoid disturbance to terrestrial and aquatic wildlife.	Low potential. Minimal vegetation removal would be required for the installation of the well. Watermain will follow existing right-of-ways to avoid disturbance to wildlife.	Low potential. Minimal vegetation removal would be required for the installation of the well. Watermain will follow existing right-of-ways to avoid disturbance to wildlife.	Low potential. Minimal vegetation removal would be required for the installation of the well. Watermain will follow existing right-of-ways to avoid disturbance to wildlife.
Disturbance to SAR	Low potential. Minimal vegetation removal will be required for installation of the well. In addition, the watermain will be installed along existing public right-of-ways to avoid vegetation removal and subsequently avoid disturbance to	Low potential. Minimal vegetation removal will be required for installation of the well. In addition, the watermain will be installed along existing public right-of-ways to avoid vegetation removal and subsequently	Low potential. Minimal vegetation removal will be required for installation of the well. In addition, the watermain will be installed along existing public right-of-ways to avoid vegetation removal and subsequently avoid	Low potential. Minimal vegetation removal will be required for installation of the well. In addition, the watermain will be installed along existing public right-of-ways to avoid vegetation removal and subsequently avoid

Specific Evaluation Criteria	Alternative A	Alternative B	Alternative C	Alternative D
	potential SAR in the Study Area.	avoid disturbance to potential SAR in the Study Area.	disturbance to potential SAR in the Study Area.	disturbance to potential SAR in the Study Area.

4.2.6.2 Social Environment

Table 4.2.5.2-1 presents the short-listed alternatives and a discussion of the effects on the specific evaluation criteria associated with the social environment.

Table 4.2.5.2-1: Potential Effects of the Alternatives on the Social Environment

Specific Evaluation Criteria	Alternative A	Alternative B	Alternative C	Alternative D
Impacts on adjacent land use	Low Potential. Landowner access granted Well located on private land in source protection area. Watermain would run along public right-of-ways.	High potential. Landowner access not granted Well located on private land in source protection area. Watermain would run along public right-of-ways.	Low potential. Landowner access granted Well located on private land in source protection area. Watermain would run along public right-of-ways.	Low potential. Landowner access granted Well located on private land in source protection area. Watermain would run along public right-of-ways.
Impacts to public health and safety	Moderate potential. Tested private wells indicate arsenic concentrations below potential new ODWQS of 10 µg/L. However, a shallow municipal well could develop elevated arsenic levels over time.	Moderate potential. Tested private wells indicate arsenic concentrations below potential new ODWQS of 10 µg/L. However, a shallow municipal well could develop elevated arsenic levels over time.	High potential. Water sample from a private tested well in target area indicated arsenic concentrations above the existing ODWQS of 25 µg/L.	Low potential. Water samples from the target area indicate arsenic levels well below the potential new ODWQS of 10 µg/L. Deep well unlikely to develop elevated arsenic levels over time.
Reliability of drinking water supply	Good potential.	Good potential.	Good potential.	Testing has demonstrated adequate flow rate.
Changes to visual aesthetics	Low potential. Minimal changes to visual aesthetics during construction (i.e., construction equipment, installation of the watermain).	Low potential. Minimal changes to visual aesthetics during construction (i.e., construction equipment, installation of the watermain).	Low potential. Minimal changes to visual aesthetics during construction (i.e., construction equipment, installation of the watermain).	Low potential. Minimal changes to visual aesthetics during construction (i.e., construction equipment, installation of the watermain).
Changes to built heritage or	Moderate potential. Archaeological resources could	Moderate potential. Archaeological resources could	Moderate potential. Archaeological resources could	Moderate potential. Archaeological resources could

Specific Evaluation Criteria	Alternative A	Alternative B	Alternative C	Alternative D
archaeological resources or sites	be present; Stage 2 archaeological assessment needs to be conducted. Any sites recommended for further work must be assessed and documented prior to construction. If those sites are not avoided, effects will be high but archaeological investigations should sufficiently document the cultural heritage value or interest prior to any construction effects.	be present; Stage 2 archaeological assessment needs to be conducted. Any sites recommended for further work must be assessed and documented prior to construction. If those sites are not avoided, effects will be high but archaeological investigations should sufficiently document the cultural heritage value or interest prior to any construction effects.	be present; Stage 2 archaeological assessment needs to be conducted. Any sites recommended for further work must be assessed and documented prior to construction. If those sites are not avoided, effects will be high but archaeological investigations should sufficiently document the cultural heritage value or interest prior to any construction effects.	be present; Stage 2 archaeological assessment needs to be conducted. Any sites recommended for further work must be assessed and documented prior to construction. If those sites are not avoided, effects will be high but archaeological investigations should sufficiently document the cultural heritage value or interest prior to any construction effects.
Changes to other municipal infrastructure	Changes to sizing of existing watermains may be required.	Changes to sizing of existing watermains may be required.	Changes to sizing of existing watermains may be required.	Changes to sizing of existing watermains may be required.
Effects on current traffic patterns during construction and/or operations	Moderate potential. Disturbance to traffic movement along Highway 10 between 4th and 5th Line.	Moderate potential. Disturbance to traffic movement along Highway 89 between 4th and 5th Line.	Moderate potential. Disturbance to traffic movement along Highway 89 between 4th and 5th Line.	Moderate potential. Disturbance to traffic movement along Highway 89 between 2nd Line Southwest and 4th Line.
Changes to existing noise and/or vibration levels	Low potential. Noise emissions from construction equipment and during operations will be in accordance with MOE publication NPC-115.	Low potential. Noise emissions from construction equipment and during operations will be in accordance with MOE publication NPC-115.	Low potential. Noise emissions from construction equipment and during operations will be in accordance with MOE publication NPC-115.	Low potential. Noise emissions from construction equipment and during operations will be in accordance with MOE publication NPC-115.
Changes to air quality	Low potential. Minimal potential for effects during construction with applied mitigation measures (i.e., maintaining equipment in good repair, watering to avoid dust, etc.). No	Low potential. Minimal potential for effects during construction with applied mitigation measures (i.e., maintaining equipment in good repair, watering to avoid dust, etc.). No	Low potential. Minimal potential for effects during construction with applied mitigation measures (i.e., maintaining equipment in good repair, watering to avoid dust, etc.). No	Low potential. Minimal potential for effects during construction with applied mitigation measures (i.e., maintaining equipment in good repair, watering to avoid dust, etc.). No

Specific Evaluation Criteria	Alternative A	Alternative B	Alternative C	Alternative D
	impacts during operation.	impacts during operation.	impacts during operation.	impacts during operation.
Impact on water supply for fire protection	Low potential. The installation of the new well will result in increased water supply.	Low potential. The installation of the new well will result in increased water supply.	Low potential. The installation of the new well will result in increased water supply.	Low potential. The installation of the new well will result in increased water supply.

4.2.6.3 Economic Environment

Table 4.2.5.3-1 presents the short-listed alternatives and a discussion of the effects on the specific evaluation criteria associated with the economic environment.

Table 4.2.5.3-1: Potential Effects of the Alternatives on the Economic Environment

Specific Evaluation Criteria	Alternative A	Alternative B	Alternative C	Alternative D
Capital costs of proposed well and watermain[1]	Relatively lower cost due to shorter watermain route.	Relatively higher cost due to longer watermain route.	Relatively higher cost due to longer watermain route.	Relatively lower cost due to shorter watermain route.
Operations costs	Similar maintenance costs.	Similar maintenance costs.	Similar maintenance costs.	Similar maintenance costs.
Life cycle cost	Similar life cycle cost.	Similar life cycle cost.	Similar life cycle cost.	Similar life cycle cost.

[1]Capital cost of the watermain is based on the cost of installation per km. Watermain and well installation costs are approximate and based on past experience.

4.2.6.4 Technical Environment

Table 4.2.5.4-1 presents the short-listed alternatives and a discussion of the effects on the specific evaluation criteria associated with the technical environment.

Table 4.2.5.4-1: Potential Effects of the Alternatives on the Technical Environment

Specific Evaluation Criteria	Alternative A	Alternative B	Alternative C	Alternative D
Security of quality of water source	Moderate potential. Based on the Town's experience and according to the OGS, arsenic levels in the shallow	Moderate potential. Based on the Town's experience and according to the OGS, arsenic levels in the shallow	Moderate potential. Based on the Town's experience and according to the OGS, arsenic levels in the shallow	Low potential. As a result of the depth of the well, risk of elevated arsenic levels is reduced. Source protection

Specific Evaluation Criteria	Alternative A	Alternative B	Alternative C	Alternative D
	bedrock aquifer may increase over time. Source protection required.	bedrock aquifer may increase over time. Source protection required.	bedrock aquifer may increase over time. Source protection required.	required.
Security of quantity of water source	Low potential. The installation of the new well will result in increased water supply.	Low potential. The installation of the new well will result in increased water supply.	Low potential. The installation of the new well will result in increased water supply.	Low potential. The installation of the new well will result in increased water supply.
Ease of implementation and maintenance	Similar implementation and maintenance.	Similar implementation and maintenance.	Similar implementation and maintenance.	Similar implementation and maintenance.

Construction of watermains for the four well locations has the potential to affect surface water quality in watercourses through increased sedimentation occurring during construction of the crossings. This potential effect is highest for Alternative Well Locations B and C, the associated watermain construction will require the highest number of watercourse crossings (four). With appropriate mitigation measures, such as silt fencing during construction, effects on surface water will be temporary. As Alternative Well Location A requires the fewest crossings, it has the lowest potential for this type of effect.

Alternative Well Location D is likely to have the relative lowest potential for effects on surface water quantity and flow because the well will be installed deeper than the other three Alternative Well Locations, which will result in less drawdown.

All four of the Alternative Well Locations are located adjacent to a locally significant wetland (Willow Brook Swamp). However, Alternative Well Location A is located at the headwaters of the Boyne River, a coldwater fishery, increasing the likelihood of potential effects on aquatic wildlife and habitat. The watermain will be installed along existing public right-of-ways, which will avoid the need for vegetation removal, subsequently avoiding potential effects on wildlife and wildlife habitat. As such, Alternative Well Locations B, C and D are not likely to have adverse effects on wildlife and wildlife habitat. Construction activities will largely be contained to the public right-of-ways; therefore, all of the potential Alternative Well Locations have minimal potential to affect potential SAR in the Study Area.

All four Alternative Well Locations are expected to have potential effects on current traffic patterns during construction activities. All potential Alternative Well Locations are likely to have similar effects on noise and vibrations. Construction and operations will be in compliance with MOE publication NPC-115, which places noise limits for operation of machinery to mitigate disturbance to nearby residents. Landowner access has only been secured for Alternative Well Location D. Alternative Well Location C will have significant effects on public health and safety because water samples from this location indicated arsenic concentrations above the ODWQS guideline. There are also potential effects to public health and safety for Alternative Well Locations A and B since arsenic levels could become elevated over time because these wells are considered to be shallow wells. Alternative Well Location D will have minimal effects on public health and safety since this alternative is a deep well and is less likely to have elevated arsenic concentration over time. The capital cost of Alternative Well

Location D is slightly higher than the costs of implementing the other three Alternative Well Location alternatives. The reason for this is that the well installation cost is greater due to the depth of the well.

4.2.7 Recommended Alternative Means

Alternative Well Location D was selected as the preferred solution as it best addressed the problem in terms of providing the quantity of water needed and a source of drinking water that meets ODWQS for the residents of Shelburne into the future (shown in Figure 4.2-1). In 2010, water quality at the three shallow Alternative Well Locations was assessed by offering existing land owners the opportunity to have the water quality in their wells tested. The letter sent to landowners is included in Appendix A. In response to this letter, six residents agreed to have their well water tested and arsenic levels in tested well water ranged from 0.5 to 26.2 µg/L. The highest level of arsenic (26.2 µg/L) was reported near the proposed Alternative Well Location C. In consideration of the presence of arsenic in tested wells, the increase in concentrations in two of Town's production wells, and OGS concurrence that arsenic concentrations in a well can increase over time, it was determined that a deeper well accessing the Gasport Formation would provide the best water quality option, while meeting the required water quantity demand for the growing community.

5.0 STAKEHOLDER CONSULTATION AND ABORIGINAL ENGAGEMENT

Stakeholder consultation and Aboriginal engagement is a two-way process by which the proponent and stakeholders/Aboriginal communities share information, with the intent of developing a Project that is environmentally sound and socially acceptable. Stakeholder consultation and Aboriginal engagement has been carried out to meet the requirements for both a Schedule B Municipal Class EA and the EIS Guidelines. Since the Provincial and Federal EA processes were carried out in parallel, some activities were combined as indicated. The EA process(s) by which the consultation and engagement activities originated are specified in Section 5.2.

Several consultation techniques have been used to inform the public, agencies and Aboriginal communities about the Project and to solicit their comments. Techniques used for this Project have included mailings, meetings, newspaper notices and public open house. Copies of consultation materials, including public stakeholder lists used for mailings are provided in Appendix A.

5.1 Summary of Stakeholder Consultation and Aboriginal Engagement Activities

Stakeholder consultation and Aboriginal engagement was carried out in accordance with applicable requirements, which include the Municipal Class EA process and the Federal EIS guidelines. A description of stakeholder consultation and Aboriginal engagement activities carried out for both processes is specified below.

The Municipal Class EA process identifies a number of mandatory points of contact with stakeholders. As previously noted, the Municipal Class EA followed a Schedule B process, which includes Phases 1 and 2 of the Municipal Class EA process. Mandatory points of contact with the public for Phases 1 and 2 are as follows:

- Review and obtain input about the problem or opportunity, environmental issues, alternative solutions and preliminary determination of a preferred solution; and
- Notice of completion submitted to review agencies and the public, followed by a period of at least 30 calendar days.

The Federal comprehensive study process includes three mandatory points of contact with the public as follows:

- Public comment on Project and conduct of the comprehensive study (public participation #1);
- Public participation during conduct of the comprehensive study (public participation #2); and
- Public comment period on the comprehensive study report (public participation #3).

The public consultation completed to fulfil the requirements of the Provincial and Federal processes are described below.

5.1.1 Municipal Class EA

A notice of Project commencement was distributed to Provincial and municipal agencies and to adjacent landowners on September 18, 2009. Copies of the notice of commencement were also published in the

Shelburne Free Press and the Orangeville Banner. A copy of the notice of commencement is provided in Appendix A.

Aboriginal communities and organizations were notified of the proposed Project through mailing of a letter and the notice of commencement. The following Aboriginal communities and organizations were contacted in 2009:

- Six Nations of the Grand River Territory;
- Mississaugas of the New Credit;
- Association of Iroquois and Allied Indians;
- Métis Nation of Ontario;
- Métis Nation of Ontario – Region 8, Georgian Bay; and
- Haudenosaunee Development Institute.

Aboriginal Affairs and Northern Development Canada (AANDC) and the Ontario Ministry of Aboriginal Affairs (MAA) later provided additional suggested potentially interested Aboriginal communities to include in further Aboriginal engagement. These other communities were included in further Aboriginal community communications, including for the Federal comprehensive study process, as follows:

- Chippewas of Kettle and Stony Point;
- Ogemawahj Tribal Council; and
- Union of Ontario Indians.

A public open house was held in the Town of Shelburne on October 22, 2012 to present and receive input on the problem or opportunity, environmental issues, alternative solutions, determination of a preferred solution and the likely environmental effects. The notice of public open house and open house panels presented at the open house are provided in Appendix A.

Other consultation as part of the EA process (Appendix A) also included:

- Presentation to Town Council to describe the Project (December 2009);
- Letters presenting overview of the Project to Mayor and Council of Township of Amaranth, Mayor and Council of Township of Melancthon, and the Town of Shelburne Council (October 2009);
- Correspondence with MTO informing the agency of the Project and request for feedback on MTO right-of-way on Highway 89 (May 2011);
- Correspondence with Ontario Geologic Society (OGS) on the Town's investigation of the new OGS well "10A", which became the preferred well location for the Project (February 2010);
- Correspondence with MNR, GRCA and NVCA to obtain ecological information such as wetland habitat, and fish, invertebrate and terrestrial biota mapping (August 2009 to December 2011);
- Correspondence with GRCA and Centre for Sustainable Wetlands to notify them of the October 2012 Open House (October 2012);

- Meeting with MOE to discuss intrabasin transfer from Grand River watershed to Natawasaga River watershed (April 2011). Minutes of this meeting are provided in Appendix A;
- Meeting with MOE and MNR to discuss intrabasin transfer and water quality of the new well, particularly relating to concentrations of arsenic (November 2011);
- Town of Shelburne Project Steering Committee meetings to discuss Project and EA updates.

Following receipt of comments and input on the Project and EA process, the comments were incorporated into the final report, as part of the EA/EIS and consultation record. Comments obtained throughout the process are presented below in Section 5.2.

5.1.2 Comprehensive Study

The Federal comprehensive study process was initiated by the submission of a project description document to Federal authorities in September 2, 2011. The project description document provides the necessary background information for the RA to determine EA track, scope of the Project and other project details required under CEAA.

Following review of the project description by the Agency, the notice of commencement for the comprehensive study was published on the Agency's website on December 15, 2011 [CEAA, 2012b]. In addition to the notice of commencement, the Agency invited the public and Aboriginal communities to comment on the draft EIS guidelines and to apply for Federal funding ($20,000 of public funding was available for the Project). The comment period ("public participation #1) was completed from December 15, 2011 to January 30, 2012. After the comment period, the final EIS guidelines were revised and released by the Agency on April 27, 2012, following incorporation of feedback from the public.

In addition to the Municipal Class EA process consultation presented above, meetings that were carried out by the Town in support of the comprehensive study process included the following:

- Meeting with the Agency and Federal Economic Development Agency of Southern Ontario to discuss potential scope of the EIS in advance of submission of the project description (December 2010);
- Teleconference with the Agency and Federal Economic Development Agency of Southern Ontario to discuss potential scope of the EIS in advance of submission of the project description (April 2011); and
- Phone calls by the Agency to potentially interested Aboriginal communities to propose a meeting to discuss the proposed Project and solicit feedback (January 2012).

In addition, the Agency conducted a meeting with Six Nations of the Grand River First Nation and the Agency on February 9, 2012 to discuss the proposed Project and solicit feedback.

Comments received as part of pubic consultation and Aboriginal engagement are presented in Section 5.2.

5.2 Summary of Stakeholder Consultation Feedback

A summary is provided below of stakeholder concerns raised and how it was addressed by the EA/EIS. Outstanding issues and methods to address these outstanding issues are provided.

For the purposes of this EA/EIS, consultation and engagement activities are divided into the following categories:

- Public Consultation;
- Government agency liaison; and
- Aboriginal engagement.

5.2.1 Public Consultation

Table 5.2.1-1 documents the comments received from the public in response to the proposed Project.

Table 5.2.1-1: Summary of Public Consultation Program Comments Received

Date Received	Comment/Question	Response	Action Taken
September 21, 2009	■ Expressed concern about the runoff from a nearby slaughterhouse contaminating groundwater, and causing further environmental pollution.	■ Emailed the following response: Thank you very much for providing your input regarding the Town of Shelburne's Class Environmental Assessment for Additional Water Supply. At this time, we are just starting to undertake the studies that will help us design the best possible project location, at the same time as ensuring that potential environmental effects are avoided or mitigated. Once these studies are completed, we will be sharing the results at a Public Information Centre. We would be happy to add you to our stakeholder	■ Existing projects and activities are addressed as part of baseline characterization of the environment.

Date Received	Comment/Question	Response	Action Taken
		contact list to ensure that you are informed of the date of this public meeting where you will have the opportunity to learn more about our project and provide input. We look forward to seeing you at our information centre.	
November 10, 2009	Expressed concern regarding the location of the proposed wells.	Comment noted. The EIS describes the screening of potential well locations and assesses the effects of the project.	The EIS presents findings of the well location investigations and the effects of the project.
March 4, 2012	Request to have future notifications emailed.	Note made in files to email all future notices.	Comment addressed by adding member of public to stakeholder list.
October 11, 2012	Identification of source water protection requirements and implementation under the Clean Water Act	The Town has consulted with the GRCA and NVCA on the proposed Project and source protection consideration.	Statement provided in Section 1.5.2

5.2.2 Government Agency Consultation

Key agencies also received the Notice of Project Commencement. These agencies are listed in the key stakeholder and Aboriginal community list in Appendix A. The Town of Shelburne also had several meetings with a number of agencies. These meetings and the topics discussed are documented in Table 5.2.2-1.

Table 5.2.2-1: Summary of Agency Comments Received

Group/ Agency	Date Received	Comment/Question	Response	Action Taken
MTO	May 26, 2011	■ Permit requirements for any installation on or near the MTO right-of-way would be expected for the Project. ■ An EA should be completed, especially for any water	■ Thank you for the feedback provided regarding the Town of Shelburne's Additional Water Supply Project. The Town has carried out a Schedule B Class EA for the construction and	■ Commitment made in Section 1.5.2: The MTO will be kept advised by the Town of its plans for the watermain along the MTO right of way.

Group/ Agency	Date Received	Comment/Question	Response	Action Taken
		crossings involved. Can you advise what EA process you expect to follow for such an undertaking?	operation of a new drinking water production well for the Town's water supply system. ■ Federal funding would be administered by the Federal Economic Development Agency for Southern Ontario; therefore, the proposed project also requires an EA be successfully completed under the CEAA.	
MOE	November 9, 2012	■ The 2006 Federal guideline is still under review in Ontario and has not been adopted ■ MNR has ruled the well location is slightly over the drainage divide; therefore; the Project includes an intrabasin transfer (from the Grand River watershed to the Nottawasaga Valley watershed). Legislation on intrabasin transfer is not likely to be posted until June 2012. The Town is to follow the Technical Bulletin which was prepared for municipal use for	■ The Project has been proposed in anticipation that the Province will eventually implement the lower standard of 10 µg/L. ■ No regulations are currently in place to address requirements for interbasin transferred. Personal communication with the MOE project officer on July 10, 2012 indicated that there are no further requirements to address interbasin transfer for this Project.	■ MNR has been consulted on the assessment requirements for interbasin transfer, which have been addressed in the EA/EIS.

Group/ Agency	Date Received	Comment/Question	Response	Action Taken
		water and wastewater proposed projects. The proposed water project does not trigger the 19 megalitres per day consumptive use for Prior Notice and Consultation (PNC) but does trigger the interbasin transfer criteria of an increase of 379,000 L/d. In accordance with the Great Lakes Agreement, there must be PNC with all Great Lake States to provide an understanding of the nature of the Project.		

5.3 Aboriginal Engagement

The EIS Guidelines state that the Proponent must ensure that it engages with Aboriginal people that may be affected by the Project and that have asserted or established Aboriginal or treaty rights (Figure 5.3-1). As part of the EA/EIS, the following Aboriginal communities/groups have been identified as having a potential interest in, or could be affected by, the Project:

- Six Nations of the Grand River First Nation;
- Haudenosaunee Development Institute;
- Mississaugas of the New Credit;
- Métis Nation of Ontario;
- Association of Iroquois and Allied Indians;
- Beausoleil First Nation;
- Chippewas of Kettle and Stony Point First Nation;

- Chippewas of Georgina Island First Nation;
- Saugeen First Nation;
- Ogemawahj Tribal Council;
- Union of Ontario Indians; and
- Chippewas of Rama First Nation.
- Great Lakes Métis Council
- Chippewas of Nawash Unceded First Nation;
- Wahta Mohawk Territory;
- Mississaugas of Scugog Island First Nation.

Copies of all notifications sent by the Town of Shelburne to Aboriginal communities can be found in Appendix A. The list of Aboriginal communities and organizations has been updated as the Town moves through the EA/EIS. All of the communities and organizations identified above will continue to be informed about the Project.

The Chippewas of Rama First Nation responded to the Town's Project notice for the Municipal Class EA process acknowledging receipt in June 2011. The Six Nations of the Grand River First Nation responded to the notice of commencement for the Federal EA process in January 2012. Copies of correspondence from Aboriginal communities are provided in Appendix A.

The Six Nations' response indicated there is an interest from the First Nation on the proposed Project (Appendix A). The Six Nations stated they look forward to the opportunity to review, meet and discuss the proposed water taking plans. In response, as noted in Section 5.1.2, the Agency met with representatives of the Six Nations directly on February 9, 2012.

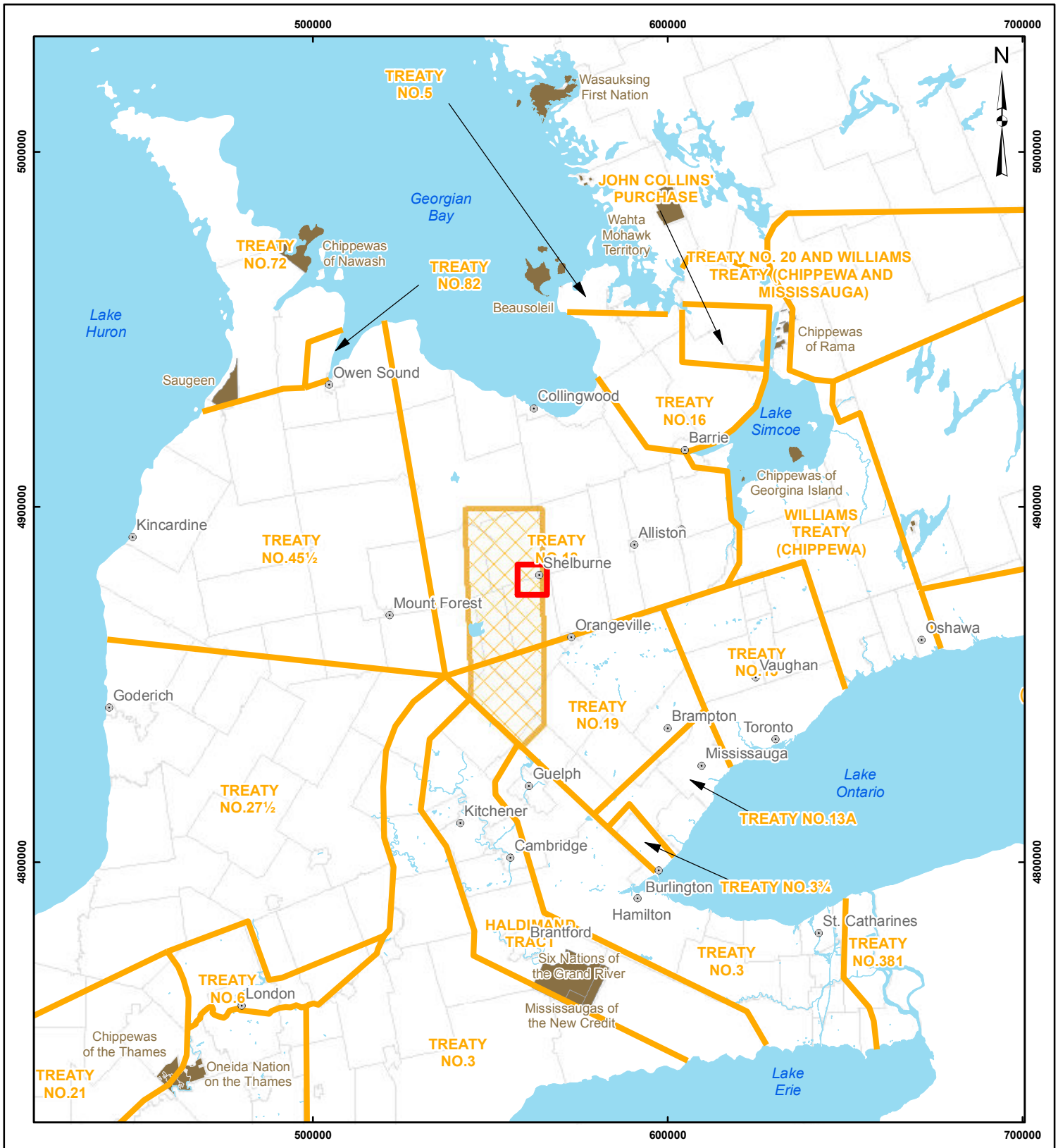
The Haudenosaunee Development Institute (HDI) expressed an interest in meeting with the Town to discuss the project. The Town and HDI met on December 5, 2012. The meeting included a presentation of the project and summary of the EA/EIS findings as well as discussing opportunities for HDI to be engaged regarding the development of this and other Town Projects.

Table 5.3-1: Aboriginal Community Comments and Responses

Group	Date Received	Comment/Question	Response	Action Taken
Six Nations of the Grand River First Nation	February 9, 2012	What is the exact depth of well?	The depth of the well is approximately 86.5 m.	No further action required.
Six Nations of the Grand River First Nation	February 9, 2012	What is the size of watermain?	To be determined by the Town during the detailed design phase.	No further action required.
Six Nations	February 9,	Is the well within the headwaters of	Yes, it is located less	No further action

Group	Date Received	Comment/Question	Response	Action Taken
of the Grand River First Nation	2012	the Grand River?	than 120 metres of the Grand River – Nottawasaga Valley watershed boundary.	required.
Six Nations of the Grand River First Nation	February 9, 2012	Are the EA technical studies available? If so, the reviewers would like copies.	The EA technical studies will be made available after the Town submits the EIS to federal agencies.	The Six Nations of the Grand River First Nation is invited to a meeting to discuss the results of the EIS, although the First Nation has since indicated that no further consultation is needed.
Six Nations of the Grand River First Nation	February 9, 2012	What are the impacts resulting from the transfer of water from the Grand River watershed into the Nottawasaga Valley watershed.	The well site is slightly over the drainage divide in the Grand River watershed. Wastewater from Shelburne is discharged into the Nottawasaga Valley watershed.	The potential effects to the watersheds are described in Section 7.2.2.
Six Nations of the Grand River First Nation	February 9, 2012	Members of the community undertake traditional activities (i.e., hunting) in the Luther Marsh area.	Luther Marsh area is approximately 15 km southwest of the well site.	Effects on groundwater and surface water quality and quantity are described in Section 7.2.
Six Nations of the Grand River First Nation	February 9, 2012	Six Nations has an interest in ensuring that water quality and availability are protected.	Section 7.2 describes the potential effects on water quality.	The Town will ensure there will be no significant adverse effects on water quality as a result of the Project.
Six Nations of the Grand River First Nation	February 9, 2012	Six Nations representatives have concerns about cumulative effects from other projects in the area, e.g., the proposed quarry in Melancthon.	The cumulative effects assessment is presented in Section 10. The Town does not consider the proposed quarry in Melancthon in the cumulative effects	No action required since the proposed Melancthon quarry is no longer an active

Group	Date Received	Comment/Question	Response	Action Taken
			assessment, since the Town did not identify a potential interaction with the Project.	proposal.



LEGEND

- Treaty Lands
- First Nations Land (Reserves)
- Municipal Boundary
- Haldimand Tract
- Waterbody
- Study Area

25 12.5 0 25 50 75

SCALE 1:1,500,000 KILOMETRES

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT
FOR ADDITIONAL WATER SUPPLY

TITLE
ABORIGINAL TREATY LANDS AND RESERVES

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	RPM	17 Feb. 2011		
GIS	BC	9 Jul. 2012		
CHECK	MK	9 Jul. 2012		
REVIEW	MK	9 Jul. 2012		

FIGURE: 5.3-1

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5.4 Aboriginal Traditional Knowledge

Traditional knowledge refers to the broad base of knowledge held by individuals and collectively by communities that may be based on spiritual teachings, personal observation and experience, or passed on from one generation to another through oral and/or written tradition. Traditional knowledge can provide relevant information related to the biophysical environment, including historical information that may otherwise not be available.

As noted above, the Six Nations of the Grand River First Nation initially expressed interest in the Project and later in the EA/EIS process indicated that no further contact about the Project was necessary. Six Nation representatives expressed an interest in ensuring that water quality and availability would be protected. During the course of the EA process, the Agency was informed that Six Nation community members undertake traditional activities (i.e., hunting) in the Luther Marsh area, which is located approximately 15 km southwest of the well site. No additional information on traditional knowledge for this EA/EIS was obtained through contact with Aboriginal communities.

6.0 EXISTING ENVIRONMENT

The following sections describe the existing environment at a level of detail that is relevant to the proposed Project. The descriptions have been compiled based on available information, discussions with government agencies, relevant mapping and information prepared from field studies.

6.1 Physical Environment

6.1.1 Groundwater Quality and Quantity

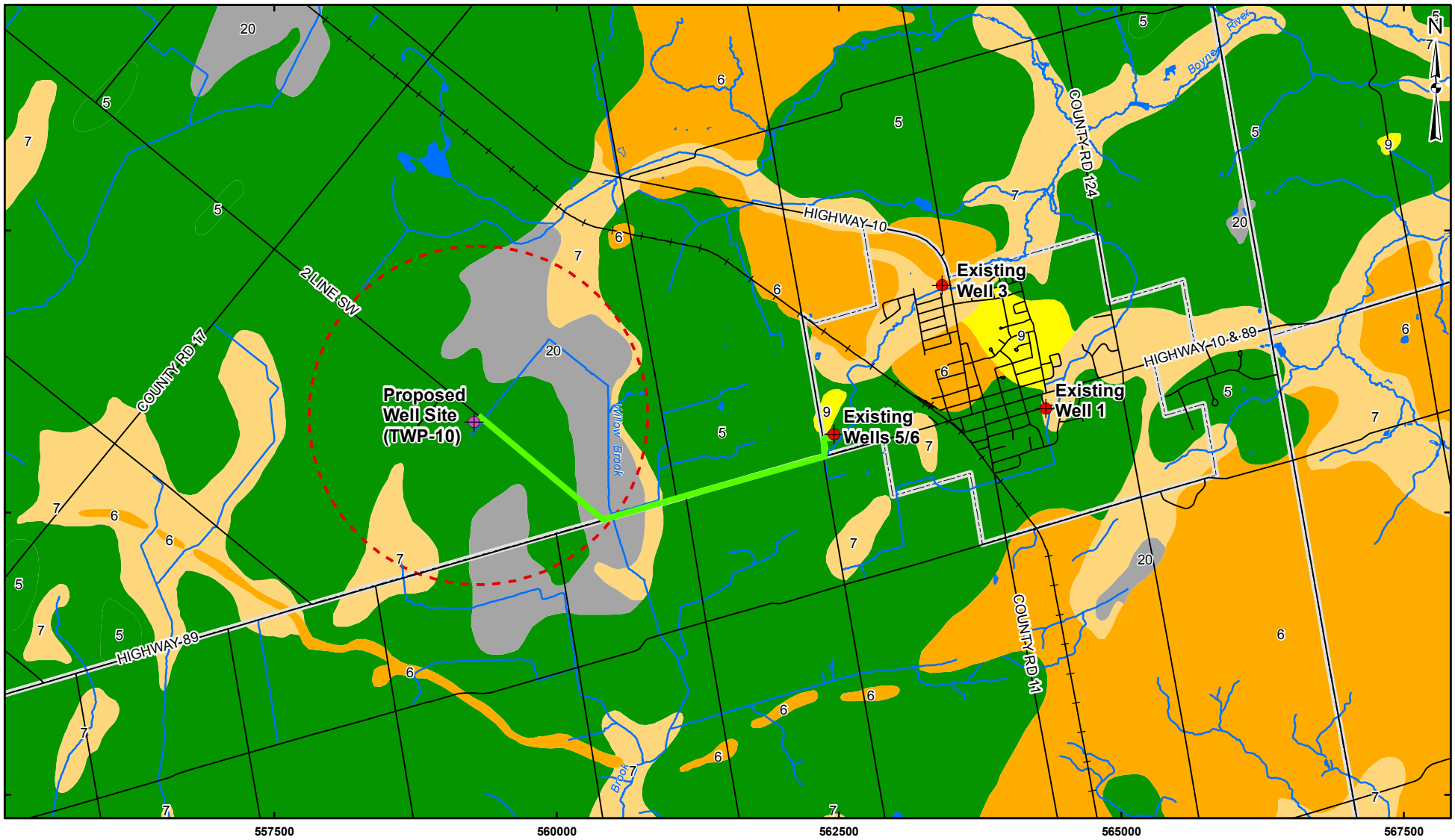
The Hydrogeology Report, included in Appendix B presents a comprehensive characterization of groundwater quality and quantity within the project study area. This includes:

- A detailed description of the geology and hydrogeology of the site and surrounding study area (see Figure 6.1.1-1, Figure 6.1.1-2 and Figure 6.1.1-3 provided below, which are described in detail in Appendix B);
- The results of field studies completed to assess the quantity and quality of groundwater available from bedrock aquifers occurring in the vicinity of the Town; and
- A detailed presentation of the results and analysis of pumping test performed to assess the long term sustainable yield of the deep bedrock aquifer and the groundwater quality at the time of testing.

The key conclusions related to these analyses presented in Appendix B are as follows:

- The Town of Shelburne has commissioned the completion of a test production well (TW7-10) located on the west side of 2nd Line, approximately 1.1 km north of Highway 89. The well extends to a total depth of 86.5 mbgs. Future operation of this well would draw water from the Gasport Formation, which is encountered from approximately 60.7 to 89.1 mbgs (equivalent to 435.9 to 407.5 masl). Based on field testing and analysis completed as part of this project, TW7-10 can sustain a long term yield of at least 1,635 m^3/d.
- Steady-state pumping from TW7-10 (at 1,635 m^3/d) is sustained by:
  - Seepage loses from the surface catchments over the 3 km^2 zone of influence; and
  - Horizontal groundwater flow in a deep bedrock aquifer capture area.

Other important conclusions related to potential environmental effects related to long term groundwater withdrawals at the test site are presented in the Hydrogeology Report (Appendix B) and are summarized below in sub-section 7.2.1.1.



LEGEND

- Existing Municipal Well
- Test Production Well
- Road
- Railway
- Watercourse
- Proposed Watermain
- Waterbody
- Municipal Boundary
- Hydrogeologicial Study Area
- 5: Glacial till
- 6: Ice-contact stratified deposits
- 7: Glaciofluvial deposits
- 9: Coarse-textured glaciolacustrine deposits
- 20: Organic deposits

SCALE 1:50,000

1 0.5 0 1 2 Kilometers

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE
QUATERNARY GEOLOGY

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	14 Nov. 2008		
GIS	BC	9 Jul. 2012		
CHECK	MK	9 Jul. 2012		
REVIEW	MK	9 Jul. 2012		

FIGURE: 6.1.1-1

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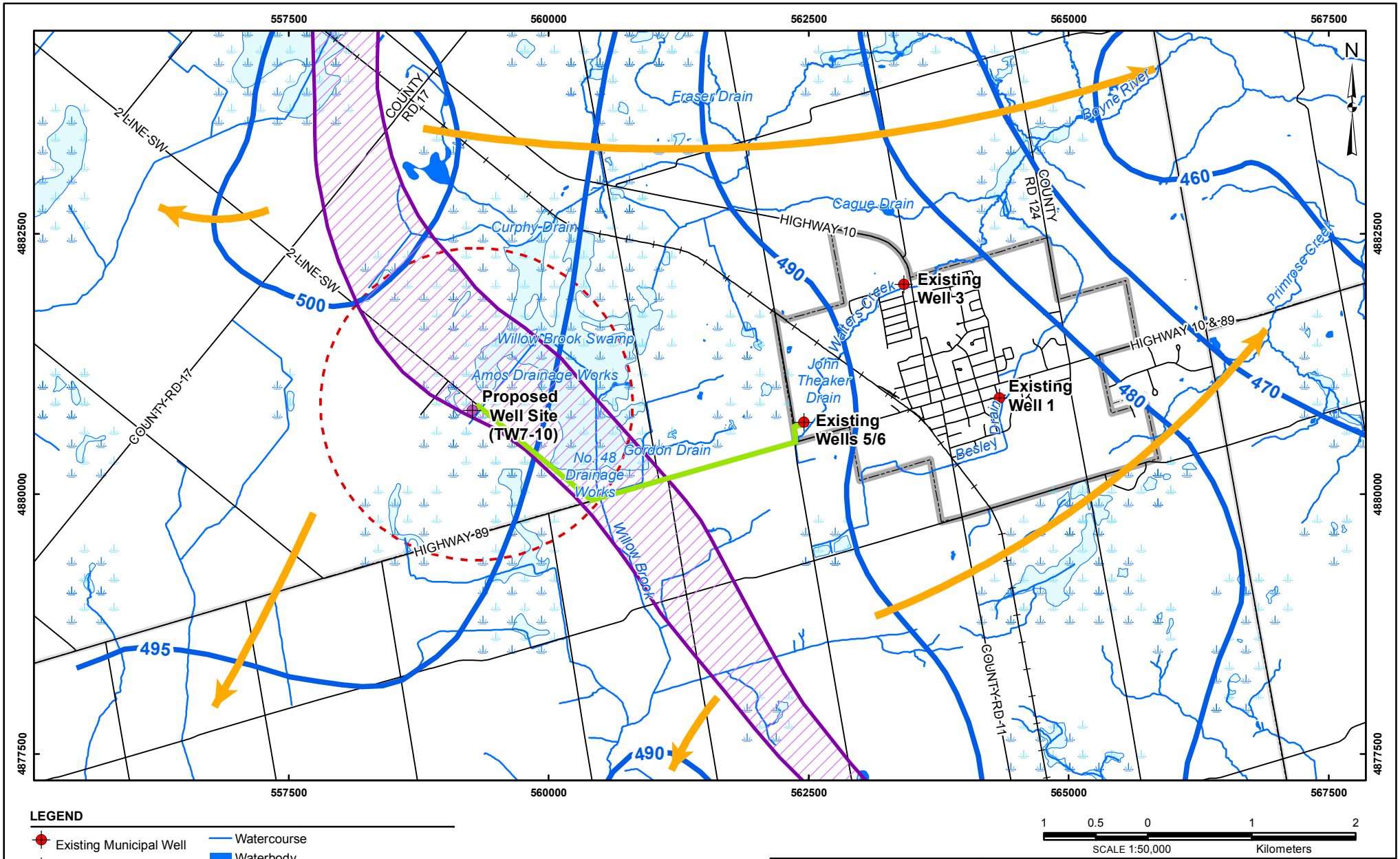

LEGEND

- Existing Municipal Well
- Test Production Well
- Road
- Railway
- Watercourse
- Waterbody
- Wetland (MNR LIO 2009)
- Municipal Boundary
- Hydrogeologicial Study Area

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE
GROUNDWATER FLOW IN GUELPH FORMATION

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	14 Nov. 2008		
GIS	BC	9 Jul. 2012		
CHECK	MK	9 Jul. 2012		
REVIEW	MK	9 Jul. 2012		

FIGURE: 6.1.1-2

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\Draft\EISReport\Groundwater_Flow_Guelph_Formation.mxd

PLOT DATE: October 10, 2012
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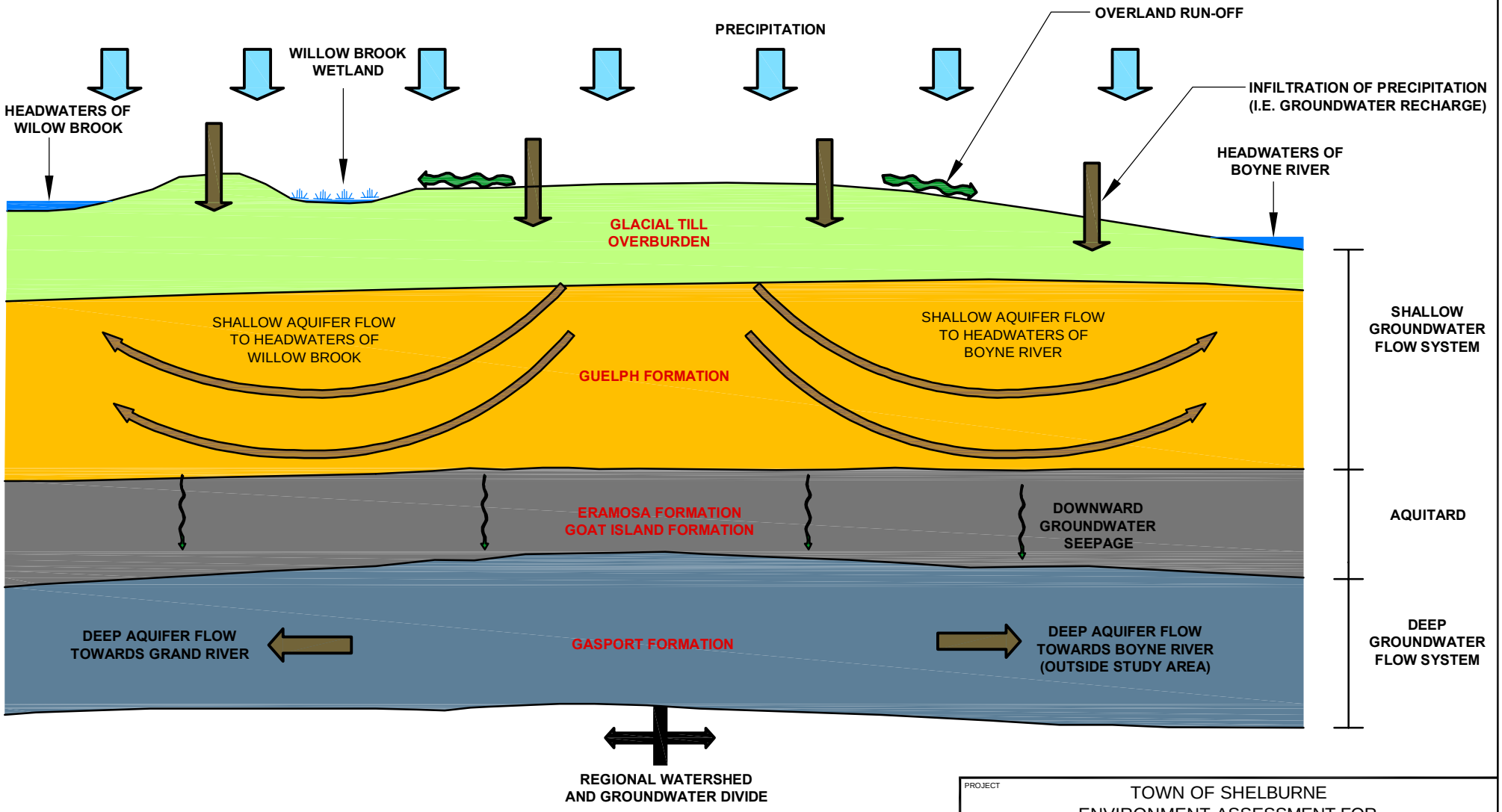


PROJECT

TOWN OF SHELBURNE
ENVIRONMENT ASSESSMENT FOR
ADDITIONAL WATER SUPPLY

TITLE

CONCEPTUAL MODEL OF GROUNDWATER FLOW WITHIN STUDY AREA

Golder Associates
Mississauga, Ontario, Canada

PROJECT No.		09-1112-6007	FILE No.	0911126007BB611-3.dwg
DESIGN			SCALE	AS SHOWN REV. A
CAD	DD/KD	March 12, 2012	FIGURE No.	
CHECK	SMD	March 12, 2012		6.1.1-3
REVIEW	SMB	March 12, 2012		

6.1.2 Surface Water Quality and Quantity

The majority of the study area is located in the Boyne River subwatershed in the jurisdiction of the Nottawasaga Valley Conservation Authority and the Grand River Conservation Authority. The headwaters of the Boyne River are located approximately 2 km north of the Town of Shelburne. According to the NVCA, the headwaters of the Boyne River exhibit fair to poor stream health [NVCA, 2007]. This is a result of sparse riparian vegetation and field drainage activities which influence stream health within the Study Area. Urban impacts from the Town of Shelburne also occur in the headwaters.

The well site is located within the Grand River watershed and is approximately 120 m from the watershed divide with the Nottawasaga River watershed divide. As discussed in Section 5.2.2, MNR ruled the well location is slightly over the drainage divide; therefore; the Project includes an interbasin transfer (from the Grand River watershed to the Nottawasaga Valley watershed) since the well would take pump water on the Grand River side of the divide and treated wastewater from the SWSS is currently discharged to a tributary of the Boyne River in the Nottawasaga River watershed.

The Well Site is adjacent to the Willow Brook Swamp, which is a locally significant wetland (Figure 1.2-1). Willow Brook Swamp is non-Provincially Significant Wetland complex made up of two individual wetlands composed of two wetland types (99% swamp and 1% marsh).

6.1.3 Soils and Terrain

The Hydrogeology Report, included in Appendix B, presents a detailed description of the quaternary deposits (i.e. mineral soils) and the terrain (i.e. topography and physiography).

6.2 Biological Environment

A general study area was initially reviewed as part of the screening of alternatives and the following descriptions focus on the biological resources within and surrounding the Project site, which includes the well site and watermain route (Figure 6.2-1). There is limited natural vegetation within the Project site. The location of the well site is within an agricultural field and the watermain runs within the right-of-way of a rural road and highway.

6.2.1 Approach

6.2.1.1 Background Data Review

Background ecological resource information was compiled and reviewed from the following sources:

- Digital Orthoimagery (scale 1:20:000);
- MNR Natural Heritage Information Centre (NHIC) [NHIC, 2011] database for significant species and designated natural features;
- Grand River Information Network [GRCA, 2011] mapping database for designated natural features and watercourse information;

- MNR Natural Resource Values Information System (NRVIS) district databases;
- Ontario Breeding Bird Atlas (OBBA) database;
- Town of Shelburne Official Plan [Town of Shelburne, 2006]; and
- Consultation with the MNR Midhurst District office, NVCA and GRCA to gather any additional significant species, designated natural features or fisheries information.

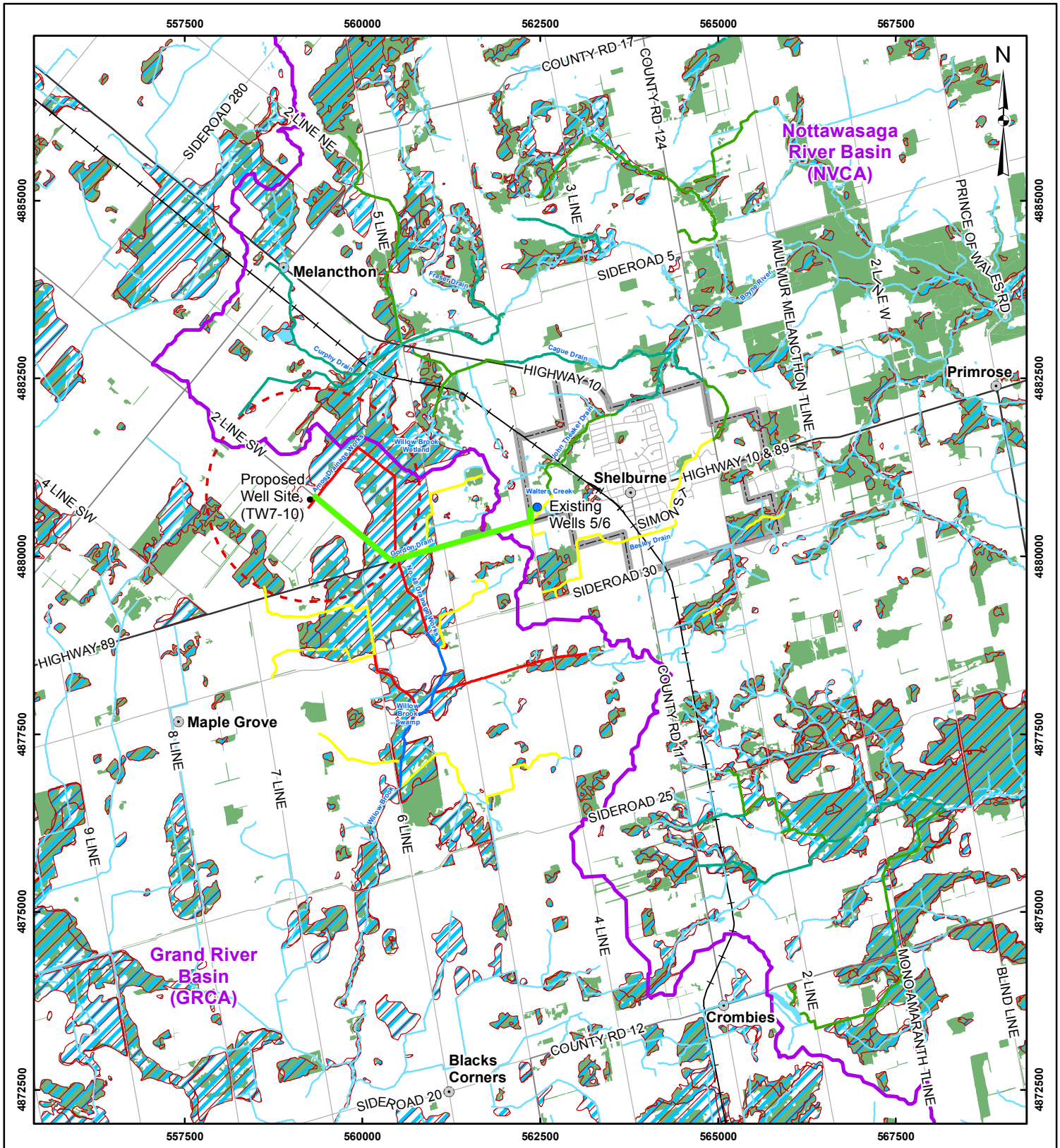
6.2.1.2 Field Surveys

Field surveys focused on the ecological features within and adjacent to the Project site in addition to a field review of the aquatic features in the vicinity of the well site that have the potential to be influenced by the operation of the well.

Aquatic habitat surveys of the municipal drain (Amos Drainage Works) in the vicinity of the well location were completed on November 3, 2010 and July 18, 2012. The surveys consisted of a visual assessment of the length of Amos Drainage Works channel from 2nd Line SW to Hwy 89 noting channel dimensions, general morphological characteristics, presence of fish and habitat for fish, flow conditions, etc.

A field review of vegetation resources was conducted on January 18, 2012 and verified on July 18, 2012. Vegetation communities were classified using a combination of the first version and the recently updated *Ecological Land Classification* (ELC) *System for Southern Ontario* (Lee et. al. 1998; draft update 2011). Searches for Butternut within the Project footprint were also conducted during the field surveys. The vegetation features are mapped on Figure 6.2.2-1.

Species specific surveys were conducted for SAR that have the potential to inhabit the Project footprint. Specific SAR surveys included visual searches on January 18 and July 18, 2012 for Butternut and other potential SAR plant species that may occur within the footprint of the Project. It was also determined that there was potential for SAR grassland birds (bobolink, eastern meadowlark and barn swallow) in the Project study area Three breeding bird surveys were conducted by a qualified avian specialist on May 24, June 14 and July 5, 2012. Surveys consisted of ten-minute point counts, and area searches. All wildlife and wildlife sign observed during the field surveys were recorded including tracks, nests and vocalizations.



LEGEND

- City / Town
- Proposed Well Site
- Well 5/6
- Railways
- Utility Line
- Watercourses
- Town Boundary
- Wooded Areas
- Proposed Watermain
- Waterbody
- LIO Wetland

REFERENCE

- Cold, Intermittent (GRCA)
- Cold, Permanent (GRCA)
- Cool, Intermittent (GRCA)
- Cool, Permanent (GRCA)
- Unknown, Intermittent (NVCA, GRCA)
- Unknown, Permanent (NVCA, GRCA)
- Warm, Intermittent (NVCA)
- Warm, Permanent (NVCA)
- Cool/Cold, Intermittent (NVCA)
- Cool/Cold, Permanent (NVCA)
- Watershed Divide (MNR LIO 2009)
- Ecological Study Area

Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4 Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2008, Nottawasaga Valley Conservation Authority and Grand River Conversvation Authority
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

1,000 500 0 1,000 2,000 3,000
SCALE 1:75,000 METRES

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT
FOR ADDITIONAL WATER SUPPLY

TITLE
NATURAL FEATURES

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	RPM	17 Feb. 2011		
GIS	BC	9 Jul. 2012		
CHECK	MK	9 Jul. 2012		
REVIEW	MK	9 Jul. 2012		

FIGURE: 6.2-1

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6.2.2 Existing Ecological Conditions

Field and background information has been compiled to provide a description of the natural features within and surrounding the study area. It has also been used to determine potential aquatic and terrestrial sensitivities associated with the Project and to recommend mitigation measures to reduce impacts to these features.

6.2.2.1 Fish and Fish Habitat

The proposed well site and watermain route are located within the Grand River watershed, specifically in the Willow Brook subwatershed. The zone of influence surrounding the Project site is mainly within the Willow Brook subwatershed and marginally within the Nottawasaga River watershed. The north edge of the zone of influence extends into a very small portion of the headwater wetlands of the Boyne River.

The headwater areas of Willow Brook in which the Project site is located consists of a series of anthropogenically modified agricultural drains. It appears that the main headwater tributary known as the Amos Drainage Works, north of Highway 89 and No. 48 Drainage Works south of Highway 89 is the main watercourse in the vicinity of the Project site. The proposed watermain crosses the Amos Drainage Works, at two locations; one crossing is near the proposed well site adjacent to 2nd Line SW and the other is adjacent to the Highway 89 crossing. The Amos Drainage Works travels adjacent to and through a portion of the Willow Brook Wetland Complex on the north side of Highway 89. On the south side of Highway 89, the drain is referred to as No. 48 Drainage Works [MNR, 2000] and these reaches also flow through portions of the Willow Brook Wetland Complex.

A field review of aquatic resources in the Amos Drainage Works was completed on November 3, 2010 and July 17, 2012. Within the reaches of Amos Drainage Works that flow from 2nd Line SW to the Highway 89 crossing, the channel passes through wetland communities that are part of the Willow Brook Wetland Complex. The channel has been historically straightened and is subject to on-going maintenance activities to promote drainage of the surrounding lands.

For the purposes of aquatic habitat characterization, Amos Drainage Works is divided into three reaches as depicted on Figure 6.2-1. Reach 1 is located downstream of the 2nd Line southwest crossing to the right angle bend approximately 1 km downstream. The dug channel is 4 to 6 m wide with bank heights up to 3 m. The abundant growth of cattail, willow shrubs and terrestrial grasses throughout the channel indicates that this reach likely only flows after storm events and during spring runoff. At the time of the November 2010 field survey there was very low flow and shallow water in the channel. During the July 2012 field investigation the channel in this reach was completely dry. There were no fish observed nor is there potential for fish habitat in this reach due to these conditions.

Reach 2 of the Amos Drainage Works is located within the wetland complex. This reach is deeper than Reach 1 and contained water at the time of the field reviews. This wetland reach contains an abundance of watercress growth, which is considered an indicator of groundwater seepage. In association with the fact that it contained water in July 2012 during drought conditions, this reach contains permanent fish refuge habitat. Numerous cyprinids were observed in this section of the drain during the field reviews. The water balance for Amos Drain (Willow Brook) indicates that there is minimal, if any flow in the reaches upstream of Highway 89 during the summer months (June-September). Based on the water balance result and field observations, the pooling within the wetland reach (Reach 2) is at equilibrium with the water level in the wetland.

During the November 2010 aquatic survey, Reach 3 contained very low flows and shallow water. During the July 2012 survey, a beaver dam was constructed at the inlet of the culvert under Highway 89 which created pooled water upstream of the highway in both Amos Drain and Gordon Drain which runs along the north side of Highway 89. This pooled water provided refuge for fish at the time of this survey. The water balance for Amos Drain (Willow Brook) indicates that there is minimal, if any flow in the channel at Highway 89 during the summer months (June-September). Much like Reach 1, Reach 3 is heavily modified by agricultural practices and if not for the beaver dam, likely doesn't contain water during low flow conditions.

The Amos Drainage Works is classified as permanent, coldwater in the NRVIS database and Class 'C' according to the DFO Drain Classification, which indicates "warm water with no top predators" [GRCA, 2011]. The No. 48 Drainage Works is classified as permanent, coolwater in the NRVIS database and Class 'D' immediately downstream of Highway 89 and Class 'E' downstream of 20th Sideroad, which indicates "cold/cool water with no trout/salmon/predators present" and "warm water, top predators present, no channelization within 10 years", respectively [GRCA, 2011]. The Grand River Fisheries Management Plan also notes that the absence of groundwater discharge areas upstream of Grand Valley limits the fish communities to either warm water or cool water [GRCA, 1998]. The wetland evaluation record for the Willow Brook Wetland Complex indicates it is considered a locally significant area for fish spawning and rearing and that there is a commercial baitfish license for this wetland [MNR, 1983].

The Amos and No. 48 Drainage Works were both assessed by MNR field staff in the summer of 2000. The fish species identified in these two drains are shown in Table 6.2.3.3-1. All fish species identified within Amos and No. 48 Drainage Works are widespread across southern Ontario and not designated provincially or federally.

Table 6.2.3.3-1: Fish Species Identified in Amos and No. 48 Drainage Works by MNR (2000)

Common Name	Scientific Name
Amos Drainage Works (North of Highway 89)	
Brassy minnow	*Hybognathus hankinsoni*
Brook stickleback	*Culaea inconstans*
Northern redbelly dace	*Chrosomus eos*
Common shiner	*Notropis cornutus*
Fathead minnow	*Pimephales promelas*
Creek chub	*Semolitus atromaculatus*
Blacknose dace	*Rhinichthys atratulus*
Johnny darter	*Etheostoma nigrum*
Central mudminnow	*Umbra limi*
Iowa darter	*Etheostoma exile*
No. 48 Drainage Works (South of Highway 89)	
Creek chub	*Semolitus atromaculatus*
White sucker	*Catostomus commersonii*
Central mud minnow	*Umbra limi*
Blacknose dace	*Rhinichthys atratulus*
Johnny darter	*Etheostoma nigrum*

Common Name	Scientific Name
Brook stickleback	*Culaea inconstans*
Rainbow darter	*Etheostoma caeruleum*

Additional aquatic resources within the Project study area include Walter's Creek. The proposed watermain crosses Walter's Creek (also known as John Theaker Drain) at Highway 89, near the connection to Well 5/6 (Figure 6.2-1). This drain is part of the Boyne River subwatershed. The reach of Walters Creek that will be crossed by the proposed watermain is classified as intermittent [NVCA, 2010]. Walters Creek eventually becomes thermally classified as a coldwater watercourse approximately 2 km downstream of Highway 89, north of the Town of Shelburne [NVCA, 2010].

6.2.2.2 Vegetation Resources

The study area is located within the northeastern boundary of the Dundalk Till Plain in the headwaters of the Grand River. The plain is characterized by swamps and poorly drained depressions [Chapman and Putnam, 1984]. The majority of the study area is located within the Upper Grand River subwatershed. According to the Grand River Fisheries Management Plan, much of the upper watershed was once composed of wetlands [GRCA 1998]. Historic agricultural practices modified the area and it now consists of a network of drains and anthropogenically influenced wetlands.

The main natural feature in the vicinity of the proposed well and water main route is the Willow Brook Wetland Complex, a non-Provincially Significant Wetland made up of the former Willow Brook Swamp and Melancthon #38 wetlands [MNR, 2012]. This wetland is mapped on Figure 6.2.2-1. This wetland complex with an areas of 591 ha is located within the Grand River and Nottawasaga River watersheds. The wetland communities in proximity to the Project are depicted on Figure 6.2.2-1. Willow Brook Wetland Complex made up of two wetland types (swamp and marsh). Approximately 75% of the wetland communities are dominated by deciduous trees, 23% dominated by tall shrubs, 1% dominated by robust emergent vegetation and 1% coniferous trees. The Willow Brook wetland is palustrine with permanent outflow in the Amos Drainage Works/No. 48 Drainage Works. The Wetland Evaluation [MNR, 1983] indicates that there are localized areas of disturbance within Willow Brook Swamp, including channelization.

The Town's Official Plan does not indicate any significant woodlots within the study area [Town of Shelburne, 2006]. The majority of the study area is used for agriculture. The proposed well site is located within a former agricultural field that is now left fallow with the growth of grasses and other herbaceous plants and primary succession with the growth of scattered shrubs. The proposed watermain route is located within the road right-of-way of 2nd Line southwest and Highway 89 which consists of regularly maintained growth of grasses and other herbaceous plants. There were no rare vegetation communities observed within and surrounding the Project site. There were no rare plant species observed within and surrounding the Project site. Details of the vegetation field surveys are contained in Appendix C and ELC communities are illustrated on Figure 6.2.2-1.

6.2.2.3 Wildlife and Wildlife Habitat

The wetland evaluation record for Willow Brook Wetland Complex indicates the wetland provides wildlife habitat for common Ontario wildlife species such as muskrat (*Ondatra zibethicus)*, raccoon (*Procyon lotor)*, beaver (*Castor canadensis)*, mink (*Neovison vison)*, coyote (*Canis latrans)* and fox (*Vulpes vulpes*). The Willow Brook Wetland Complex also provides winter cover for wildlife and is referred to as locally significant for deer [MNR, 1983].

OBBA data were reviewed and compiled for the study area to provide a broad context of the breeding bird community in the general area and the potential for rare species. Two 10 km x 10 km OBBA data squares (17NJ58 and 17NJ68) encompass the study area. A full list of species observed in these two data squares is presented in Appendix C. In total, 108 bird species were recorded as exhibiting some level of breeding evidence in these two squares [Bird Studies Canada, 2011]. Of these, 42 species were *confirmed* breeders [Bird Studies Canada, 2011]. However, this data should be interpreted with caution since the OBBA data squares cover a much larger area than the study area, and include large tracts of wetland to the north and east. Hence, data from the two OBBA data squares does not necessarily indicate occurrence in the study area.

Of the *confirmed* breeding species within the two OBBA data squares, two species are designated SAR: Eastern Meadowlark (*Sturnella magna*) and Barn Swallow (*Hirundo rustica*). Both birds are threatened species (THR) both federally (listed on Schedule 1 of the *Species at Risk Act* (SARA)) and provincially (protected under sections 9 and 10 of Ontario's *Endangered Species Act* (ESA)). These are discussed further in Section 6.2.3.2.

6.2.2.4 Species of Conservation Concern

A review of various background data sources (NHIC, range maps, OBBA) and a follow-up with the Midhurst District MNR Species At Risk (SAR) Biologist [Benvenuti, 2012] (pers. comm. J. Benvenuti 2012) and NVCA staff indicates the possible presence of 19 species of conservation concern within the general study area. The SAR list can be found in Appendix C. Some of these species have not been observed in several decades and may no longer be present in the general study area. Others may be present in the general study area, but suitable habitat does not occur within the proposed well and watermain sites.

The following summarizes the background information gathered on Species of Conservation Concern in the study area:

- There are records of Butternut (*Juglans cinerea*) and American ginseng (*Panax quinquefolius*) in the general study area.
- One reptile species, Blanding's turtle (*Emydoidea blandingii*) has been recorded within the general study area. MNR has indicated the potential for three other reptile species of conservation concern; Snapping turtle (*Chelydra serpentine*), Milksnake (*Lampropeltis triangulum*), and Eastern Ribbonsnake (Great Lakes population) (*Thamnophis sauritis*).
- Seven bird species of conservation conern have been recorded within the general study area and vicinity. They are Bobolink (*Dolichonyx oryzivorus*), Eastern Meadowlark, Barn Swallow, Canada warbler (*Wilsonia canadaensis*), Chimney swift (*Chaetura pelagic*), Least Bittern (*Ixobrychus exilis*) and Henslow's sparrow

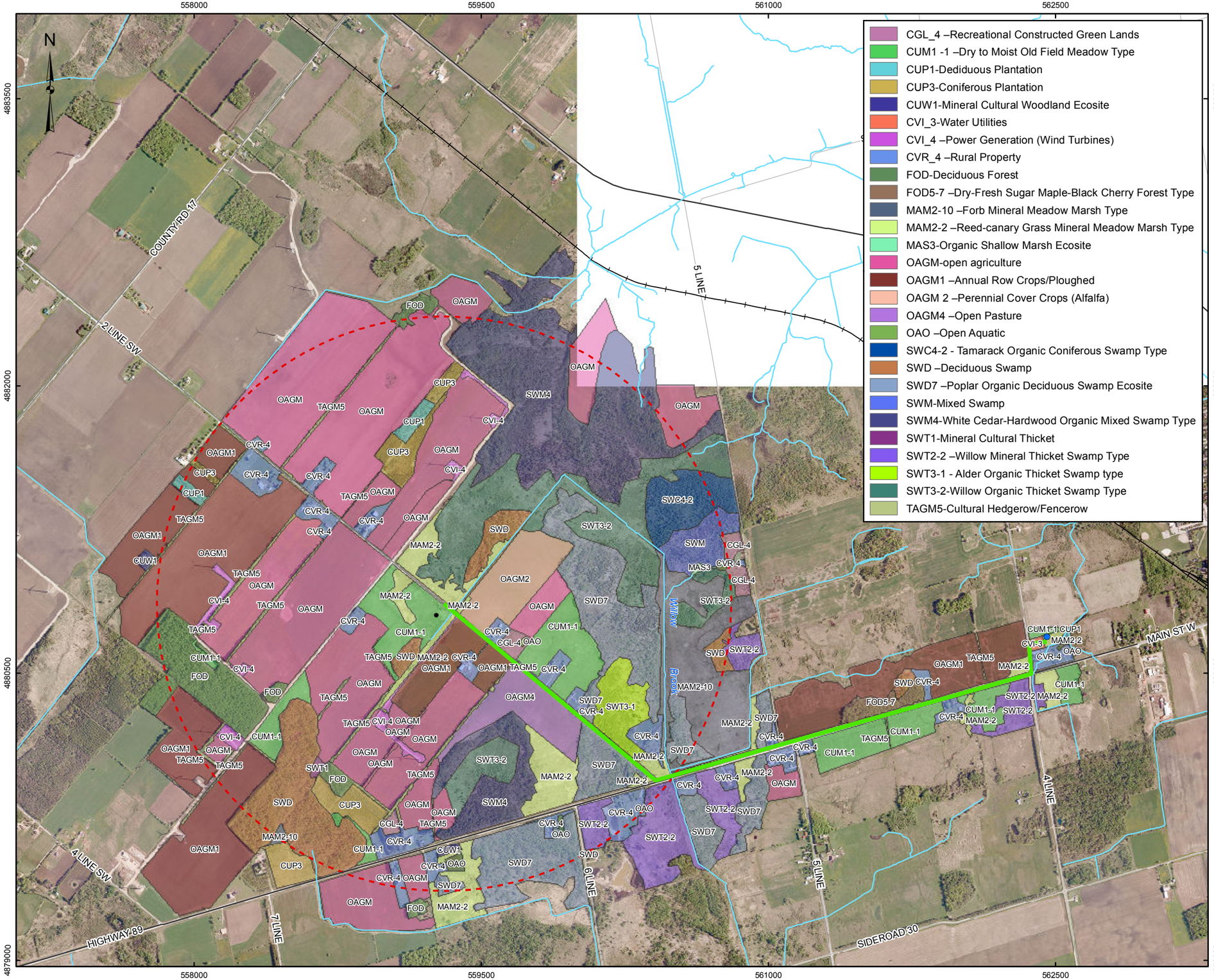
(*Ammodramus henslowii*), NHIC records for Least bittern and Hooded warbler are more than 30 years old [NHIC, 2011].

- The ranges of two arthropods species of conservation concern encompass the general study area; Monarch (*Danaus plexippus*) and West Virginia white (*Pieris virginiensis*).
- Suitable habitat for a number of these species is not available for the Project site. These species are American ginseng, Canada warbler, Least bittern, and West Virginia white.

The DFO Aquatic Species At Risk mapping was used to determine the potential for aquatic species of conservation concern in the study area [Conservation Ontario website, 2011]. This mapping does not indicate the potential presence of any aquatic SAR in the watercourses that occur within the study area. The NHIC database contained a record for Redside dace in the local study area; however, staff at the NVCA and the MNR indicated that Redside dace is no longer found within the local watercourses [Featherstone, 2011; Benvenuti, 2012].

Species specific field investigation results indicate that there are no Butternut or other plant SAR records within the Project footprint or in areas adjacent. The breeding bird survey results indicate breeding activity of Bobolink and Eastern meadowlark within the fallow field where the pumphouse is located. The evidence establishes this field as *Probable Breeding* habitat. Bobolink and Eastern meadowlark were also observed in various pastures and old fields along the length of the watermain route. At least one pair of Barn swallows are nesting in the culvert at the intersection of Hwy 89 and 4th Line Road. These three bird species are listed as Threatened on the Species At Risk in Ontario (SARO) list and thus are protected under the Ontario *Endangered Species Act (ESA)*. Documentation of the results of these surveys is being reported to the MNR in an *Information Gathering Form* as part of the ESA due diligence process. These birds are also protected under the *Migratory Bird Convention Act, 1994*. To avoid the incidental take of migratory birds, activities affecting their breeding habitat should be avoided during the core breeding period, from May 1 to July 31.

Although there were no observations during Golder's field investigation, there is suitable habitat within the Project footprint that could support milksnake, eastern ribbonsnake (Great Lakes population) and monarch butterfly (all listed as Special Concern under both the ESA and SARA). Appropriate mitigation measures will be required during construction to provide the mitigation necessary to avoid killing, harming or harassing these species during construction.



LEGEND

- Proposed Well Site
- Existing Well 5/6
- Proposed Watermain
- Watercourses
- Railways
- Highway
- Major Road
- Local Road
- Hydrogeologicial Study Area

REFERENCE

Base Data - MNR LIO, obtained 2009
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2012
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

300 150 0 300 600
SCALE 1:20,000 METRES

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT
FOR ADDITIONAL WATER SUPPLY

TITLE
ECOLOGICAL LAND CLASSIFICATION

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	EG	8 Feb. 2012	FIGURE: 6.2.2-1	
GIS	BC	9 Jul. 2012		
CHECK	MK	9 Jul. 2012		
REVIEW	MK	9 Jul. 2012		

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6.3 Atmospheric Environment

6.3.1 Climate Conditons

The climate of Shelburne is humid continental climate with large seasonal variation in temperatures. Summers are fairly warm and humid and during periods of hot weather, high humidity is often an aggravating factor, pushing humidex temperatures into the lower 40 Celsius range. The Great Lakes have an impact on the local climate of Shelburne in particular moderating the temperatures in all season, preventing exceptionally cold or hot periods.

As for overall precipitation south central Ontario is located across one of North America's major storm tracks. As a result, when high and low pressure systems move over the study they bring great variation in the day-to-day weather. The majority of weather systems travel through the province every two to five days during the year. Periods of active weather rarely last long. The majority of precipitation falls in May through September with showers and thunderstorms in the summer season. In Winter, the majority of precipitation falls with low pressure systems and weather fronts and locally developed “lake effect” snows generated from Georgian Bay and Lake Huron.

The closest Environment Canada weather station with a 30 year period of record is the Orangeville MOE climate station. This station was used because it has more than 30 years of continuous Meteorological data (from 1971 to current) and has similar elevation to the project area. It is located at an elevation of 411.5 masl, and is at 43°55'.06.0" N Latitude and -80°05' 11.0" W Longitude. The Orangeville MOE climate station is approximately 20km to the SSE of the Shelburne area. The following parameters are measured at the Orangeville MOE climate station; temperature and precipitation.

6.3.1.1 Temperature

Table 6.3.1.1-1 and 6.3.1.1-2 presents the temperature data obtained from Environment Canada’s 1971-2000 climate normals for the Orangeville meteorological station. Table 6.3.1.1-1 shows monthly values and extremes, and Table 6.3.1.1-2 shows seasonal values. Figure 6.3.1.1-1 presents the monthly temperatures in graphical form for Trenton, displaying daily average, maximum and minimum and extreme values over the calendar year.

Table 6.3.1.1-1: Monthly Temperature Normals for Orangeville, Ontario

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average (°C)	-8.0	-7.3	-2.3	4.9	11.8	16.5	19.1	18.3	14.0	7.8	1.6	-4.7	6.0
Standard Deviation (°C)	2.8	2.8	2.4	2.0	2.1	1.4	1.1	1.3	1.1	1.7	1.6	2.6	0.9
Daily Maximum (°C)	-3.9	-3.0	2.4	10.0	17.8	22.5	25.0	24.0	19.3	12.5	5.1	-1.2	10.9
Daily Minimum (°C)	-12.1	-11.7	-7.0	-0.3	5.7	10.6	13.1	12.5	8.6	2.9	-1.9	-8.1	1.0
Extreme Maximum (°C)	13.0	13.0	22.5	28.5	31.1	34.0	35.0	35.5	32.2	28.3	22.8	18.0	35.5
Extreme Minimum (°C)	-36.0	-36.5	-34.4	-20.0	-6.1	-2.2	0.6	-1.1	-5.6	-10.6	-18.0	-33.0	-36.5
Days with Temp. Above 30°C	0	0	0	0	0	1	2	1	0	0	0	0	4
Days with Temp. Below -10°C	18	16	9	1	0	0	0	0	0	0	1	11	55

Table 6.3.1.1-2: Seasonal Temperature Normals for Orangeville, Ontario.

Parameter	Spring	Summer	Fall	Winter	Year
Daily Average (°C)	4.8	18.0	7.8	-6.7	6.0
Daily Maximum (°C)	10.1	23.8	12.3	-2.7	10.9
Daily Minimum (°C)	-0.5	12.1	3.2	-10.6	1.0
Extreme Maximum (°C)	31.1	35.5	32.2	18.0	35.5
Extreme Minimum (°C)	-34.4	-2.2	-18.0	-36.5	-36.5
Days with Maximum Temperatures Above 30°C	0	4	0	0	4
Days with Minimum Temperatures Below -10°C	9	0	1	44	55

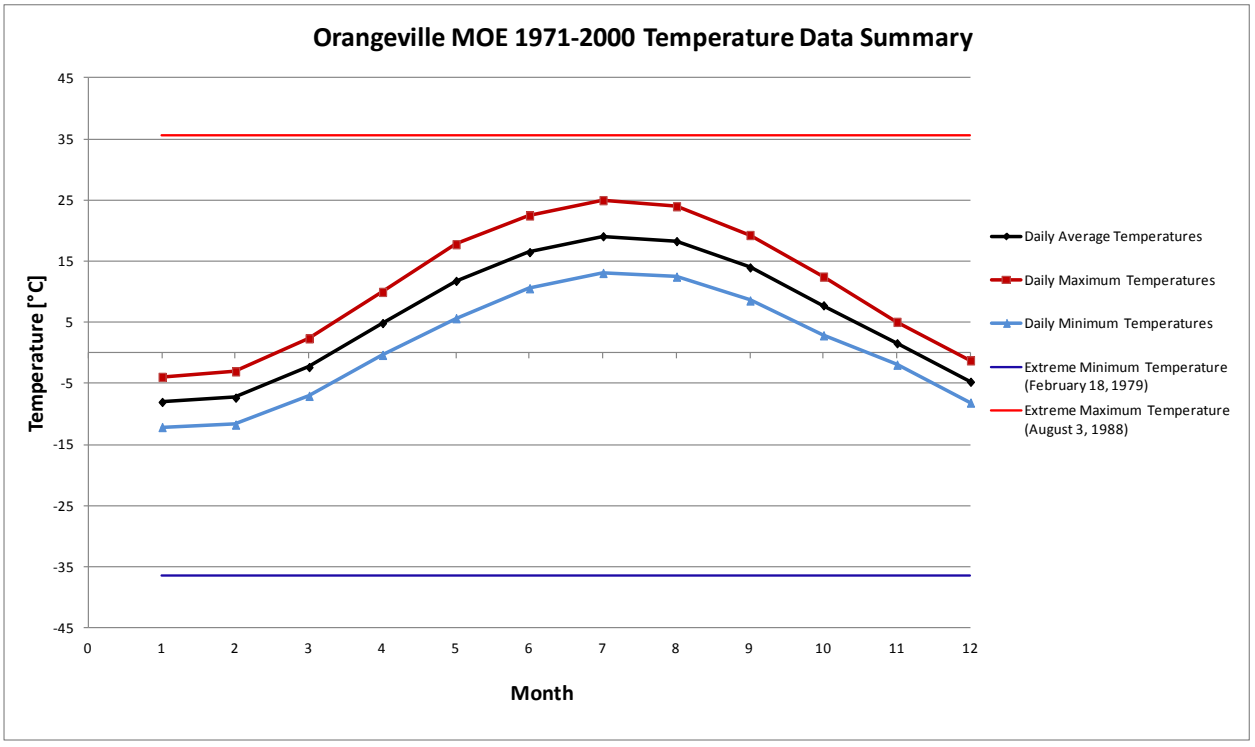


Figure 6.3.1.1-1: Monthly Temperatures Normals for Orangeville, Ontario.

6.3.1.2 Precipitation

Table 6.3.1.2-1 and 6.3.1.2-2 presents the precipitation data obtained from Environment Canada's 1971-2000 climate normals for the Orangeville MOE climate station. Table 6.3.1.2-1 shows monthly values and extremes, and Table 6.3.1.2-2 shows seasonal values. Figure 6.3.1.2-1 presents the monthly precipitation in graphical form for Trenton, displaying total rainfall, snowfall and all time extreme values over the calendar year.

Table 6.3.1.2-1: Monthly Precipitation Normals for Orangeville, Ontario

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall (mm)	24.2	20.8	42.0	61.7	78.9	83.9	75.3	95.6	83.7	67.8	66.6	31.2	732
Snowfall (cm)	41.1	30.1	23.8	8.3	0.4	0.0	0.0	0.0	0.0	3.2	15.2	38.1	160
Precipitation (mm)	65.2	50.9	65.8	69.9	79.3	83.9	75.3	95.6	83.7	71.0	81.8	69.3	892
Extreme Daily Precipitation (mm)	35.3	38.6	41.7	37.0	59.1	59.7	59.7	83.8	65.0	45.0	56.6	37.3	—
Days with Measurable Precipitation	15	11	12	12	12	12	10	12	12	13	15	15	149

Table 6.3.1.2-2: Seasonal Precipitation Normals for Orangeville, Ontario

Parameter	Spring	Summer	Fall	Winter	Year
Rainfall (mm)	182.6	254.8	218.1	76.2	731.5
Snowfall (cm)	32.5	0.0	18.4	109.3	160.2
Precipitation (mm)	215.0	254.8	236.5	185.4	891.7
Extreme Daily Precipitation (mm)	59.1	83.8	65.0	38.6	—

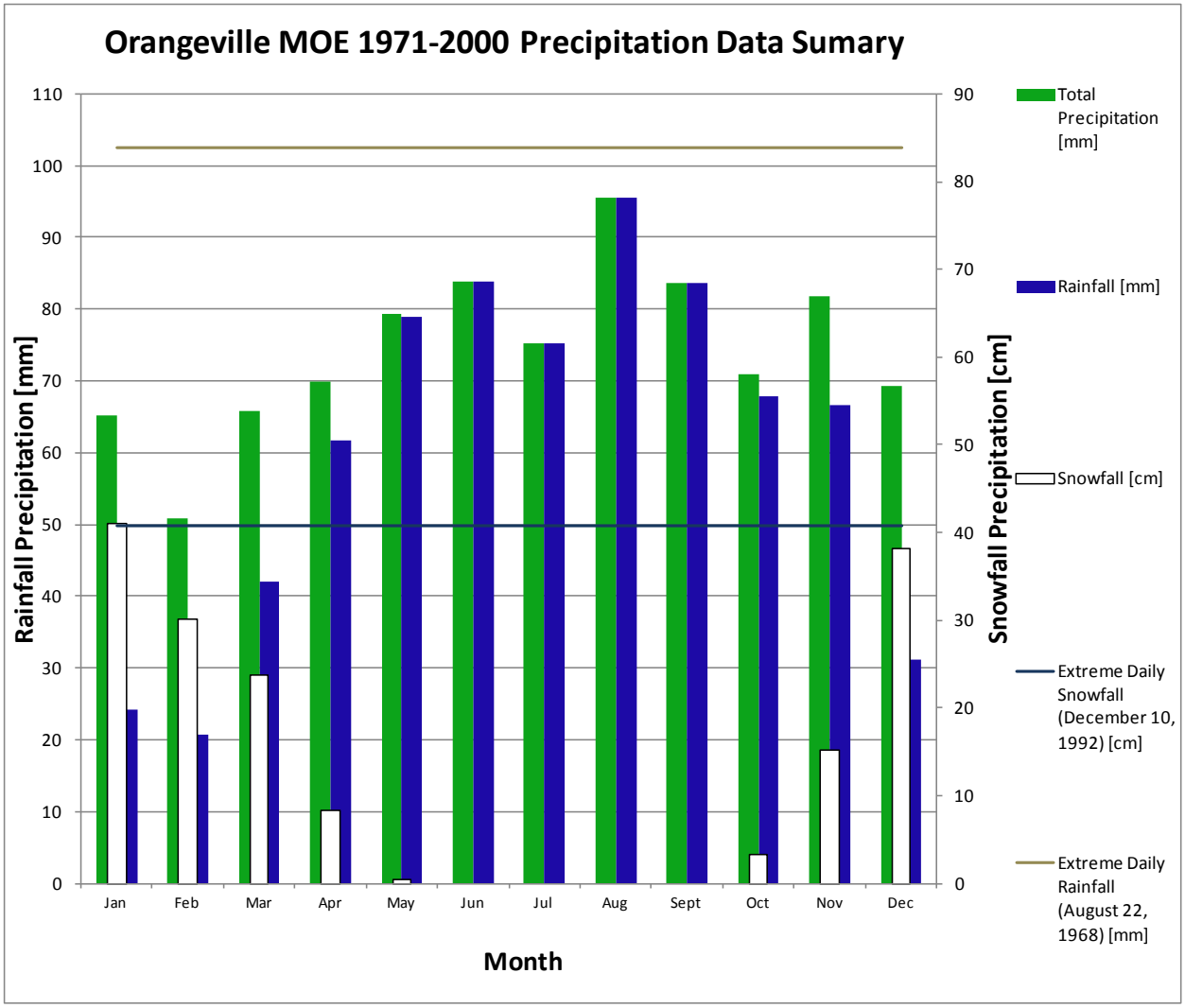


Figure 6.3.1.2-1: Monthly Precipitation Normals for Orangeville, Ontario.

6.3.1.3 Wind

Table 6.3.1.3-1 presents the monthly wind data obtained from Environment Canada's 1971-2000 climate normals for Waterloo Wellington Airport meteorological station. Waterloo Wellington Airport was chosen for its long term wind data (over 30 years). Waterloo Wellington Airport is located approximately 70 km to the SSW of Shelburne area at 43°27'00.000" N, 80°23'00.000" W, with an elevation of 317.0 masl. The prevailing yearly wind direction is west at 12.6 km/hr. Table 6.3.1.3-1 presents the monthly and annual average wind including hourly wind and wind gust.

Table 6.3.1.3-1: Monthly Wind Normals for Waterloo Wellington Airport, Ontario.

Period	Average Speed (km/h)	Most Frequent Direction	Maximum Hourly Speed (km/h)	Maximum Gust Speed (km/h)	Direction of Maximum Gust
Jan	15.4	SW	70	113	S
Feb	14.0	W	67	102	SW
Mar	14.9	W	74	120	S
Apr	14.9	W	72	98	SW
May	12.3	W	71	106	SW
Jun	10.9	W	52	89	W
Jul	9.6	W	52	111	W
Aug	8.7	W	45	98	NW
Sep	9.8	W	53	89	W
Oct	11.5	W	63	96	SW
Nov	14.2	SW	66	100	SW
Dec	14.6	SW	61	96	SW
Year	**12.6**	**W**	–	–	–

6.3.2 Air Quality

In Ontario, limits and guidelines for regulating air quality are established under O. Reg. 419/05 (Air Pollution – Local Air Quality). These include standards, point-of-impingement (POI) guidelines and ambient air quality criteria (AAQC) for various compounds. The AAQC are commonly used in assessments of general air quality in a community, and the potential for causing an adverse effect, whereas the standards and POI guidelines are used to assess specific impacts of an individual facility for compliance and permitting requirements.

In addition, there are two (2) sets of Federal objectives and criteria; namely, the National Ambient Air Quality Objectives (NAAQOs) and the Canada-Wide Standards. The NAAQO's are benchmarks that can be used to facilitate air quality management on a regional scale, and provide goals for outdoor air quality that protect public health, the environment, or aesthetic properties of the environment (CCME, 1999). The Federal government has established the following levels of NAAQO's (Environment Canada, 2010):

- the maximum Desirable level defines the long-term goal for air quality and provides a basis for an anti-degradation policy for unpolluted parts of the country and for the continuing development of control technology; and

- the maximum Acceptable level is intended to provide adequate protection against adverse effects on soil, water, vegetation, materials, animals, visibility, personal comfort and well-being.

The Canada-Wide Standards are standards that have been developed under the Canada-wide Accord on Environmental Harmonization that provides common environmental standards across the country that are agreed upon by the individual Provinces and Territories. The Canada-Wide Standards process has been progressing for a limited set of compounds, namely ozone and fine particulate matter ($PM_{2.5}$), with the first set of Canada-Wide Standards for air quality was ratified by the Canadian Council of Ministers of Environment in June 2000.

A summary of the applicable Ontario and Canadian objectives and criteria are listed in Table 6.3.1-1.

Table 6.3.1-1: Canadian Regulatory Air Quality Objectives and Criteria

Substance	Averaging Periog	Ontario Criteria		Canada-Wide Standards[c]	National Ambient Air Quality Objectives[d]	
		Schedule 3[a]	Ambient[b]		Desirable	Acceptable
SPM (µg/m^3)	24-Hour	120	120	—	—	120
	Annual	—	60	—	60	70
PM_{10} (µg/m^3)	24-Hour	—	—	—	—	—
$PM_{2.5}$ (µg/m^3)	24-Hour	—	25	30[g]	—	—
NO_X (µg/m^3)	1-Hour	400[e]	—	—	—	—
	24-Hour	200[e]	—	—	—	—
NO_2 (µg/m^3)	1-Hour	—	400	—	—	400
	24-Hour	—	200	—	—	200
	Annual	—	—	—	60	100
SO_2 (µg/m^3)	1-Hour	690	—	—	450	900
	24-Hour	275	—	—	150	300
	Annual	—	—	—	30	60
CO (µg/m^3)	1-Hour	36,200	36,200	—	15,000	35,000
	8-Hour	15,700	15,700	—	6,000	15,000
O_3 (µg/m^3)	1-Hour	—	—	—	100	160
	8-Hour	—	—	128[f]	—	—
	24-Hour	—	—	—	30	50
	Annual	—	—	—	—	30

[a] MOE (2008a)
[b] MOE (2008b)
[c] CCME (2000)
[d] EC (2010)
[e] The Ontario limit for NO_X is based on Nitrogen Oxides, which are defined to be the sum of nitrogen dioxide (NO_2) and nitric oxide (NO).
[f] Compliance with the Canada Wide Standard is based on the 4th highest measurement annually, averaged over three consecutive years.
[g] Compliance with the Canada Wide Standard is based on the 98th percentile of the annual monitored data averaged over three years of measurements.
— = No guideline available; µg/m^3 = micrograms per cubic metre; SO_2 = sulphur dioxide; NO_2 = nitrogen dioxide; O_3 = ozone; CO = carbon monoxide; SPM = suspended particulate matter < 0.44 µm; PM = particular matter.

6.3.2.1 Background Air Quality

Background air quality was determined from data collected at MOE monitoring stations. There is no local air quality monitoring station available for Shelburne, Ontario; therefore the closest air quality monitoring stations located in Tiverton was used determine background air quality.

Ambient monitoring data for the SPM and PM_{10} size fractions is not readily available; however, an estimate of the background PM_{10} concentrations can be determined from the available $PM_{2.5}$ monitoring results. Fine particulate matter (i.e., $PM_{2.5}$) is a subset of the PM_{10}, and PM_{10} is a subset of SPM (see Figure 6.3.2.1-1). Therefore, it is reasonable to assume that the ambient concentrations of SPM will be greater than corresponding PM_{10} levels, and PM_{10} concentrations will be greater than the corresponding levels of $PM_{2.5}$. The overall levels

of $PM_{2.5}$ in Canada were found to be about 50% of the PM_{10} concentrations (CEPA/FPAC, 1998). By applying this ratio it will be possible to estimate the background PM_{10} concentrations for the region.

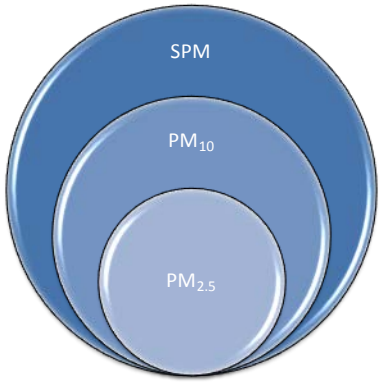
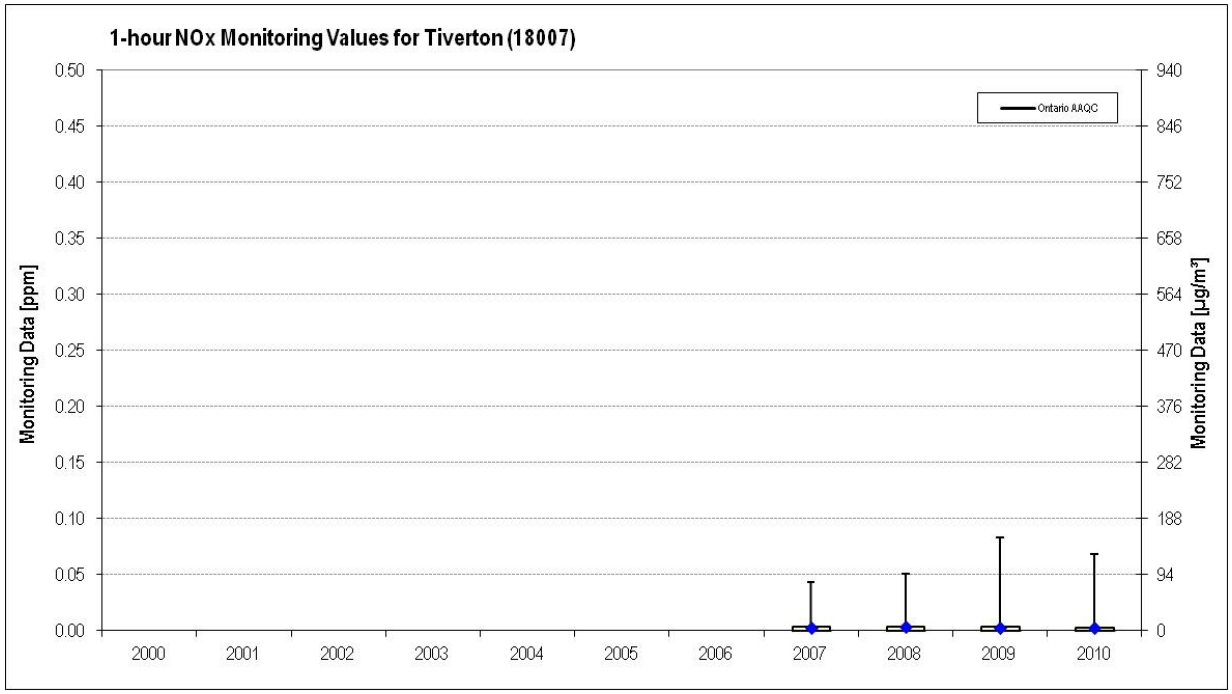
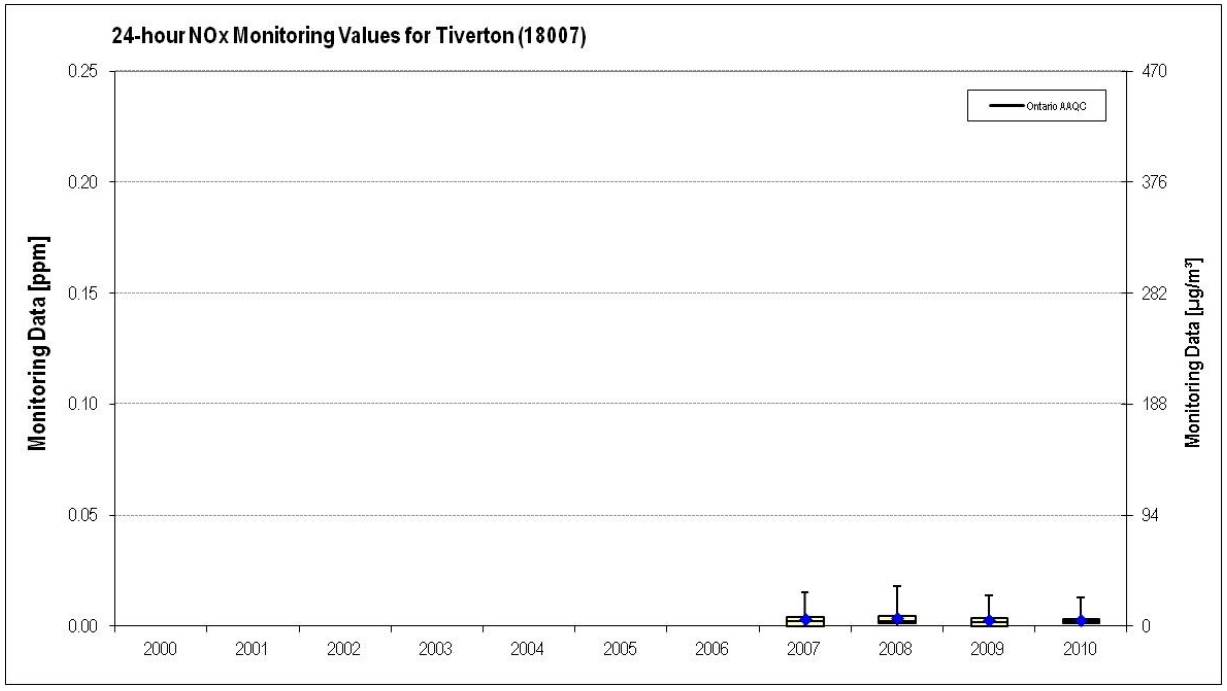


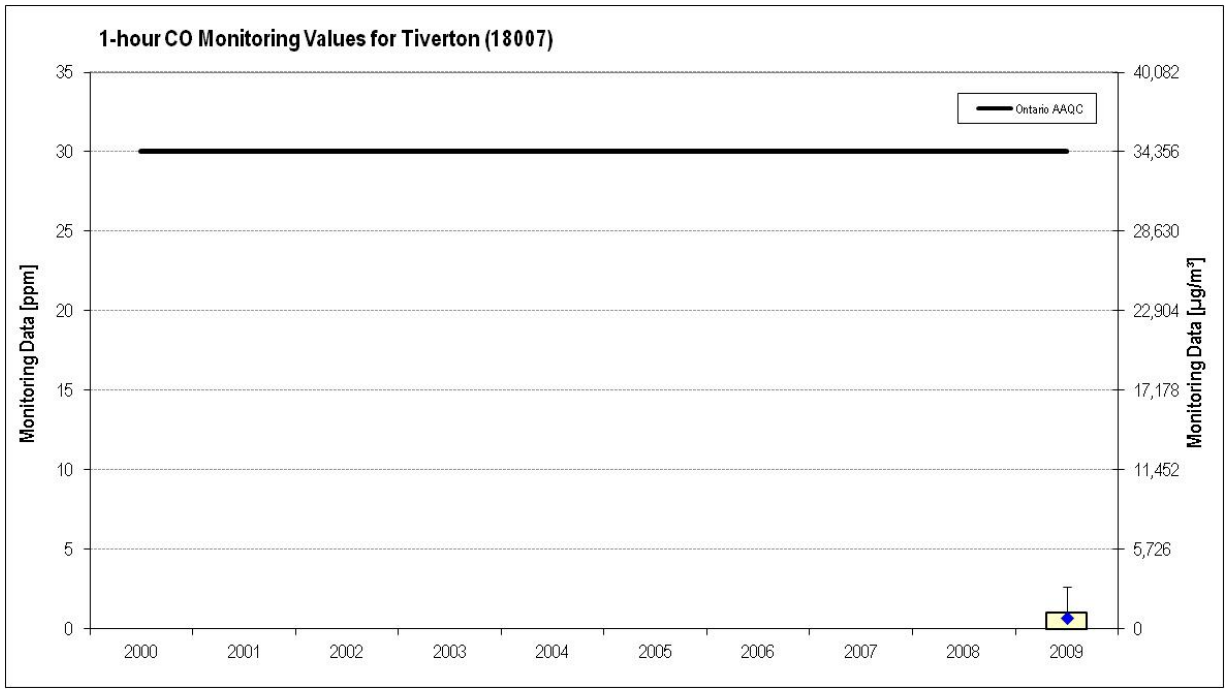
Figure 6.3.2.1-1: Relationship between SPM, PM_{10} and $PM_{2.5}$

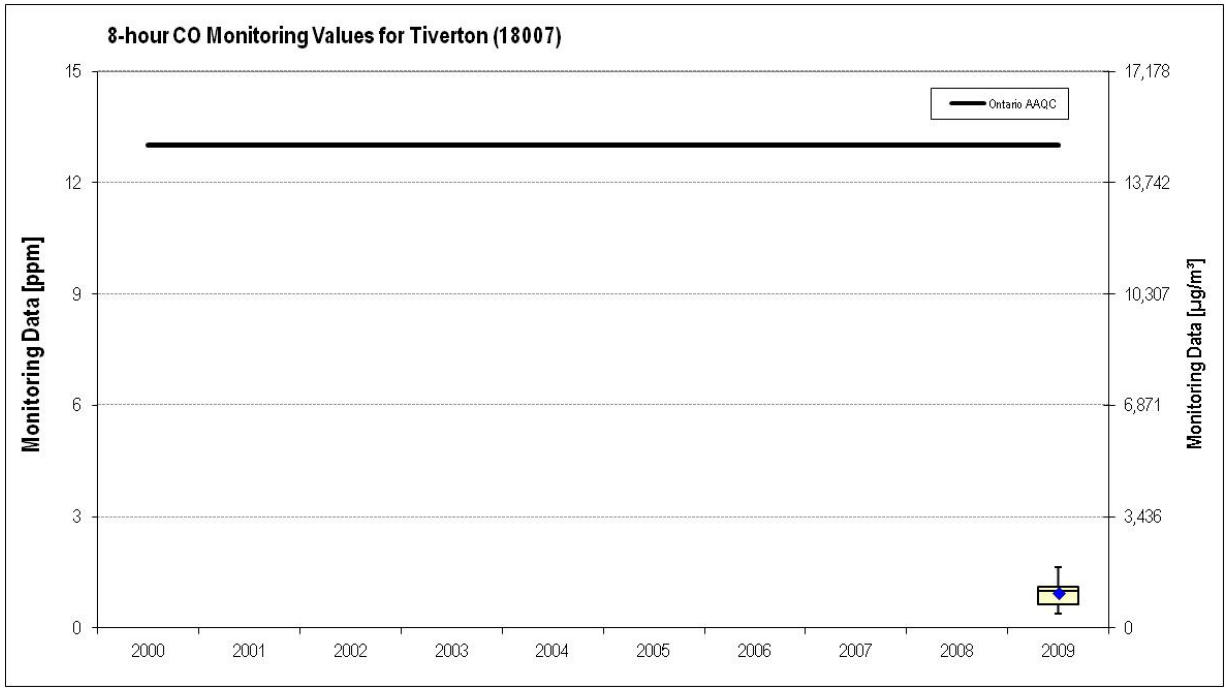
The available air monitoring data represents the combined effect of emissions from sources near to each of the monitoring stations, as well as the effect of the emissions transported into the region. The emissions transported into the region could be considered to be the 'background air quality', which would be added to the contribution locally. Based on feedback from regulators, and regulatory guidance (Alberta Environment, 2009), the 90th percentile of the available monitoring data is considered a conservative estimate of background air quality. For SPM and PM_{10}, the background air quality were scaled from the background $PM_{2.5}$ as described above.

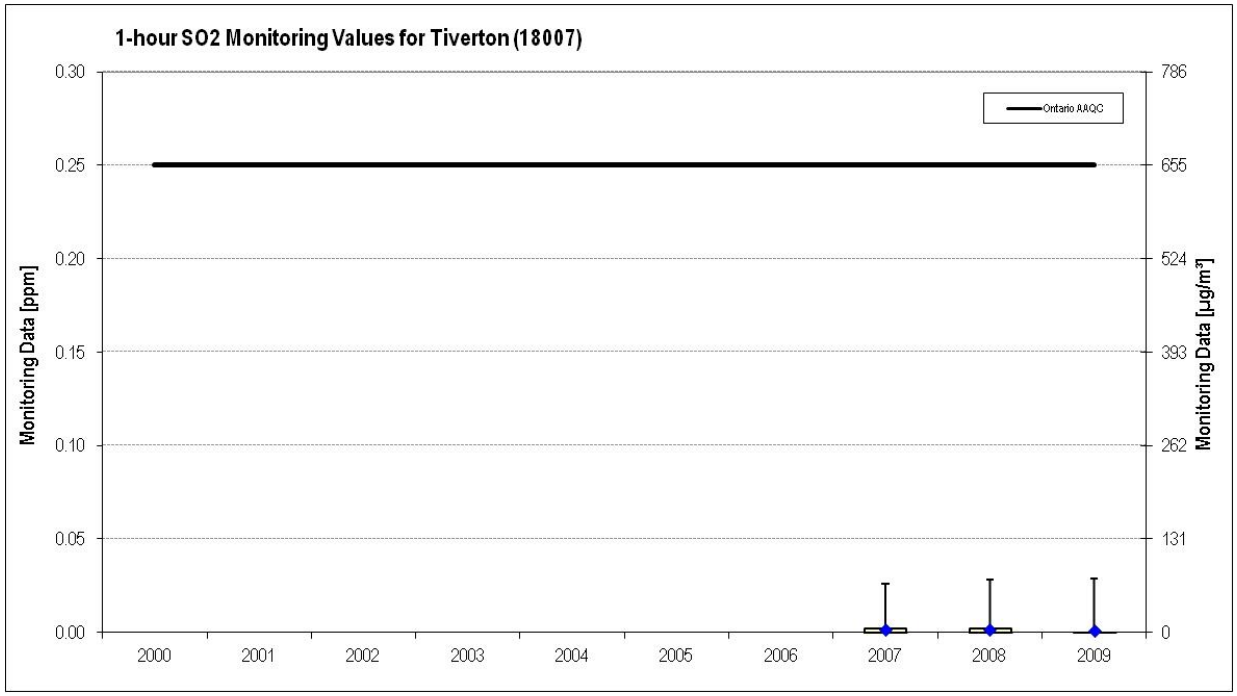
For all compounds, the average measured air quality is below the CWS for their respective components.

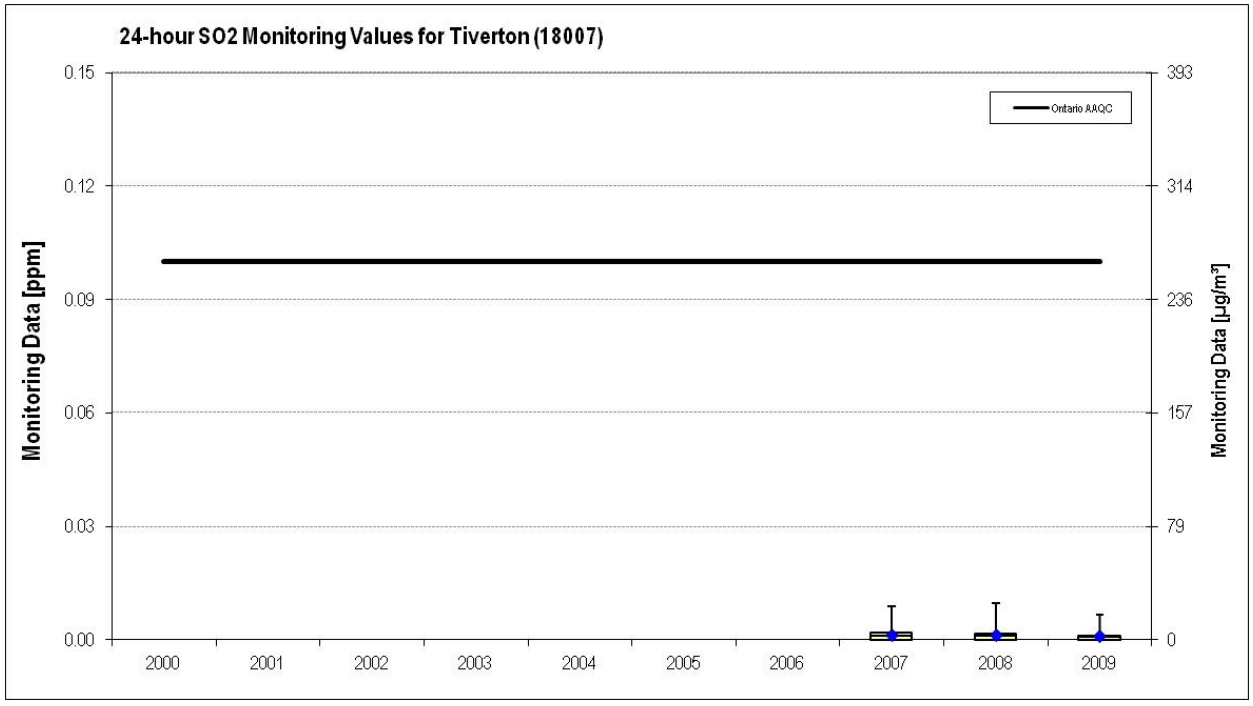


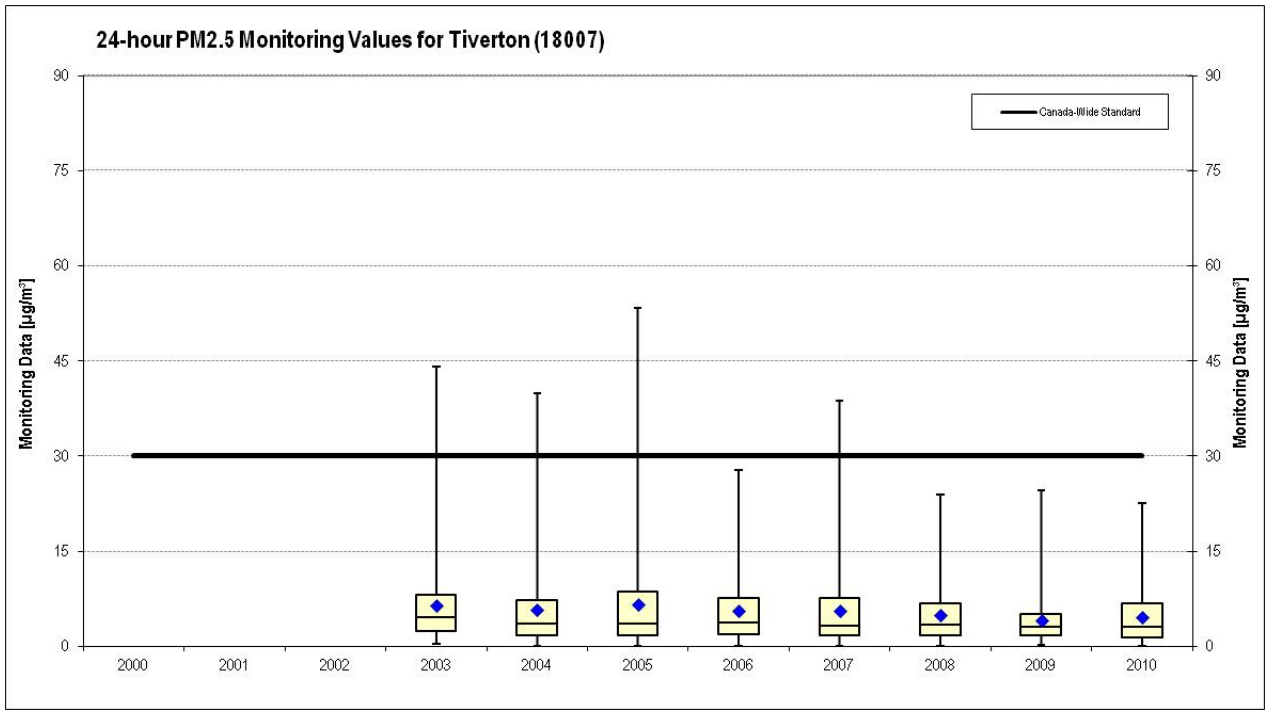

24-hour NOx Monitoring Values for Tiverton (18007)
Monitoring Data [ppm]
Monitoring Data [µg/m³]
Ontario AAQC
0.25
0.20
0.15
0.10
0.05
0.00
470
376
282
188
94
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

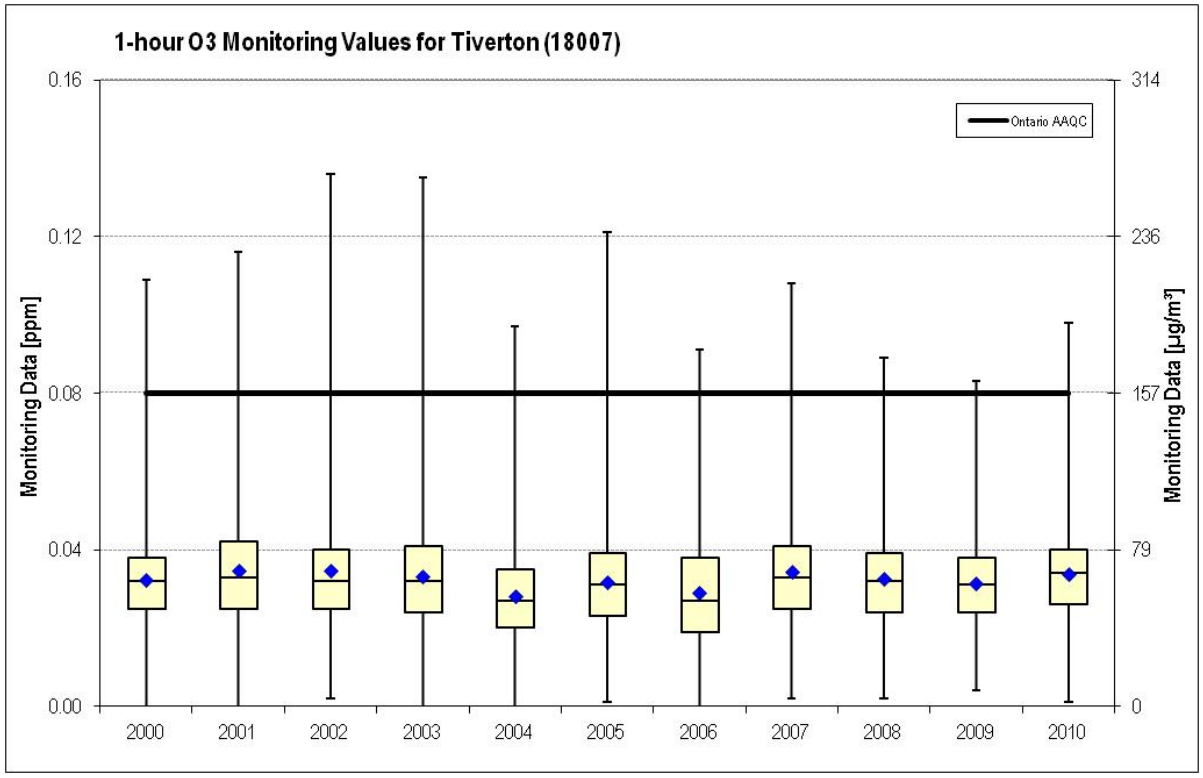

1-hour CO Monitoring Values for Tiverton (18007)
Monitoring Data [ppm]
Monitoring Data [µg/m³]
Ontario AAQC
35
30
25
20
15
10
5
0
40,082
34,356
28,630
22,904
17,178
11,452
5,726
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009

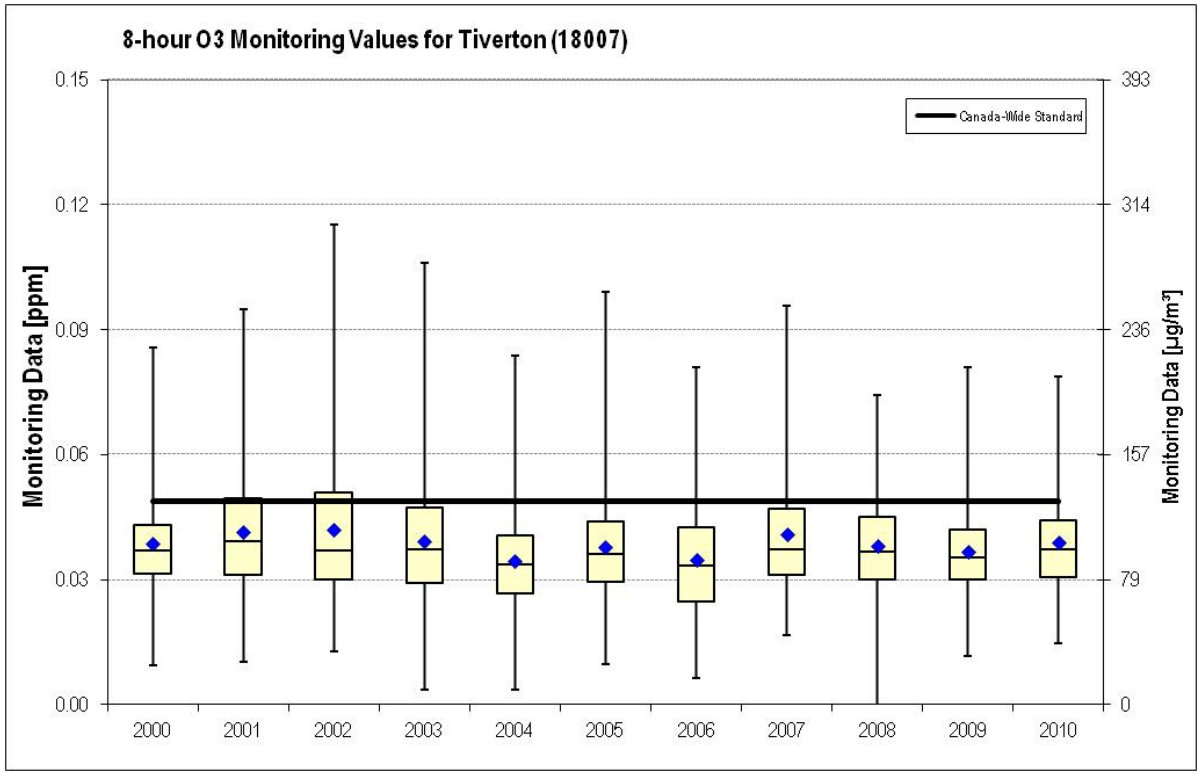

8-hour CO Monitoring Values for Tiverton (18007)
Ontario AAQC
Monitoring Data [ppm]
Monitoring Data [µg/m³]
15
12
9
6
3
0
17,178
13,742
10,307
6,871
3,436
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009


1-hour SO2 Monitoring Values for Tiverton (18007)
Ontario AAQC
Monitoring Data [ppm]
Monitoring Data [µg/m³]
0.30
0.25
0.20
0.15
0.10
0.05
0.00
786
655
524
393
262
131
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009


24-hour SO2 Monitoring Values for Tiverton (18007)
Monitoring Data [ppm]
Monitoring Data [µg/m³]
Ontario AAQC
0.15
0.12
0.09
0.06
0.03
0.00
393
314
236
157
79
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009


24-hour PM2.5 Monitoring Values for Tiverton (18007)
Monitoring Data [µg/m³]
Monitoring Data [µg/m³]
Canada-Wide Standard
90
75
60
45
30
15
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010


1-hour O3 Monitoring Values for Tiverton (18007)
Ontario AAQC
Monitoring Data [ppm]
Monitoring Data [µg/m³]
0.16
0.12
0.08
0.04
0.00
314
236
157
79
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010


8-hour O3 Monitoring Values for Tiverton (18007)
Canada-Wide Standard
Monitoring Data [ppm]
Monitoring Data [µg/m³]
0.15
0.12
0.09
0.06
0.03
0.00
393
314
236
157
79
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

6.3.3 Noise

The Ontario Model Municipal Noise Control By-law (Model By-law) [MOE, 1978] stipulates noise emission standards and sets sound level limits for existing and proposed stationary sources. According to the Model By-law, the study area is a Class 2 area, which is an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 areas, and in which a low ambient sound level, normally occurring between 23:00 and 07:00 in Class 1 areas will be realized as early as 19:00 hours. These areas are also characterized by an evening background sound level defined by natural environment and infrequent human activity and areas with no clearly audible sound from stationary sources other than those under impact assessment [MOE, 1978].

The MOE publication Sound Level Limits for Stationary Sources in Class 1 & 2 Areas [MOE, 1995] establishes sound level limits for Urban Areas. Table 6.3.3-1 summarizes the default values for allowable noise levels from a stationary source in a Class 2 area in the absence of site-specific baseline measurements. The statistical descriptor which has been selected for environmental noise effects assessments is the energy equivalent sound level, L_{eq}, measured in dBA.

Table 6.3.3-1: Minimum Values of One Hour L_{eq} (dBA) by Time of Day

Time of Day	One Hour L_{eq} (dBA)
07:00 – 19:00	50
19:00 – 23:00	45
23:00 – 07:00	45

Source: MOE, 1995

Noise in the study area is expected to be heavily influenced by road traffic during construction. In addition, noise levels within the study area are influenced by regular agricultural operations. The Town enacted By-law 45-2004 to prohibit and regulate noise. According to the by-law, noise associated with operation of equipment and construction is prohibited in quiet areas and residential areas between 23.00 and 07.00 hours. Both the Township of Amaranth and Township of Melancthon have enacted noise by-laws, By-law 43-2004 and By-law 31-2002, respectively. Both these by-laws state that excessive noise resulting from excavation construction work, lawn mowers and construction tools is not permitted between 11:00 pm and 6:00 am. However, excessive noise is not prohibited if the noise arises from necessary work being performed by the municipality or its agents or contractors.

Highway 89 is an east-west Provincial highway connecting Highway 9 in the west and Highway 400 in the east. Highway 89 is a well travelled through highway for commercial and reactional uses, as well as serving local connections for communities of Harriston, Mount Forest, Shelburne, Alliston and Cookstown. Within the Shelburne town limits, the road is under the Town's jurisdiction. The highway is generally a two-lane rural highway with a speed limit of 80 km/h.

A traffic study conducted by MTO [MTO, 2008] recorded traffic counts at Gordon Street on Highway 89 (at the western boundary of the town limits near existing wells 5/6). Average weekday daily traffic volumes in summer

were measured to be 5,210 vehicles (including 565 trucks), with approximately an even split between eastbound and westbound directions.

6.4 Socio-economic Environment

The Town of Shelburne is located in Dufferin County in Southwestern Ontario. According to the 2011 Census, the population of the Town of Shelburne was 5,846 persons. In 2006, the population was 5,149, indicating 13.5% increase over these five years [StatsCan, 2011]. It is expected that the population is continuing to grow at a rate of approximately 4% per year. The population of Dufferin County was 56,881 in 2011, and is expected to be increasing at a rate of approximately 2% per year.

The VECs for the socio-economic environment include human health, Aboriginal land and resources, and physical and cultural heritage resources. A description of the existing conditions of the socio-economic VECs is described in the following sections.

6.4.1 Human Health

Drinking water quality, air quality and noise are components of public health and safety considered to be potentially affected by the construction and operation of the project. The only constituent of concern previously identified in the Town's water supply is arsenic, and therefore, this forms the basis of the assessment on effects to public health and safety. The Town is currently in compliance with the ODWQS of 25 µg/L for arsenic under O. Reg. 169/03, the MOE has indicated that the ODWQS for arsenic could be reduced from 25 to 10 µg/L. If the ODWQS for arsenic is lowered to 10 µg/L, the Town would be out of compliance in some of their wells. As described by problem/opportunity statement in Section 3.1.1, the proposed well will provide a sustainable source of safe drinking water for Shelburne, as part of the existing SWSS, and will meet applicable standards of drinking water quality. Details on water quality of the proposed well are presented in the context of groundwater quality and quantity in Section 6.1.1.

Baseline noise and air quality conditions are described in Section 6.3.

6.4.2 Aboriginal Land Use and Resource Use

Aboriginal occupation of southern Ontario was heavily influenced by the dispersal of various Iroquoian-speaking peoples 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 [Schmalz 1991].

The Iroquois, or Haudenosaunee, are an association of Aboriginal peoples of North America. Iroquoian-speaking peoples of present-day central and upstate New York came together in an association known today as the Iroquois League, comprising the Mohawk, Oneida, Onondaga, Cayuga and Seneca nations. After the Tuscarora nation joined the League in 1722, the Iroquois became known as the Six Nations.

Today the Six Nations of the Grand River First Nation is the single most populated First Nation in Canada, with a total of 22,294 band members, 11,297 of them living on a 18,000 ha Reserve near Brantford, Ontario [Six Nations, 2005]. The Six Nations lay claim to the Haldimand Tract, which was granted to them in 1784. It runs

the length of the Grand River, approximately 10 km on either side of the river, from near the Project site to Lake Erie. The Project is located within the Haldimand Tract, as defined by the Six Nations of the Grand River First Nation.

The Mississaugas of the New Credit are an Ojibway Nation occupying Reserve land adjacent to the Six Nations of the Grand River. Originally from the north shore of Lake Huron, and later the Toronto area, they were relocated to their present Reserve in 1847.

A number of other Ojibway, or Chippewa, nations also have traditional connections to the land in southern Ontario. As shown on Figure 5.3-1, the Project is located in the area of Treaty 18 of the Williams Treaties. Signatories to the Williams Treaties included the Chippewas of Georgina Island and Rama whose present day Reserve lands are shown on Figure 5.3-1. Together with Beausoleil First Nation, these three communities are known as the Chippewas Tri-Council.

The Saugeen First Nation and the Chippewas of Nawash First Nation, together referred to as the Saugeen Ojibway Nation, also share traditional lands from the Bruce Peninsula south to near the study area.

The Métis Nation of Ontario (MNO) and the Ontario Ministry of Natural Resources recognize Traditional Harvesting Territories in Ontario, including the Georgian Bay Territory, which extends south to near the study area. These territories recognize the right of Métis to harvest food from within their territories. MNO contacted by the Town as part of the Aboriginal engagement program for the Project. There was no indication of interest about the Project from those Aboriginal communities.

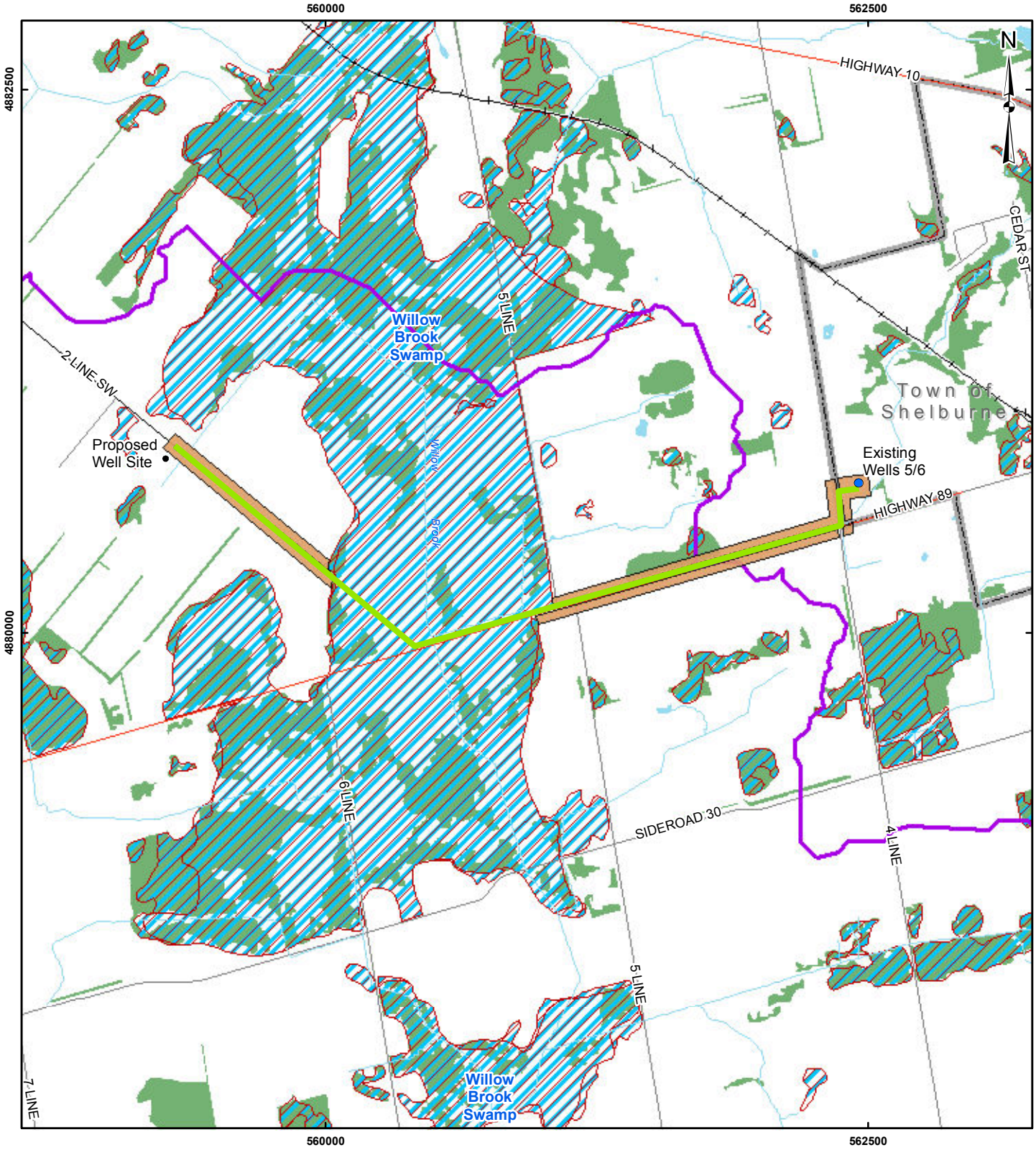
6.4.3 Physical and Cultural Heritage Resources

6.4.3.1 Archaeological Resources

A Stage 1 Archaeological Assessment was completed in November 2011 in accordance with the *Ontario Heritage Act* and to satisfy the requirements of a Schedule B Municipal Class EA under Ontario's EAA. This assessment was conducted to determine the archaeological potential of an approximately 3,500 ha area in the vicinity of the Town in the townships of Melancthon and Amaranth.

The Stage 1 Archaeological Assessment concluded that given the documentation of water sources within the study area and the presence of pockets of well-drained soil the potential for the recovery of pre- and post-contact Aboriginal archaeological resources was judged to be moderate. This potential is negated for areas within the study area that have been subject to previous disturbance or are poorly drained; however, these areas would have to be confirmed during a field survey. The study area also exhibits moderate potential for the recovery of historic cultural material. Areas with archaeological potential are contained to the road right-of-ways, which is illustrated in Figure 6.4.3.1-1.

A Stage 2 Archaeological Assessment is recommended in the areas that exhibited moderate archaeological potential, which will be carried out prior to obtaining a CofA for the Project works.



LEGEND

- City / Town
- Railways
- Utility Line
- Highway
- Major Road
- Local Road
- Watercourse, Permanent
- Watercourse, Intermittent
- Watershed Divide (MNR LIO 2009)
- Waterbody
- LIO Wetland
- Town Boundary
- Wooded Areas
- Area of Archaeological Potential

400 200 0 400 800 1,200

SCALE 1:25,000 METRES

PROJECT

TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT
FOR ADDITIONAL WATER SUPPLY PROJECT

TITLE

ARCHAEOLOGICAL POTENTIAL

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	RPM	17 Feb. 2011	Figure 6.4.3.1-1	
GIS	BC	9 Jul. 2012		
CHECK	MK	9 Jul. 2012		
REVIEW	MK	9 Jul. 2012		

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\Draft\EIS\Report\ArchaeologicalPotential.mxd

6.4.3.2 Built Heritage Resources

A cultural heritage field assessment of the well site and watermain route within existing road right-of-ways near Shelburne was undertaken on July 26, 2012. The field assessment consisted of a windshield survey to determine if features of cultural heritage value or interest are present within the proposed watermain route. The weather was a mix of sun and cloud with light showers.

A summary of the findings are as follows:

- One concrete culvert was identified within the right-of-way. It is located just east of the intersection of Highway 89 and 2nd Line Southwest. The culvert was identified to be 40 years of age or older and of a standard design used widely in Southern Ontario. Therefore, it was not determined to have cultural heritage value or interest.
- No other potential heritage resources were identified within the right-of-ways.

7.0 ENVIRONMENTAL EFFECTS OF PROJECT WORKS AND ACTIVITIES

Section 7 presents the assessment of environmental effects from the Project, including identification of potential Project-environment interactions, assessment of likely environmental effects, mitigation measures, residual adverse effects following the implementation of mitigation measures and the significance of the residual effects of the Project on the environment. The assessment was completed for the construction and operations phase works and activities.

7.1 Screening of Potential-Environmental Effects

Table 7.1-1 presents potential Project-environment interactions between VECs and Project works and activities identified for assessment by the EA/EIS.

Table 7.1-1: Preliminary Plausible Project-Environment Interaction Matrix

Project Works and Activities	Environmental Components										
	Physical Environment			Biological Environment			Atmospheric Environment		Socio-Economic Environment		
	Groundwater quality and quantity	Surface water quality and quantity	Terrain and soil	Fish and fish habitat, aquatic ecosystems	Vegetation	Wildlife and wildlife habitat	Air quality	Noise and/or vibration levels	Human health	Aboriginal land and resource use	Physical and cultural heritage (archaeological)
Construction Phase											
Stripping of topsoil at the well site and along the watermain route (if not installed through directional drilling)		✓	✓	✓	✓	✓	✓	✓		✓	✓
Construction equipment delivery and laydown			✓		✓	✓	✓	✓		✓	
Installation of concrete foundation and construction of well house		✓			✓	✓	✓	✓		✓	✓
Installation of fencing			✓		✓	✓	✓	✓	✓		✓
Installation of pump system and components							✓	✓			
Installation of water treatment facilities (if option is taken to treat on-site)							✓	✓			
Excavation and backfilling for watermain pipe installation	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Inspection and testing of Project components	✓	✓									
Site restoration including topsoil cover and re-vegetation		✓	✓	✓	✓	✓	✓	✓		✓	
Construction of a back-up well	✓	✓	✓	✓	✓		✓	✓		✓	✓
Operations Phase											
Routine operations and maintenance at the well site and along the watermain route	✓	✓		✓		✓	✓		✓	✓	

7.2 Physical Environment

The Hydrogeology Report, included in Appendix B, presents a comprehensive assessment of the potential effects related to long term pumping of TW7-10 on the physical environment. The conclusions presented in the Hydrogeolgoical Report are re-iterated herein.

7.2.1 Groundwater Quality and Quantity

7.2.1.1 Potential Effects on Groundwater Quality and Quantity

Initial screening for potential environmental effects to groundwater quality and quantity relate to the following Project works and activities:

- On-going operation of TW7-10 (at 1,635 m^3/d);
- Excavation and backfilling for watermain pipe installation;
- Inspection and testing of Project components;
- Construction of a back-up well; and
- Routine operations and maintenance at the well site and along the watermain route.

To identify the effects of TW7-10 production pumping (at 1,635 m^3/d), a 72-hour groundwater pumping test was carried out from November 29 through to December 2, 2010. Performance testing results (as discussed in Appendix B) indicate that less than 1 m of groundwater level drawdown is anticipated within private wells completed within the Guelph Formation and located beyond 300 m from TW7-10. Based on the well depths reported within the MOE water well records, the operation of private wells should not be affected from long term operation of TW7-10. Groundwater pumping at TW7-10 will not affect the quality of groundwater flow in the local bedrock aquifer.

Potentially adverse effects to groundwater quality during construction of the well house and watermain are not anticipated and would be temporary. Potential effects from the taking of groundwater on other VECs are described in their respective sections below.

7.2.1.2 Measures to Mitigate Effects on Groundwater Quality and Quantity

In order to ensure potential effects of the Project on ground water quality and quantity are minimzed, standard mitigation measures for the construction phase listed in Table 7.2.1.2-1 will be impletmented as part of the Project.

Table 7.2.1.2-1: Standard Mitigation Measures

Activity	Mitigation Measures
Refuelling and Maintenance	■ Identify suitable locations for designated refuelling and maintenance areas (e.g., away from watercourses, storm inlets, and natural areas).

Activity	Mitigation Measures
	■ Refuelling or maintaining equipment will not occur within 30 m of a watercourse. ■ Cleaning of equipment is not to occur in watercourses or in locations where debris can gain access to sewers or watercourses. ■ Prepare to intercept, clean-up, and dispose of any spillage which may occur (whether on land or water). ■ Appropriate spills containment and clean-up materials are to be available at the site, and contractors are required to develop spill prevention and response procedures. ■ Immediately clean and contain spills in accordance with provincial regulatory requirements (MOE Spills Action Centre: 1 (800) 268-6060).
Disposal	■ Implement all reasonable measures to prevent the emptying of fuel, lubricants or pesticides into sewers or watercourses (e.g., maintain a minimum 30 m separation from all watercourses and drainage systems, do not clean equipment in watercourses).
Drainage and Water Control	■ All portions of the work should be properly and efficiently drained during construction. ■ Provide temporary drainage and pumping to keep excavation and site free from water. ■ Control disposal or runoff or water containing suspended materials or other harmful substances in accordance with approval agency requirements. ■ Provide settling ponds and sediment basins as required. ■ Do not direct water flow over pavements, except through approved pipes/troughs.
Dust Control	■ Cover or wet down dry materials and rubbish to prevent blowing dust and debris. ■ Avoid the use of chemical dust control products adjacent to watercourses. ■ Hours of construction are to be limited to reduce the impact of dust, etc on surrounding land uses. ■ Avoid excavation, and other construction activities with potential to

Activity	Mitigation Measures
	release airborne particulates, during windy and prolonged dry periods. ■ Cover or otherwise contain loose construction materials that have potential to release airborne particulates during their transport, installation or removal. ■ Spray water to minimize the release of dust from gravel, paved areas and exposed soils. Use chemical dust suppressants only where necessary on problem areas. ■ Use water to suppress dust during any concrete cutting.
Site Clearing	■ Protective measures shall be taken to safeguard trees from construction operations ■ Equipment or vehicles shall not be parked, repaired, refuelled near the dripline area of any tree not designated for removal. Construction and earth materials shall also not be stockpiled within the defined dripline areas. ■ Restrict tree removal to areas designated by the Contract Administrator. ■ Minimize stripping of topsoil and vegetation. ■ Restore disturbed areas as soon as possible to minimize the duration of soil exposure. ■ Upon completion of construction, the disturbed areas will be restored with seed and mulch that will maintain or enhance the local habitat.
Sedimentation/Erosion Control	■ Use of appropriate erosion and sediment control measures (silt fences, filter bags, etc.) should be implemented prior to work and maintained during the work phase and beyond, as necessary to prevent run off from the construction site and the movement of re-suspended sediment. ■ Protect watercourses, wetlands, catch basins and pipe ends from sediment intrusion. ■ Complete restoration works following construction. ■ Install straw bale check dams in ditchlines following rough grading of ditches.

In addition, operations and contingency plans described in Section 12.1.6 will be implemented to mitigate potential effects during the operations phase.

7.2.1.3 Residual Adverse Effects

Based on the discussion above, although the Project will result in a change to groundwater levels in the vicinity of the well, based on the results of pumping tests (Appendix B), the Project is not predicted to have an adverse effect on groundwater quantiy. With the implementation of mitigation measures, no adverse effects on groundwater quality are predicted.

It is noted that the Project is likely to generate a positive residual effect by contributing to the supply of drinking water for Shelburne that will meet anticipated future standards.

7.2.1.4 Significance of Residual Adverse Effects

With the implementation of mitigation measures identified above, including monitoring, follow-up and necessary adaptive management, the implementation of the Project is not likely to have a significant adverse effect on groundwater quality and quantity.

7.2.2 Surface Water Quality and Quantity

7.2.2.1 Potential Effects on Surface Water Quality and Quantity

Initial screening for potential environmental effects to surface water quality and quantity relate to the following Project works and activities:

- On-going operation of TW7-10 (at 1,635 m^3/d);
- Stripping of topsoil at the well site and along the watermain route;
- Installation of concrete foundation and construction of wellhouse;
- Excavation and backfilling for watermain pipe installation;
- Inspection and testing of Project components;
- Site restoration including topsoil cover and re-vegetation;
- Construction of a back-up well; and
- Routine maintenance at the well site and along the watermain route.

As discussed in Appendix B, a water budget assessment has been undertaken to evaluate the effects of TW7-10 pumping (at 1,635 m^3/d) on local surface water features. Surface water courses within the TW7-10 zone of influence primarily represent engineered drains in the upper reaches of the Willow Brook and the Boyne River. Due to their limited catchment area (due to proximity to the regional watershed divide), the water surplus within these headwaters vary significantly throughout the year. In response to long term pumping from TW7-10 (at

1,635 m^3/day), groundwater contribution towards the local surface water features is expected to be reduced by approximately 700 m^3/day. During the spring season, seepage losses could represent approximately 6% of the water surplus. Dry conditions in the headwater areas currently exist during the summer months due to the lack of available water surplus. Relative to this seasonal variability, seepage losses from surface catchments (in response to TW7-10 pumping) should have no discernible effect on the variation of streamflow rate or temperature currently observed within local drainage features. Effects on Luther Marsh are unlikely to occur due to the distance from the well location (approximately 15 km) and limited drawdown area from the project.

The construction activities listed above may cause degradation to surface water quality as a result of increased suspended solids loading from soil erosion, as well as the potential for accidental spills of hazardous materials (i.e., oil, gas, lubricants, etc.).

Based on the results of testing presented in the Hydrogeology Report, no adverse effects on surface water quanity and quality are anticipated as a result of the Project. It has been recommended that confirmation of the assessment of potential effects that may be realized from long-term pumping of TW7-10 (at a rate of 1,635 m^3/d), should include implementation of an environmental monitoring program. The components of the monitoring plan are provided in Section 12.

7.2.2.2 Measures to Mitigate Effects on Surface Water Quality and Quantity

In order to ensure potential effects of the Project on surface water quality and quantity are minimzed, standard mitigation measures for the construction and operations phases listed in Table 7.2.1.2-1 and Section 12.1.6 will be impletmented as part of the Project.

7.2.2.3 Residual Adverse Effects

Due to the distance of the Amos Drainage Works from the porposed well site and the minimal drawdown that is expected during operation of the well, no residual adverse effects on surface water quantity are expected during the construction and operations phases of the well.

7.2.2.4 Significance of Residual Adverse Effects

Residual adverse effects on surface water quality and quantity are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

7.2.3 Soils and Terrain

7.2.3.1 Potential Effects on Soils and Terrain

Initial screening for potential environmental effects to soil and terrain relate to the following Project works and activities:

- Stripping of topsoil at the well site and along the watermain route;

- Construction equipment delivery and laydown;
- Installation of concrete foundation and construction of well house
- Installation of fencing;
- Excavation and backfilling for watermain pipe installation;
- Site restoration including topsoil cover and re-vegetation;
- Construction of a back-up well; and
- Routine operations and maintenance at the well site and along the watermain route.

Construction activities listed above may result in the temporary disturbance and/or removal of soils along the watermain route and in the vicinity of the well site. In addition, toxic effects to soils could occur as a result from accidental spills or leaks during construction and operations. The potential effects from accidents and malfunctions are assessed in Section 8.

7.2.3.2 Measures to Mitigate Effects on Soils and Terrain

In order to minimize the adverse environmental effects of the Project on soils and terrain, the standard mitigation measures for the construction and operations phases listed in Table 7.2.1.2-1 will be impletmented.

7.2.3.3 Residual Adverse Effects

Due to the small footprint of the Project components, short-term duration of the construction activities and mitigation measures applied, no residual adverse effects on soils and terrain are expected during the construction and operations phase of the well.

7.2.3.4 Significance of Residual Adverse Effects

Residual adverse effects on soils and terrain are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

7.3 Biological Environment

7.3.1 Fish and Fish Habitat

7.3.1.1 Potential Effects on Fish and Fish Habitat

The potential for effects on fish and fish habitat during construction specifically relate to the installation of the watermain under watercourses. For the purposes of this assessment, two methods of constructing these watercourses crossings are considered. The first method is the open cut method wherein the channel is dry or dewatered and the trench is excavated through the channel. The second crossing method is by tunnelling or

directional drilling underneath the channel bed so as not to disturb the channel bed and banks and riparian vegetation,

The potential environmental effects to fish and fish habitat relate to the open cut watercourse crossing works and activities:

- Clearing of riparian vegetation and stripping of topsoil at the watercourse crossings;
- Disturbance of the channel bed and banks for the excavation of the watermain trench;
- Accidental spills of hazardous materials from the construction equipment.

The potential environmental effects to fish and fish habitat relate to the tunnelling method of watercourse crossing:

- Clearing of riparian vegetation and stripping of topsoil at the entrance and exit locations for the tunnelling equipment;
- Accidental spills of hazardous materials from the construction equipment.

The construction activities listed above have the potential to alter fish habitat and change the water quality as a result of disturbances to the banks and channels of watercourses at crossing locations or adjacent to watercourses, potential increase in suspended sediments from erosion of disturbed soils , as well as the potential for accidental spills of hazardous materials (i.e., oil, gas, lubricants, etc.).

During operation of the well, the radius of the predicted deep aquifer drawdown zone extends approximately 1.0 km. The predicted seepage losses from the surface catchments also correspond to the 1.0 km zone around TW7-10. The predicted drawdown zone encompasses Reaches 1, 2 and 3 of the Amos Drain. In Willow Brook wetland, near Reach 2, no measurable changes to shallow groundwater levels were observed from the steady state pumping of TW7-10 during the test period. On the basis of these results, long term operation of TW7-10 at a rate of 1,635 m^3/d should not affect the normal variation in water levels in the wetland or fish bearing reaches of Amos Drain. The seepage losses may alter the flow regime in Amos Drain by extending the low flow period. However, the system contains intermittent flow (low to no flow in summer) and the seepage losses will not affect the seasonal habitat in these intermittent reaches. There is sufficient storage in the wetland to maintain the permanent aquatic habitat in Reach 2 of Amos Drain. Correspondingly, the productive capacity and habitat availability within Amos Drain are not expected to be adversely affected.

7.3.1.2 Measures to Mitigate Effects on Fish and Fish Habitat

In order to minimize the adverse environmental effects of the Project on fish and fish habitat, the following mitigation measures will be employed at the open cut watercourse crossing:

- Limit the amount of clearing of riparian vegetation and where possible avoid grubbing the roots of woody vegetation to maintain bank stability;
- Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation,

- Use the Fisheries and Oceans (DFO) operating statement for *Isolated or Dry Open Cut Stream Crossings*. Follow the *Measures to Protect Fish and Fish Habitat*.
- Time the crossings to coincide with the dry channel period. If the channel is not dry and it is necessary to isolate the section to be crossed, undertake a fish rescue operation;
- Protect sensitive fish life stages by adhering to fisheries timing windows;
- Re-instate the channel bed and banks to previous condition (channel profile) using stockpiled channel materials from the excavation;
- Site specific erosion and sediment control plans;
- Installation and maintenance of silt fences adjacent to watercourses throughout the construction period;
- Site specific waste management, spill prevention and emergency response plans (construction and operation phases); and
- In the event that a spill occurs, and containment and clean-up is not effective before spilled materials dissipate into the environment, a habitat quality assessment will be completed to evaluate the need for restoration activities.

In order to minimize the adverse environmental effects of the Project on fish and fish habitat, the following mitigation measures will be employed with the tunnelling method of watercourse crossing:

- Limit the amount of vegetation clearing and where possible avoid grubbing the roots of woody vegetation to maintain bank stability;
- Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation,
- Use the Fisheries and Oceans (DFO) operating statement *Punch and Bore Crossing* or *High Pressured Directional Drilling*. Follow the *Measures to Protect Fish and Fish Habitat*.
- Site specific erosion and sediment control plans;
- Installation and maintenance of silt fences adjacent to watercourses throughout the construction period;
- Site specific waste management, spill prevention and emergency response plans (construction and operation phases); and
- In the event that a spill occurs, and containment and clean-up is not effective before spilled materials dissipate into the environment, a habitat quality assessment will be completed to evaluate the need for restoration activities.

A positive effect on fish and fish habitat may occur as a result of site restoration. Planting native vegetation along riparian areas will decrease erosion and sedimentation in nearby watercourse which will improve fish and fish habitat.

7.3.1.3 Residual Adverse Effects

Spill prevention, fuels handling and waste management during the construction and operation phases are intended to reduce the potential for accidental spills of hazardous materials that may affect fish and fish habitat. If a spill does occur, residual effects on fish and fish habitat are anticipated. Mitigation measures for erosion and sediment control are deemed sufficient; therefore, no residual effects on fish and fish habitat are expected as a result of erosion and sedimentation.

Due to the distance of the Amos Drainage Works from the proposed well site and the minimal drawdown that is expected during operation of the well, no residual adverse effects on fish and fish habitat are expected during the operation phase of the well.

7.3.1.4 Significance of Residual Adverse Effects

No residual adverse effects on fish and fish habitat are expected as a result of the Project; therefore, no significant adverse effects are anticipated.

7.3.2 Vegetation

7.3.2.1 Potential Effects on Vegetation

Initial screening for potential environmental effects to vegetation relate to the following Project works and activities:

- Stripping of topsoil at the well site and along the watermain route;
- Construction equipment delivery and laydown;
- Installation of concrete foundation and construction of wellhouse;
- Installation of fencing;
- Excavation and backfilling for watermain pipe installation;
- Site restoration including topsoil cover and re-vegetation;
- Construction of a back-up well; and
- Routine operations and maintenance at the well site and along the watermain route.

Construction activities listed above will result in the removal of existing vegetation along the watermain route and in the vicinity of the well site. The construction of the watermain will result mainly in the disturbance of herbaceous vegetation within the road right-of-way which will be immediately re-vegetated upon construction completion. The watermain will also cross a few watercourses and as such may require the removal of bank vegetation. This vegetation is herbaceous and will be immediately seeded and re-vegetated after construction disturbance. The construction of the wellhouse includes the permanent removal of 2500 m^2 of herbaceous vegetation within a fallow field.

In addition, toxic effects to vegetation could occur as a result from accidental spills or leaks during construction and operations.

During operation of the well, the predicted radius of the deep aquifer drawdown zone extends approximately 1.0 km. The predicted drawdown zone encompasses portions of the Willow Brook wetland. During the pumping test, no measurable changes to shallow groundwater levels in the wetland were observed from the steady state pumping of TW7-10. On the basis of these results, long term operation of TW7-10 at a rate of 1,635 m^3/d should not affect the normal variation in water levels in the wetland. Correspondingly, the plant species and wetland vegetation communities are not expected to be adversely affected.

7.3.2.2 Measures to Mitigate Effects on Vegetation

In order to minimize the adverse environmental effects of the Project on vegetation, the following mitigation measures will be employed:

- Tree removal and vegetation clearing zones will be restricted to those identified on the contract drawings and delineated in the field;
- Vegetation retention zones will also be identified on contract drawings and delineated in the field;
- Employ appropriate vegetation clearing techniques;
- Striping of topsoil and vegetation will be restricted to designated areas and along right-of-ways;
- Excavated material stockpiles shall not be placed within driplines of trees not designated for removal;
- Damaged branches and roots of trees not designated for removal will be trimmed back properly and cleanly; and
- All disturbed areas shall be restored with topsoil, hydroseeding or sod as soon as possible.

7.3.2.3 Residual Adverse Effects

As indicated in Section 6.2.2, the vegetation communities identified within proximity to the Project site during the field survey are not considered to be rare. Therefore, with the implementation of the mitigation measures listed in Section 7.3.2.2, no residual effects are anticipated.

7.3.2.4 Significance of Residual Adverse Effects

Residual adverse effects on vegetation are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

7.3.3 Wildlife and Wildlife Habitat

7.3.3.1 Potential Effects on Wildlife

Initial screening for potential environmental effects to wildlife and wildlife habitat relate to the following Project works and activities:

- Vegetation removal and stripping of topsoil at the well site and along the watermain route;
- Construction equipment delivery and laydown;
- Installation of fencing;
- Excavation and backfilling for watermain pipe installation;
- Site restoration including topsoil cover and re-vegetation; and
- Routine operations and maintenance at the well site and along the watermain route.

The removal of vegetation and topsoil during clearing and grubbing has the potential to alter wildlife habitat. The habitat along the watermain route consists of herbaceous plant communities that are regularly disturbed to maintain a right of way along the roadways. The disturbance created by the clearing of vegetation and excavation and installation of the watermain will be temporary and will be restored to existing conditions. The culvert at Hwy 89 and 4th Line will not be altered and thus effects on Barn Swallow nests are not anticipated. The disturbance of the pumphouse will be a permanent 10m by 10m alteration of wildlife habitat, specifically habitat that was determined to be *Probably Breeding* habitat for Bobolink and Eastern meadowlark. The effect on this habitat removal are expected to be minor as the footprint is small compared to the amount of habitat available, the site is close to 2nd Line SW and a gravel road has already been installed at this location.

The installation of fencing may potentially fragment terrestrial wildlife habitat. Delivery of construction equipment may cause vehicular collisions with wildlife. In addition, there may be disturbance to wildlife, including SAR, due to noise, dust and the physical presence of construction equipment. Wildlife may also become trapped in unattended ditches or excavated areas, specifically outside of regular working or daylight hours.

7.3.3.2 Measures to Mitigate Effects on Wildlife

In order to minimize or eliminate adverse environmental effects of the Project on wildlife and wildlife habitat, including nesting migratory birds in accordance with the *Migratory Birds Convention Act*, SAR in accordance with the ESA as well as wildlife generally, the following mitigation measures will be employed:

- Limiting clearing to only those areas absolutely necessary to safely install, maintain and operate the new well site and watermain;
- Where practical, retain riparian vegetation along watercourses;
- Avoid vegetation clearing and heavy construction works during the bird breeding season (May 1st to July 31st);
- In addition to the above, SAR species-specific mitigation for Bobolink, Eastern meadowlark and Barn swallow will be negotiated with the MNR;

- Installing exclusion fences (e.g. silt fences) in advance of work to clearly mark sensitive areas (i.e., riparian areas) and to prevent wildlife from entering the Project site;
- Use of dust prevention measures (i.e., watering);
- The contractor will be advised that harassing or harming wildlife is prohibited;
- Wildlife incidentally encountered during construction will not be knowingly harmed;
- Restoring lands upon completion of the project with native vegetation, including re-seeding exposed areas; and
- Monitoring and site checks of trenches at the end and start of each working day.

7.3.3.3 Residual Adverse Effects

Construction activities will be restricted to a footprint of approximately 2,500 m^2 for the well site and approximately 4,000 m^2 for the watermain route, which is only a small portion of the whole study area. In addition, construction activities will be contained within existing right-of-ways; therefore, minimal vegetation removal will be required. The project footprint will not be located within rare vegetation communities as identified during the field survey and in Section 6.2.2. Based on the assessment above and the implementation of the mitigation measures listed in Section 7.3.3.2, no residual adverse effects on wildlife and wildlife habitat are expected.

7.3.3.4 Significance of Residual Adverse Effects

Residual adverse effects on wildlife and wildlife habitat are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

7.4 Atmospheric Environment

7.4.1 Air Quality

7.4.1.1 Potential Effects on Air Quality

Potential interactions between Project activities and air quality are identified in Table 7.1-1. Initial screening for potential environmental effects to air quality relate to the following Project works and activities:

- Stripping of topsoil at the well site and along the watermain route;
- Construction delivery and laydown;
- Installation of concrete foundation and construction of wellhouse;
- Installation of fencing;
- Installation of pump system and components;

- Installation of water treatment facilities;
- Excavation and backfilling for watermain pipe installation;
- Site restoration including topsoil cover and re-vegetation;
- Construction of a back-up well; and
- Routine operations and maintenance at the well site and along the watermain route.

There is potential for degradation of air quality as a result of increased emissions and dust from construction vehicles and activities. The increase in emissions and dust will be temporary as they will only occur during the construction phase of the Project.

Electricity is used to power the system. However, during emergencies, the system can be powered by a portable diesel generator. The potential effects would be temporary as they would only occur during the use of the emergency generator.

7.4.1.2 Measures to Mitigate Effects on Air Quality

In order to minimize the adverse environmental effects of the Project on air quality, the following mitigation measures will be employed:

- Ensure all construction equipment is in good working condition;
- Ensure staff are adequately trained in the proper use of the construction equipment;
- Use appropriate dust suppression materials and measures;
- A traffic management plan is described in Section 12.1; and
- Minimize the use of the generator at the new well by operating other wells during emergency situations.

7.4.1.3 Residual Adverse Effects

The potential effects mentioned above will only be temporary during the construction and operation phases. In addition, with the implementation of the mitigation measures listed in Section 7.4.1.2, no residual adverse effects are expected on air quality as a result of project work and activities.

7.4.1.4 Significance of Residual Adverse Effects

Residual adverse effects on air quality are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

7.4.2 Noise

7.4.2.1 Potential Effects on Noise

Potential interactions between Project activities and noise are identified in Table 7.1-1. Initial screening for potential environmental effects to noise levels relate to the following Project works and activities:

- Stripping of topsoil at the well site and along the watermain route;
- Construction equipment delivery and laydown;
- Installation of concrete foundation and construction of well house;
- Installation of fencing;
- Installation of pump system and components;
- Installation of water treatment facilities;
- Excavation and backfilling for watermain pipe installation;
- Inspection and testing of project components;
- Site restoration including topsoil cover and re-vegetation;
- Construction of a back-up well;
- Routine operations and maintenance at the well site and along the watermain route.

Effects on noise and vibration levels are a result of the use of construction vehicles and equipment. An increase in noise levels will be temporary and will only be frequent during the construction phase of the Project. The effects on noise levels are not expected to be substantially different from those currently generated by common agricultural practices and routine road maintenance. Under normal operating conditions, the well and watermain will generate noise at low levels.

7.4.2.2 Measures to Mitigate Effects on Noise

In order to minimize the adverse environmental effects of the project on noise levels, the following mitigation measures will be employed:

- Ensuring equipment is in good working condition and operating quietly prior to accessing the site;
- Regular maintenance of equipment during the construction phase;
- Minimize use of portable standby generator during power failures; and
- Only operate equipment during daylight hours to be in compliance with noise by-laws 45-2004, 43-2004 and 31-2002 from the Town of Shelburne, Township of Amaranth and Township of Melancthon, respectively.

7.4.2.3 Residual Adverse Effects

Based on the above assessment of noise levels during the construction and operation phases of the Project and with the implementation of the mitigation measures listed in Section 7.4.2.2, no residual adverse effects are anticipated.

7.4.2.4 Significance of Residual Adverse Effects

Residual adverse effects on noise levels are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

7.5 Socio-Economic Environment

7.5.1 Human Health

7.5.1.1 Potential Effects on Human Health

Potential environmental effects to human health relate to potential effects on water quality, air quality and noise. Based on assessment of those potential effects and mitigation measures to be applied, no residual adverse effects are identified in this EA/EIS on water quality, noise or air quality; therefore, no adverse effects on human health are identified.

In addition, effects on surrounding wells are considered in this assessment. The hydrogeology study assessed potential effects on groundwater quantity and quality, which includes assessment of potential effects on existing private wells in the vicinity of the well site. Expected groundwater level drawdown in the shallow (Guelph Formation) and deep (Gasport Formation) bedrock deposits, from long-term pumping of the well at 1,635 m^3/d, will be most significant near the well and insignificant along the fringe. Less than 1 m of groundwater drawdown is anticipated for private wells completed within the Guelph Formation. As a result, there are no adverse effects likely to occur at those private wells.

As noted in this EA/EIS, the Project will meet all Provincial Water Quality Objectives and Guidelines for Canadian Drinking Water Quality and Recreational Water Quality. All phases of the Project will also adhere to relevant standards and guidelines for noise and air quality.

Construction safety is regulated by the Ontario Ministry of Labour. All relevant standards and guidelines will be adhered to for the construction phase of this Project. Environmental management and operations plans for the Project are described in Section 12.

7.5.1.2 Measures to Mitigate Effects on Human Health

Mitigation measures are applied to other VECs potentially interacting with human health; therefore, no further mitigation measures are required.

7.5.1.3 Residual Adverse Effects

No residual adverse effects on human health are identified.

7.5.1.4 Significance of Residual Adverse Effects

Residual adverse effects on human health are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

7.5.2 Aboriginal Land and Resource Use

7.5.2.1 Potential Effects on Aboriginal Land and Resource Use

Potential interactions between Project activities and air quality are identified in Table 7.1-1. Initial screening for potential environmental effects to Aboriginal land and resource use relate to the following Project works and activities:

- Stripping of topsoil at the well site and along the watermain route;
- Construction equipment delivery and laydown;
- Installation of concrete foundation and construction of well house;
- Installation of fencing;
- Excavation and backing filling for watermain pipe installation;
- Site restoration including topsoil cover and re-vegetation;
- Construction of a back-up well; and
- Routine operations and maintenance at the well site and along the watermain route.

Interactions between the Project and Aboriginal Land and Resources is identified because the Project is located within the Haldimand Tract, on which the Six Nations has asserted rights, as authorized by the 1784 Haldimand Proclamation. The Six Nations asserts that the Haldimand Proclamation authorized the Six Nations to possess the land referred to as the Haldimand Tract for their sole use. Specific Claims filed with the Federal Government claim the Government's failure to uphold its duty has meant that the Haldimand Tract has become unsuitable as a hunting ground and that the Six Nations has been forced to find alternate means of subsistence. However, as compared to baseline conditions, the Project is not considered to have the potential to affect the rights or current use of lands and resources for traditional purposes by the Six Nations.

7.5.2.2 Measures to Mitigate Effects on Aboriginal Land and Resource Use

No adverse effects on Aboriginal Land and Resources are identified, and therefore no mitigation measures are required.

7.5.2.3 Residual Adverse Effects

No residual adverse effects on Aboriginal Land and Resources are identified.

7.5.2.4 Significance of Residual Adverse Effects

Residual adverse effects on Aboriginal land and resource use are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

7.5.3 Physical and Cultural Heritage

7.5.3.1 Potential Effects on Physical and Cultural Heritage

Initial screening for potential environmental effects to physical and cultural heritage relate to the following Project works and activities:

- Stripping of topsoil at the well site and along the watermain route;
- Installation of concrete foundation and construction of the well house;
- Installation of fencing;
- Excavation and backfilling for watermain pipe installation; and
- Construction of a back-up well.

As mentioned in 6.6.3, the location of the new well site is within an area of moderate archaeological potential as determined through the Stage 1 Archaeological Assessment. Therefore, potential disturbance to buried archaeological resources may occur during the construction phase of the project.

7.5.3.2 Measures to Mitigate Effects on Physical and Cultural Heritage

In order to minimize the adverse environmental effects of the project on physical and cultural heritage, the following mitigation measures will be employed:

- Preservation *in situ*, requiring changes to Project layout;
- Removal and preservation of artefacts; and
- Further assessment (i.e., Stage 2 Archaeological Assessment) will be conducted. If necessary, Stage 3 Archaeological Assessment and possibly Stage 4 Archaeological Assessment will be conducted.

7.5.3.3 Residual Adverse Effects

Based on the above assessment and the implementation of mitigation measures listed in Section 7.5.3.2, no residual adverse effects on physical and cultural heritage are anticipated.

7.5.3.4 Significance of Residual Adverse Effects

Residual adverse effects on physical and cultural heritage are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

8.0 EFFECTS OF POTENTIAL ACCIDENTS AND MALFUNCTIONS

8.1 Potential Environmental Effects

An assessment was conducted to identify potential environmental effects on the identified VECs as a result of accidents and malfunctions by the proposed Project. The assessment involved the identification of malfunctions and accidents that may arise during implementation of the construction plan and the associated potential environmental effects.

Table 8.1-1 summarizes the potential malfunctions or accidents and associated potential environmental effects during the construction and operations phases of the Project.

Table 8.1-1: Malfunctions and Accidents and Potential Environmental Effects during the Construction Phase

VEC	Malfunction or Accident	Potential Environmental Effect(s)
Groundwater quality and quantity	■ Contaminant spill/accident involving construction or operator equipment or transported materials (e.g., fuel, oil and lubricants).	■ Potential effect on groundwater quality in shallow and deep aquifer.
Surface water quality and quantity	■ Contaminant spill/accident involving construction or operator equipment or transported materials (e.g., fuel, oil and lubricants). ■ Sedimentation resulting from rainfall and runoff at the Project site.	■ Potential effect on surface water quality in nearby watercourses. ■ Obstruction to flow as a result of sedimentation.
Terrain and soil	■ Contaminant spill/accident involving construction or operator equipment or transported materials (e.g., fuel, oil and lubricants). ■ Erosion resulting from rainfall and runoff.	■ Potential effect on soil quality.
Fish and fish habitat, aquatic ecosystems	■ Contaminant spill/accident involving construction or operator equipment or transported materials (e.g., fuel, oil and lubricants). ■ Sedimentation resulting from	■ Potential effect on fish and fish habitat in nearby watercourses. ■ Potential destruction of fish and fish habitat.

VEC	Malfunction or Accident	Potential Environmental Effect(s)
	rainfall and runoff.	
Vegetation	■ Contaminant spill/accident involving construction or operator equipment or transported materials (e.g., fuel, oil and lubricants). ■ Sedimentation resulting from rainfall and runoff. ■ Equipment fire.	■ Potential damage or destruction of native vegetation species.
Wildlife and wildlife habitat	■ Contaminant spill/accident involving construction or operator equipment or transported materials (e.g., fuel, oil and lubricants). ■ Sedimentation resulting from rainfall and runoff. ■ Equipment fire.	■ Potential damage or destruction of native wildlife species and habitat.
Air quality	■ Contaminant spill/accident involving construction or operator equipment or transported materials (e.g., fuel, oil and lubricants). ■ Equipment fire. ■ Equipment malfunction.	■ Potential deterioration of air quality near the Project site.
Noise	■ Equipment malfunction.	■ Potential increase in noise levels on the construction site.
Human health	■ Contaminant spill/accident involving construction or operator equipment or transported materials (e.g., fuel, oil and lubricants). ■ Equipment fire.	■ Potential effect on water quality in shallow and deep aquifer. ■ Potential deterioration of air quality near the Project site.
Aboriginal land and resource use	■ Contaminant spill/accident involving construction or	■ Potential effect on water quality in shallow and deep

VEC	Malfunction or Accident	Potential Environmental Effect(s)
	operator equipment or transported materials (e.g., fuel, oil and lubricants). ■ Sedimentation resulting from rainfall and runoff. ■ Equipment fire. ■ Equipment malfunction.	aquifer. ■ Potential effect on water quality in nearby watercourses. ■ Potential damage or destruction of native vegetation species. ■ Potential destruction of fish and fish habitat. ■ Potential damage or destruction of native wildlife species and habitat. ■ Potential deterioration of air quality near the Project site.
Physical and cultural heritage	■ None anticipated.	■ Not applicable.

8.2 Mitigation Measures

During the construction phase, the contractor will be required to develop and implement a traffic control plan. Furthermore, the contractor will need to develop plans to manage accidental spills and sediment and erosion on-site. These plans will incorporate appropriate commitments from the Town of Shelburne's Emergency Response Plan. In addition, the contractor will be responsible for reporting spills of regulated chemicals and substances, including oil and gas to the necessary regulatory agencies. Accidental spills are to be reported to the MOE Spills Action Centre. The Ontario Ministry of Labour dictates the safety requirements for the construction phase.

The contractor will be required to adhere to the plans and implement best management practices (BMPs) to ensure that potential environmental effects from malfunctions and accidents that could occur during the Project are minimized. In addition, the contingency plans will be kept on-site during the construction phase for reference by the construction team. A brief description of the plans is described in Section 12.1.

During the operations phase, water pumped from the system will be continuously monitored by a supervisory control panel and data acquisition system. The water distribution system has the capability to stop discharging water if a malfunction occurs. In addition, operating staff are called to the site through an alarm system to address operating.

Watermain breaks may also occur during lifetime of the system. Repairs will be made with in compliance with existing Town and MOE protocols to ensure the safety of drinking water supply.

Operations and contingency plans will be fully developed to address potential malfunctions which may occur during the operation phase. The Town will adhere to these plans to ensure that potential environmental effects are minimized.

8.3 Residual Effects

Spill prevention, fuels handling and waste management during the construction and operations phases are intended to reduce the potential for accidental spills of hazardous materials that may affect surface water quality. However, the occurrence of a spill to a waterbody is considered unlikely. Mitigation measures for erosion and sediment control are deemed sufficient; therefore, no residual effects on surface water quality and quantity are expected as a result of erosion and sedimentation.

Based on the discussion for the construction and operation phases for the Project and the implementation of the mitigation measures, malfunctions and accidents are not expected to cause any residual adverse effects on the Project or the identified VECs.

8.4 Significance of Residual Effects

Based on the above discussion, malfunctions and accidents are not expected to cause significant residual adverse effects on the Project or the identified VECs.

9.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

This section assesses the potential effects of the environment on the Project. These potential effects include seismic activity, climate change and winter weather during operations.

9.1 Seismic Activity

9.1.1 Potential Effects of Seismic Activity

The Project is not located in a seismic zone. The Town of Shelburne is approximately 25 km north of Orangeville. The Ontario Building Code indicates that Orangeville is located in Earthquake Zone 0 (Zonal Velocity Ratio: 0.05).

9.1.2 Measures to Mitigate Effects of Seismic Activity

The Project does not have to account for possible effects from seismic activity; therefore, no mitigation in the design of the Project as a result of seismic activity is required. In the unlikely event of seismic activity in the area causing damage to the Project, contingency plans are in place to address malfunctions of the well and/or watermain.

9.1.3 Residual Effects

The proposed Project is located in Earthquake Zone 0; therefore, seismic activity is not expected to cause residual effects on the Project.

9.1.4 Significance of Residual Adverse Effects

Based on the above, seismic activity is not expected to cause residual effects on the Project. Subsequently, significant residual adverse effects are not anticipated as a result of seismic activity.

9.2 Climate Change

9.2.1.1 Potential Effects of Climate Change

Environment Canada has compiled data produced form global climate change models to forecast the potential impacts of climate change in Ontario over the next 50 years [Environment Canada, 2010]. One key concern with climate change in relation to the Project is the availability of drinking water as water sources are threatened by drought. In addition these water sources that are used as drinking water sources may be required for irrigation as rainfall events decrease as the result of climate change.

The effects of climate change cannot be quantitatively understood at this time, with a reasonable level of certainty. If drought conditions are encountered, the MOE has the authority to revise or suspend the PTTW allowing the operation of TW7-10, if well performance is affected by climate change.

9.2.1.2 Measures to Mitigate Effects of Climate Change

If extended periods of drought begin to affect the capacity of the well, the following mitigation measures may be implemented:

- Reduce the amount of groundwater extracted from the well in order to keep it in operation;
- Remove the well from service if the static water levels reach an unsustainable level;
- Investigate a new groundwater source (i.e., new groundwater or surface water source, or connect into another municipal water system); and
- Implement mandatory conservation programs.

9.2.1.3 Residual Adverse Effects

Since the well will be installed in compliance with O. Reg. 903, and the implementation of the mitigation measures above for extended periods of drought, climate change is not expected to result in any residual adverse effects on the Project.

9.2.1.4 Significance of Residual Effects

With the implementation of the identified mitigation measures in the event of long periods of drought, and compliance with O. Reg. 903, climate change is not expected to result in significant residual adverse effects on the Project.

9.2.2 Ice and Winter Operations

9.2.2.1 Potential Effects of Ice and Winter Operations

Ice and winter weather are not expected to affect the construction and operations of the Project. Freezing temperatures may cause the watermain to freeze and break, and chemicals used during construction or operations may also freeze. Icing of roads and ground freezing may also make it difficult for construction and restrict accessibility to the watermain.

9.2.2.2 Measures to Mitigate Effects of Ice and Winter Operations

The following mitigations may be implemented to protect against the effects of icing and winter weather:

- Ensure the watermain is installed at a depth recommended by the MOE design guidelines for watermain installation in the Shelburne area (approximately 1.8 m). Where this depth cannot be achieved insulation surrounding the watermain will be used;
- Install a tracer wire to assist with locating the watermain if a break occurs;

- Construction will occur prior to the winter months and ground freezing;
- The pumphouse will have suitable insulation in its design to prevent freezing within the treatment facility. Heating will be provided within the facility; and
- Use temporary heating during construction to avoid the freezing of chemicals.

9.2.2.3 Residual Adverse Effects

With the implementation of the identified mitigation measures, icing and winter weather is not expected to result in residual adverse effects on the Project.

9.2.2.4 Significance of Residual Effects

Since no residual adverse effects are expected as a result of the implementation of the identified mitigation measures, no significant residual adverse effects are expected as a result of icing and winter weather on the Project.

10.0 CUMULATIVE ENVIRONMENTAL EFFECTS

Cumulative effects are those incremental effects caused by the Project when added to, or combined with effects from other projects or activities on both on-site and off-site. The scope, method and assessment of cumulative effects are described in the following sections. The method is consistent with the EIS Guidelines issued by the CEAA, as well as the Agency's Operational Policy Statement, *Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act* and the *Cumulative Effects Assessment Practitioner's Guide* [CEAA, 1999].

10.1 Methodology for Identifying, Predicting and Assessing Cumulative Environmental Effects

Projects that have the potential to act cumulatively with the Project are identified in three categories:

- Past and existing projects and activities;
- Certain/planned projects and activities; and
- Reasonably foreseeable projects and activities.

The methodology for assessing cumulative effects includes:

- Determine if the Project will have a residual adverse effect on a VEC (from Sections 7 to 9 of the EA/EIS);
- If there is a residual adverse effect, determine if it acts cumulatively with effects of other actions, either past, existing or future; and
- Determine if the residual adverse effect of the Project, in combination with the other effects of other activities, may cause a significant change now or in the future in the characteristics of the VEC after the application of mitigation to the effect.

The overall method for assessment of cumulative effects is illustrated in Figure 10.1-1. The first objective of the cumulative effects assessment is to determine if the Project is likely to have an effect on a VEC. This first step was accomplished in Sections 7 to 9 of the EA/EIS. The cumulative effects assessment builds on these results and considers all of the incremental effects of the Project that were assessed to have likely residual adverse effects on a VEC.

The overall method for assessing the identified likely cumulative effects, including consideration of mitigation opportunities, identification of residual adverse effects and determination of significance is the same as that used for assessment of Project works and activities detailed in Section 2.2.

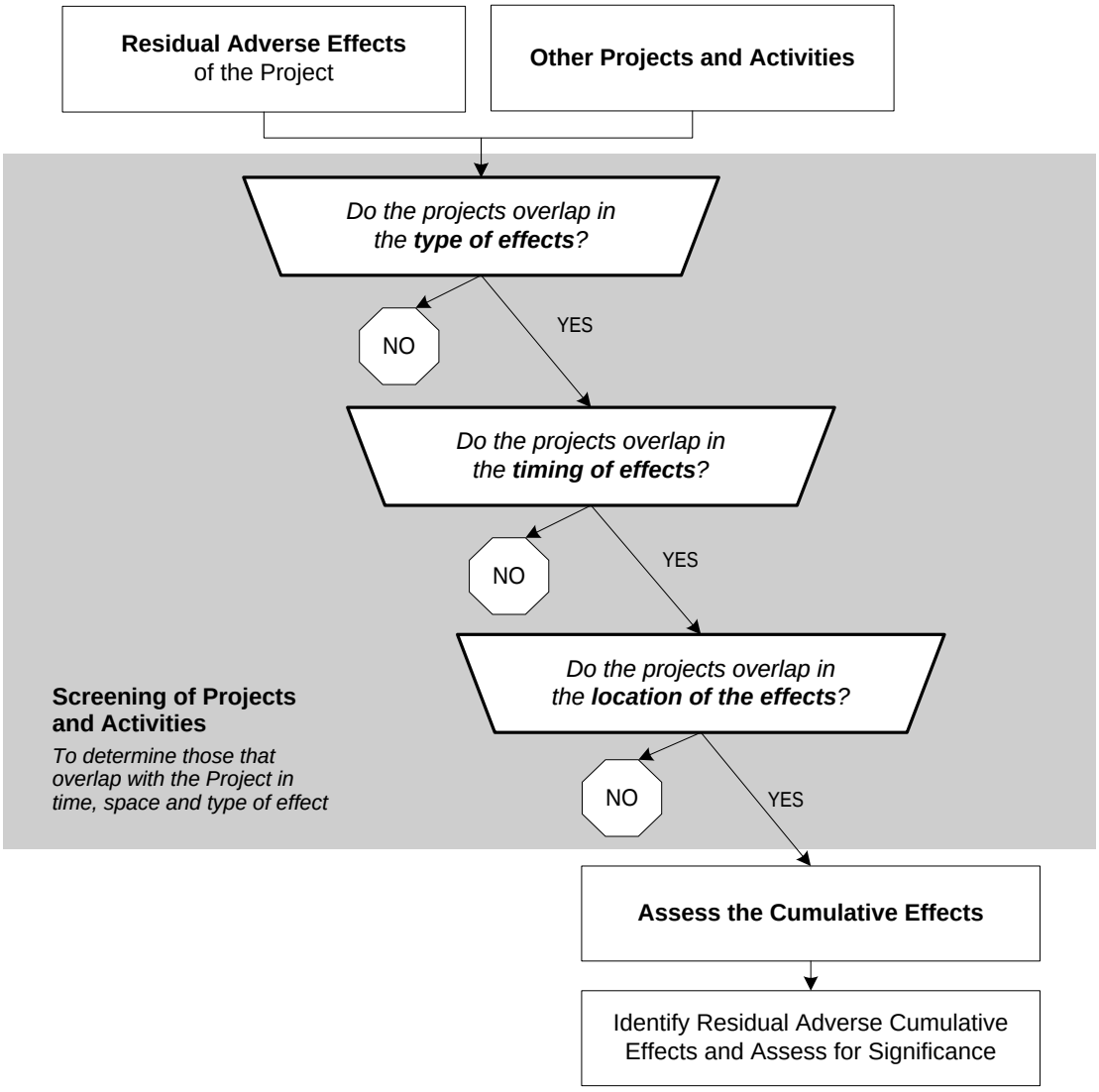


Figure 10.1-1: Cumulative Effects Assessment Method

10.2 Identification of Potential Cumulative Effects

Based on the nature of the Project and in keeping with a precautionary approach for the EA/EIS, potential cumulative effects from groundwater quantity were identified for further assessment.

The identification of projects and activities that have the potential to act cumulatively with groundwater quantity is based on information contained in Section 6, which incorporates the existing environmental conditions at the Project site.

In addition, the Agency's Operational Policy Statement on cumulative effects assessment requires that the assessment should consider other 'certain' and 'reasonably foreseeable' projects. Because there is a range of

future projects of varying certainty it is necessary to provide focus on the other projects to be included in the cumulative effects assessment.

Past, existing and foreseeable projects and activities were reviewed within the general Project study area, shown on Figure 1.2-1, since potential effects are generally contained within this area.

The temporal boundary of the cumulative effects assessment extends through 2024, the extent of the current planning period for the Town (which includes population growth forecasts).

Certain or reasonably foreseeable projects and activities are considered in the cumulative effects assessment if they are likely to involve or represent one or more of the following:

- An activity that occurs immediately adjacent to the Project site;
- Other projects and activities largely relating to groundwater extraction and municipal infrastructure and additional sources of drinking water consumption.

A description of each of the identified other projects and activities and rationale for inclusion are presented in Table 10.2-1. Figure 10.2-1 illustrates the existing domestic wells adjacent to the Project site.

Table 10.2-1: Projects and Activities Considered in the Cumulative Effects Assessment

Project	Location	Description of Activities	Rationale for Inclusion
Past and Existing Projects and Activities			
Private well water usage	Township of Melancthon, adjacent land use to the Project site	■ Domestic wells in the study area used for drinking water and agricultural use (see Figure 10.2-1).	■ Proximity to the Project site. ■ Withdrawal of groundwater.
Municipal production wells	Town of Shelburne	■ Municipal production wells used to produce drinking water for Shelburne's commercial activities and residential community.	■ Withdrawal of groundwater.
Melancthon I Wind Plant	Township of Melancthon, adjacent land use to the Project site	■ 45 1.5 megawatt (MW) turbines with nameplate capacity of 67.5 MW. ■ Commercial operation began on March 4, 2006.	■ Proximity to the Project site. ■ Noise and vibration levels.
Melancthon I Wind Plant	Township of Melancthon, adjacent land use to the Project site	■ 88 1.5 MW turbines with a nameplate capacity of 132 MW. ■ Commercial Operation began on November 24, 2008.	■ Proximity to the Project site. ■ Noise and vibration levels.
Certain/Planned Projects and Activities			
Greenbrook Village	Off County Road 124	■ 321 single detached residential units expected to be completed in 2018 (6 to 7 years	■ Effects on dust and vehicular emissions. ■ Drinking water

Project	Location	Description of Activities	Rationale for Inclusion
		construction). ■ Future blocks for development of 70 townhouse units.	consumption.
Vandyk	Northwest Shelburne	■ Phase 1 is for 160 single detached units. ■ Phase 2 for 74 single detached units. ■ Subdivision may be completed in 2020 to 2022.	■ Effects on dust and vehicular emissions. ■ Drinking water consumption.
Stone Ridge Condominiums	North side of Main Street West, west of Gordon Street, Shelburne	■ 40-unit townhouse development; if approved, may be constructed by 2017.	■ Effects on dust and vehicular emissions. ■ Drinking water consumption.
Shelburne Market Village	Northeast quadrant of Highway 10/89 and County Road 124 intersection, Shelburne	■ Phase 1 – construction of 11,212 m^2 of floor space. ■ Phase 2 – construction of 4,337 m^2 of commercial floor space. ■ 8-10 years for full build out.	■ Effects on dust and vehicular emissions. ■ Drinking water consumption.
Shelburne Plaza	Southwest quadrant of Highway 10/89 and County Road 124 intersection, Shelburne	■ Approximately 2.5 ha of commercial area; development proposed if access issues to Highway are resolved.	■ Effects on dust and vehicular emissions. ■ Drinking water consumption.
Drive-through Restaurant	664 Main Street East, Shelburne	■ Traffic study has been	■ Effects on dust and

Project	Location	Description of Activities	Rationale for Inclusion
		submitted, but no formal proposal for development.	vehicular emissions. ■ Drinking water consumption.
Industrial Mall	Northeast corner of Victoria Street and 3th Sideroad/County Road 11, Shelburne	■ 14 unit industrial mall with floor space of 3,720 m^2; construction to occur in 2012.	■ Effects on dust and vehicular emissions. ■ Drinking water consumption.
Shelburne Industrial Park	North side of 30th Sideroad/County Road 11	■ 28 ha available for development over the next 10 to 20 years.	■ Effects on dust and vehicular emissions. ■ Drinking water consumption.
Reasonable Foreseeable Projects and Activities			
Vacant industrial lot	West of Centennial Road, north of Main Street East/Highway 89/10, Shelburne	■ 1.2 ha vacant industrial space; no proposal or timeframe for development.	■ Potential development with source of drinking water consumption.
Vacant industrial lot	730 Industrial Road, Shelburne	■ 0.6 ha vacant industrial space; no proposal or timeframe for development.	■ Potential development with source of drinking water consumption
Vacant industrial land	South of Main Street West and west of former rail line, Shelburne	■ 16.4 ha vacant industrial space; no proposal or timeframe for development.	■ Potential development with source of drinking water consumption.
Vacant properties	West side of Victoria Street, west	■ 2.1 ha vacant industrial space;	■ Potential

Project	Location	Description of Activities	Rationale for Inclusion
	end of Franklyn Street, Shelburne	no proposal or timeframe for development.	development with source of drinking water consumption.
Vacant property	West side of Highway 10, northerly limit of Shelburne	■ 3,200 m^2 ha vacant institutional floor space; no proposal or timeframe for development.	■ Potential development with source of drinking water consumption.
Vacant Lot	East side of No Frills, southeast quadrant of Highway 89/10 and County Road 124, Shelburne	■ Potential for 4,400 m^2 of commercial floor space; no development proposal at this time.	■ Potential development with source of drinking water consumption.
6.5 ha vacant lot	West of former rail line, north of Main Street West, Shelburne	■ No development proposal, but may accommodate 150 residential units; no timeline for construction.	■ Potential development with source of drinking water consumption.
Vacant lots	Spread out around the Town of Shelburne	■ 22 vacant residential lots that could accommodate single unit dwellings over the next 5 to 10 years.	■ Potential development with source of drinking water consumption.
1.1 ha vacant lot	North side of Main Street East, east of Besley Drain, Shelburne	■ Investigation for development of approximately 48 residential units; no timeline on construction.	■ Potential development with source of drinking water consumption.
Melancthon Quarry	Township of Melancthon, Dufferin County	■ Aggregate quarry and associated facilities with License Area of approximately 937 ha and excavation area of	■ Proximity of Project site. ■ Potential effects to

Project	Location	Description of Activities	Rationale for Inclusion
		765 ha.	groundwater resources, dust and vehicular emissions and noise and vibration.

10.3 Evaluation of Potential Cumulative Effects

10.3.1 Past and Existing Projects and Activities

Potential cumulative effects could result from reduced capacity of existing private wells. The hydrogeology study assessed potential effects on groundwater quantity and quality, which includes assessment of potential effects on existing private wells in the vicinity of the well site. Expected groundwater level drawdown in the shallow (Guelph Formation) and deep (Gasport Formation) bedrock deposits, from long-term pumping of the well at 1,635 m^3/d, will be most significant near the well and insignificant along the fringe. Less than 1 m of groundwater drawdown is anticipated for private wells completed within the Guelph Formation. Based on the well depths reported within the MOE water well records (shown on Figure 10.2-1), the operation of private wells is not likely to be affected by long-term operation of the well.

The new production well is located a sufficient distance from existing municipal production wells, so that no interference or cumulative effects are anticipated on the groundwater system. Additionally, the new production well is located in a deeper bedrock aquifer, further reducing the potential for cumulative effects.

10.3.2 Certain and Reasonably Foreseeable Project and Activities

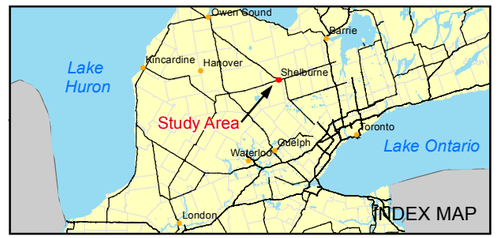
As stated in the problem/opportunity statement in Section 3.1.1, the anticipated growth of Shelburne through 2032 requires that additional water supply be installed, as well as to meet anticipated water quality standards into the future.

The future growth rate for Shelburne was incorporated into the assessment, which anticipates that 1,635 m^3/d is required to serve the Town through 2032. Certain and reasonably foreseeable projects, listed in Table 10.2-1, are assumed to be bounded by this growth rate; therefore, no cumulative residual adverse effects are anticipated.

This assessment has also considered the Highlands Melancthon Quarry (the quarry), which submitted an Aggregate Resource Application in March 2011, to the Ministry of Natural Resources. Due to public interest in the project, the Ontario Government has required the project to undergo an environmental assessment under the *Ontario Environmental Assessment Act*. On November 21, 2012 Highlands Company withdrew their Aggregate Resource Application and indicated they no longer intended to move forward with the quarry. As a result, the quarry is no longer considered certain or reasonably foreseeable and accordingly no cumulative effects are anticipated.

LEGEND

- 1700396 MOE Water Well Record No.
- Domestic Well
- Municipal Monitoring Location
- Test Production Well
- Road
- Railway (Abandoned)
- Watercourse
- Waterbody
- Wetland (MNR LIO 2009)
- Town of Shelburne Boundary
- Municipal Boundary



REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
MOE Well Records - MOE 2009
Imagery: GRCA (2006); ESRI World Imagery dataset
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

250 125 0 250 500 750
SCALE 1:15,000 METRES

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE
LOCAL WATER WELLS

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	7 Mar. 2012		
GIS	PRM	7 Mar. 2012		
CHECK	SMD	7 Mar. 2012		
REVIEW	SMD	7 Mar. 2012		

FIGURE: 10.2-1

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10.4 Mitigation Measures

As discussed above, it is anticipated that the well will provide a sustainable pumping rate of 1,635 m^3/d, and in conjunction with the existing production, the SWSS will be capable of accommodating future water demands in the service area. Ongoing monitoring and planning will be carried out by the Town to ensure Shelburne is adequately serviced with safe drinking water. Procedures and contingency plans for the operations phase (see Section 12.1) briefly describe some of the procedures in place to ensure the Town is adequately managing the SWSS. The Town will continue to carry out servicing reviews to ensure that new demands for drinking water are met.

In addition the Town will respond and address any concerns from the public (including adjacent private well users) relating to drawdown in the study area from the well.

10.5 Residual Adverse Effects

Based on the above assessment and the implementation of mitigation measures described above, no residual cumulative adverse effects are anticipated.

10.6 Significance of Residual Adverse Effects

Residual cumulative adverse effects are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

11.0 SUMMARY OF POTENTIAL ENVIRONMENTAL EFFECTS

Table 11.-1 summarizes the environmental effects assessment for the Project.

Table 11-1: Summary of Potential Environmental Effects

Environmental Component	Project-Environment Interaction(s)	Potential Effect(s)	Mitigation Measure(s)	Residual Effect (After Mitigation)	Significance
Physical Environment					
Groundwater quantity and quality	■ Excavation and backfilling for watermain pipe installation; ■ Inspection and testing of Project components; ■ Construction of a back-up well; and ■ Routine operations and maintenance at the well site and along the watermain route.	■ Potential effect of groundwater quality from accidental contaminant sources due to construction and operation of the well and watermain. ■ Potential interference with existing private and municipal wells. ■ Potential connectivity to surface water sources.	■ Standard construction best management practices, including: ▪ Refuelling and maintenance; ▪ Disposal; ▪ Drainage and water control; ▪ Dust control; ▪ Site clearing; ▪ Sedimentation and erosion control, including: – Silt fencing along watercourses to avoid sedimentation; – Culverts and sediment traps or straw bails to filter runoff; – Covering stockpiles to avoid erosion and runoff into watercourses; – Erosion blankets; – Dust control measures including sprinkling water on stockpiles; ■ Emergency response and spills contingency plan; and ■ Operations and contingency plan.	■ Groundwater level drawdown in shallow and deep bedrock aquifers should not affect the operation of local private well owners. ■ Based on water samples collected during performance testing of TW7-10, the quality of the groundwater is suitable for development of municipal supply. ■ Groundwater pumped from TW7-10 is interpreted to be not under the direct influence of surface water (i.e., non-GUDI). ■ Mitigation measures are deemed sufficient; therefore, no residual adverse effects on groundwater quality and quantity are anticipated.	■ Residual adverse effects on groundwater quality and quantity are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.
Surface water quantity and quality	■ Stripping of topsoil at the well site and along the watermain route; ■ Installation of concrete foundation and construction of wellhouse; ■ Excavation and backfilling for watermain pipe installation; ■ Inspection and testing of Project components; ■ Site restoration including topsoil cover and re-vegetation; ■ Construction of a back-up well; and ■ Routine operations and maintenance at the well site and along the watermain route.	■ The construction activities listed above may cause degradation to surface water quality as a result of increased suspended solids loading from soil erosion, as well as the potential for accidental spills of hazardous materials (i.e., oil, gas, lubricants, etc.). ■ During operations of the well, the potential drawdown is expected to extend up to 1.0 km from the proposed well site. The effect of drawdown decreases with increasing distance from the well	■ Installation of watermain leak detection system. ■ Site-specific erosion and sediment control plans. ■ Equipment refuelling and maintenance plan. ■ Site specific waste management, spill prevention and emergency response plan.	■ Relative to this seasonal variability, seepage losses from surface catchments (in response to TW7-10 pumping) should have no discernible effect on the variation of stream flow rate or temperature currently observed within local drainage features. ■ Local wetland areas are underlain by glacial till soils and drained by engineered trenches at surface. Water levels in these areas did not respond to	■ Residual adverse effects on surface water quality and quantity are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

Table 11-1: Summary of Potential Environmental Effects (Continued)

Environmental Component	Project-Environment Interaction(s)	Potential Effect(s)	Mitigation Measure(s)	Residual Effect (After Mitigation)	Significance
		site. The Amos Drainage Works is located within the outer most portion of the 1.0 km drawdown area.		groundwater pumping from TW7-10 (over a 72 hour period). Since wetland areas are located towards the edge of TW7-10 zone of influence, seepage losses will be insignificant.	
Terrain and soils	■ Stripping of topsoil at the well site and along the watermain route; ■ Construction equipment delivery and laydown; ■ Installation of concrete foundation and construction of well house ■ Installation of fencing; ■ Excavation and backfilling for watermain pipe installation; ■ Site restoration including topsoil cover and re-vegetation; ■ Construction of a back-up well; and ■ Routine operations and maintenance at the well site and along the watermain route.	■ Construction activities listed above may result in the temporary disturbance and/or removal of soils along the watermain route and in the vicinity of the well site. In addition, toxic effects to soils could occur as a result from accidental spills or leaks during construction and operations.	■ Installation of watermain leak detection system. ■ Site-specific erosion and sediment control plans. ■ Equipment refuelling and maintenance plan. ■ Site specific waste management, spill prevention and emergency response plan. ■ Striping of topsoil and vegetation will be restricted to designated areas and along right-of-ways. ■ All disturbed areas shall be restored with topsoil, hydro-seeding or sod as soon as possible. ■ Monitoring and site checks of trenches at the end and start of each working day.	■ Mitigation measures are deemed sufficient; therefore, no residual adverse effects on terrain and soils are expected as a result of erosion during construction activities.	■ Residual adverse effects on terrain and soils are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.
Biological Environment					
Fish and fish habitat, aquatic ecosystems	■ Clearing of riparian vegetation and stripping of topsoil at the watercourse crossings; ■ Disturbance of the channel bed and banks for the excavation of the watermain trench; ■ Accidental spills of hazardous materials from the construction equipment. ■ Clearing of riparian vegetation and stripping of topsoil at the entrance and exit locations for the tunnelling equipment; ■ Accidental spills of hazardous materials	■ Construction activities may cause degradation of water quality and habitat as a result of suspended solids loading from soil erosion, as well as potential spills of hazardous materials ■ During operation, potential drawdown is expected to extend up to 1.0 km from the proposed well site. Effects on fish and fish habitat are expected to be minimal from drawdown.	■ Limit the amount of clearing of riparian vegetation and where possible avoid grubbing the roots of woody vegetation to maintain bank stability. ■ Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation. ■ Use the Fisheries and Oceans (DFO) operating statement for *Isolated or Dry Open Cut Stream Crossings*. Follow the *Measures to Protect Fish and Fish Habitat*.	■ Mitigation measures are deemed sufficient; therefore, no residual adverse effects on fish and fish habitat are expected as a result of erosion and sedimentation. ■ Due to the distance of the Amos Drainage Works from the well site and minimal drawdown, no residual adverse effects are anticipated.	■ Residual adverse effects on fish and fish habitat are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

Table 11-1: Summary of Potential Environmental Effects (Continued)

Environmental Component	Project-Environment Interaction(s)	Potential Effect(s)	Mitigation Measure(s)	Residual Effect (After Mitigation)	Significance
	from the construction equipment.		■ Time the crossings to coincide with the dry channel period. If the channel is not dry and it is necessary to isolate the section to be crossed, undertake a fish rescue operation. ■ Protect sensitive fish life stages by adhering to fisheries timing windows. ■ Re-instate the channel bed and banks to previous condition (channel profile) using stockpiled channel materials from the excavation. ■ Site specific erosion and sediment control plans. ■ Installation and maintenance of silt fences adjacent to watercourses throughout the construction period. ■ Site specific waste management, spill prevention and emergency response plan (construction and operation phases). ■ In the event that a spill occurs, and containment and clean-up is not effective before spilled materials dissipate into the environment, a habitat quality assessment will be completed to evaluate the need for restoration activities. ■ Use the Fisheries and Oceans (DFO) operating statement *Punch and Bore Crossing* or *High Pressured Directional Drilling*. Follow the *Measures to Protect Fish and Fish Habitat*.		
Vegetation	■ Stripping of topsoil at the well site and along the watermain route; ■ Construction equipment delivery and laydown; ■ Installation of concrete foundation and construction of wellhouse;	■ Temporary or permanent removal of vegetation along watermain route and vicinity of well site. ■ Toxic effects from accidental spills.	■ Tree removal and vegetation clearing zones will be restricted to those identified on the contract drawings and delineated in the field. ■ Vegetation retention zones will	■ The vegetation communities identified in the proximity of the Project site are not considered to be rare; therefore, with the implementation of mitigation measures, no residual adverse	■ Residual adverse effects on vegetation are not expected as a result of the Project; therefore, no significant adverse

Table 11-1: Summary of Potential Environmental Effects (Continued)

Environmental Component	Project-Environment Interaction(s)	Potential Effect(s)	Mitigation Measure(s)	Residual Effect (After Mitigation)	Significance
	■ Installation of fencing; ■ Excavation and backfilling for watermain pipe installation; ■ Site restoration including topsoil cover and re-vegetation; ■ Construction of a back-up well; and ■ Routine operations and maintenance at the well site and along the watermain route.	■ No sensitive vegetation is likely to be affected by the Project.	also be identified on contract drawings and delineated in the field. ■ Employ appropriate vegetation clearing techniques. ■ Striping of topsoil and vegetation will be restricted to designated areas and along right-of-ways. ■ Excavated material stockpiles shall not be placed within drip lines of trees not designated for removal. ■ Damaged branches and roots of trees not designated for removal will be trimmed back properly and cleanly. ■ All disturbed areas shall be restored with topsoil, hydro-seeding or sod as soon as possible.	effects are anticipated.	effects are anticipated.
Wildlife and wildlife habitat	■ Vegetation removal and stripping of topsoil at the well site and along the watermain route; ■ Construction equipment delivery and laydown; ■ Installation of fencing; ■ Excavation and backfilling for watermain pipe installation; ■ Site restoration including topsoil cover and re-vegetation; and ■ Routine operations and maintenance at the well site and along the watermain route.	■ Removal of vegetation during construction activities and installation of fencing may potentially fragment habitat. ■ Delivery of construction equipment may cause vehicular collisions with wildlife. ■ Disturbance to wildlife, including SAR, may also occur due to noise, dust, and the physical presence of construction equipment. ■ Wildlife could also become trapped in unattended ditches or excavated areas.	■ Limiting clearing to only those areas absolutely necessary to safely install, maintain and operate the new well site and watermain. ■ Where practical, retain riparian vegetation along watercourses. ■ Avoid vegetation clearing and heavy construction works during the bird breeding season (May 1st to July 31st). ■ In addition to the above, SAR species-specific mitigation for Bobolink, Eastern meadowlark and Barn swallow will be outlined in the *Information Gathering Form* and through negotiations with the MNR; ■ Installing exclusion fences (e.g. silt fences) in advance of work to clearly mark sensitive areas (i.e., riparian areas) and to prevent wildlife from entering the Project site;	■ Construction activities are restricted to a small portion of the study area, and contained within existing right-of-ways; therefore, minimal vegetation removal will be required. ■ The project footprint will not be located within rare vegetation communities. ■ Based on the assessment conducted and the mitigation measures, no residual adverse effects on wildlife and wildlife habitat are anticipated.	■ Residual adverse effects on wildlife and wildlife habitat are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.

Table 11-1: Summary of Potential Environmental Effects (Continued)

Environmental Component	Project-Environment Interaction(s)	Potential Effect(s)	Mitigation Measure(s)	Residual Effect (After Mitigation)	Significance
			■ Use of dust prevention measures (i.e., watering). ■ The contractor will be advised that harassing or harming wildlife is prohibited. ■ Wildlife incidentally encountered during construction will not be knowingly harmed; ■ Restoring lands upon completion of the Project with native vegetation, including re-seeding exposed areas. ■ Monitoring and site checks of trenches at the end and start of each working day.		
Atmospheric Environment					
Noise and/or vibration levels	■ Stripping of topsoil at the well site and along the watermain route; ■ Construction equipment delivery and laydown; ■ Installation of concrete foundation and construction of well house; ■ Installation of fencing; ■ Installation of pump system and components; ■ Installation of water treatment facilities; ■ Excavation and backfilling for watermain pipe installation; ■ Inspection and testing of project components; ■ Site restoration including topsoil cover and re-vegetation; ■ Construction of a back-up well; ■ Routine operations and maintenance at the well site and along the watermain route.	■ Potential effects on noise and/or vibration levels as a result of construction vehicles and equipment. ■ Under normal operating conditions, the well and watermain route activities will not have an effect on noise and/or vibration levels. ■ The standby diesel generator could be used in case of emergency and during maintenance/testing, which will increase noise and/or vibration levels.	■ Ensuring equipment is in good working condition and operating quietly prior to accessing the site. ■ Regular maintenance of equipment during the construction phase. ■ Minimize use of portable standby generator during power failures. ■ Only operate equipment during daylight hours to be in compliance with noise by-laws 45-2004, 43-2004 and 31-2002 from the Town of Shelburne, Township of Amaranth and Township of Melancthon, respectively.	■ Given the temporary noise and/or vibration levels from construction activities and the low noise and/or vibration levels from operations, as well as the implementation of mitigation measures, no residual adverse effects on noise levels and vibrations are anticipated.	■ Residual adverse effects on noise levels are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.
Air quality	■ Stripping of topsoil at the well site and along the watermain route; ■ Construction delivery and laydown; ■ Installation of concrete foundation and	■ Potential for degradation of air quality as a result of increased emissions and dust from construction activities.	■ Ensure all construction equipment is in good working condition. ■ Ensure all staff is adequately trained in the proper use of the	■ Given the temporary effects on air emissions and dust from construction activities and no effects on air quality from	■ Residual adverse effects on air quality are not expected as a result of the Project;

Table 11-1: Summary of Potential Environmental Effects (Continued)

Environmental Component	Project-Environment Interaction(s)	Potential Effect(s)	Mitigation Measure(s)	Residual Effect (After Mitigation)	Significance
	construction of wellhouse; ■ Installation of fencing; ■ Installation of pump system and components; ■ Installation of water treatment facilities; ■ Excavation and backfilling for watermain pipe installation; ■ Site restoration including topsoil cover and re-vegetation; ■ Construction of a back-up well; and Routine operations and maintenance at the well site and along the watermain route.	■ During operations, if a power loss occurs the standby diesel generator may be used. The potential effects from the standby diesel generator will be temporary.	construction equipment. ■ Use appropriate dust suppression materials and measures. ■ Minimize the use of the standby diesel generator.	operations, as well as the implementation of mitigation measures, no residual adverse effects on air quality is anticipated.	therefore, no significant adverse effects are anticipated.
Socio-Economic Environment					
Human health	■ Routine operations and maintenance at the well site and along the watermain route.	■ Potential human health effects relate to changes in water quality, noise and/or vibration levels and air quality.	■ Mitigation measures described for effects on groundwater quality and quantity, noise and/or vibrations and air quality will be applied to ensure that effects on human health are minimized.	■ Based on the assessment and the implementation of mitigation measures for other VECs, no residual adverse effects on human health are anticipated.	■ Residual adverse effects on human health are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.
Aboriginal land use and resource use	■ Stripping of topsoil at the well site and along the watermain route; ■ Construction equipment delivery and laydown; ■ Installation of concrete foundation and construction of well house; ■ Installation of fencing; ■ Excavation and backing filling for watermain pipe installation; ■ Site restoration including topsoil cover and re-vegetation; ■ Construction of a back-up well; and ■ Routine operations and maintenance at the well site and along the watermain route.	■ Although the Project is located in the traditional Aboriginal lands, no adverse effects on land claims, treaty, title rights or on the use of land for traditional purposes is likely to result from the Project.	■ Mitigation measures described for effects on physical environment, biological environment and atmospheric environment will be applied to ensure that effects on Aboriginal land use and resource use are minimized.	■ Although the Project is located in the traditional Aboriginal lands, no residual adverse effects on land claims, treaty, title rights or on the use of land for traditional purposes are likely to result from the Project.	■ Residual adverse effects on Aboriginal land use and resource use are not expected as a result of the Project; therefore, no significant adverse effects are anticipated.
Physical and cultural heritage	■ Stripping of topsoil at the well site and	■ A Stage 1 Archaeological	■ Preservation in situ, requiring	■ Based on the assessment and	■ With the

Table 11-1: Summary of Potential Environmental Effects (Continued)

Environmental Component	Project-Environment Interaction(s)	Potential Effect(s)	Mitigation Measure(s)	Residual Effect (After Mitigation)	Significance
(archaeological)	along the watermain route; ■ Installation of concrete foundation and construction of the well house; ■ Installation of fencing; ■ Excavation and backfilling for watermain pipe installation; and ■ Construction of a back-up well.	Assessment determined the new well site is within an area of moderate archaeological potential.	changes to Project layout. ■ Removal and preservation of artefacts. ■ Further assessment (i.e., Stage 2 Archaeological Assessment, and if necessary Stage 3 Archaeological Assessment and Stage 4 Archaeological Assessment).	the implementation of mitigation measures, no residual adverse effects on physical and cultural heritage are anticipated.	implementation of the identified mitigation measures, residual adverse effects are not expected as a result of the Project; therefore, no significant adverse environmental effects are anticipated.
Malfunctions and Accidents					
Malfunctions and accidents	■ Contaminant spill/accident involving construction or operator equipment or transported materials (e.g., fuel, oil and lubricants). ■ Sedimentation resulting from rainfall and runoff at the Project site. ■ Equipment fire. ■ Equipment malfunction.	■ Potential effect on groundwater quality in shallow and deep aquifer. ■ Potential effect on surface water quality in nearby watercourses. ■ Obstruction to flow as a result of sedimentation. ■ Potential effect on soil quality. ■ Potential effect on fish and fish habitat in nearby watercourses. ■ Potential destruction of fish and fish habitat. ■ Potential damage or destruction of native vegetation species. ■ Potential damage or destruction of native wildlife species and habitat. ■ Potential deterioration of air quality near the Project site. ■ Potential increase in noise levels on the construction site. ■ Potential effect on water quality in shallow and deep aquifer. ■ Potential deterioration of air quality near the Project site.	■ Traffic control plan. ■ Emergency response and spills control plan. ■ Erosion and sediment control plan. ■ Operations plan. ■ Contingency plan.	■ Based on the discussion for the construction and operation phases for the Project and the implementation of the mitigation measures, malfunctions and accidents are not expected to cause any residual adverse effects on the Project or the identified VECs.	■ Based on the above discussion, malfunctions and accidents are not expected to cause significant residual adverse effects on the Project or the identified VECs.
Cumulative Effects					
Cumulative effects on groundwater quantity	■ Activities adjacent to the well site. ■ Sectoral projects that affect groundwater extraction and use	■ Reduced capacity of existing private wells	■ Ongoing monitoring and planning will be carried out by the Town to ensure Shelburne is adequately serviced with safe drinking water.	■ Based on the above assessment and the implementation of mitigation measures described above, no	■ Residual cumulative adverse effects are not expected as a result of the Project;

Table 11-1: Summary of Potential Environmental Effects (Continued)

Environmental Component	Project-Environment Interaction(s)	Potential Effect(s)	Mitigation Measure(s)	Residual Effect (After Mitigation)	Significance
			Procedures and contingency plans for the operations phase (see Section 12.1) briefly describe some of the procedures in place to ensure the Town is adequately managing the SWSS. ■ The Town will continue to carry out servicing reviews to ensure that new demands for drinking water are met. ■ In addition the Town will respond and address any concerns from the public (including adjacent private well users) relating to drawdown in the study area from the well.	residual cumulative adverse effects are anticipated.	therefore, no significant adverse effects are anticipated.

12.0 ENVIRONMENTAL MANAGEMENT

12.1 Groundwater and Surface Water Level Follow-up Monitoring Program

To confirm the groundwater withdrawals at the proposed municipal well site have negligible effects on existing groundwater supplies and surface water resources and to confirm no additional mitigation measures are required, a groundwater and surface water level monitoring program has been recommended within Section 6.0 of the Hydrogeological Report. The monitoring program includes:

- Development of a rating curve and stream flow monitoring at the Willow Brook crossing of Highway 89; and
- Continuous groundwater elevation monitoring in nearby observation wells (MW6/10-9 and OGS 10A).

As standardized construction measures will be implemented, no additional monitoring is recommended during the construction phase.

12.1.1 Requirements of the Follow-up Monitoring Program

This program would be initiated and funded by the Town in advance of the well operation to establish background levels. As a minimum, an on-site monitoring well, a second monitoring well in the vicinity of existing municipal Wells 5/ 6, and Willow Brook wetland at Highway 89 will be included in this monitoring program (see Table 3 of Appendix D for recommended locations). Automated water level recorders will be installed at these locations so that a continuous record of data can be developed. Manual measures at these locations should be recorded on a monthly basis for the first full year of operation and then semi-annually for subsequent years. Water levels in the production well will also be recorded frequently as part of the operations monitoring program.

12.1.2 Timeframe of Follow-up Program

The Town will finalize the details of the follow-up monitoring program after designs for the project are completed. It is expected that the groundwater and surface water level monitoring program will be a condition of a PTTW for the proposed production well, and reporting on the status of the well and identified effects will be documented and submitted to the MOE. An annual report will be prepared by the Town's engineer and submitted to the Agency and INFC for a period of two years following the construction phase. The annual report will be posted on the CEA registry to provide an opportunity for stakeholders to review the outcome of the project and verify predicted effects.

12.2 Emergency Response and Spills Contingency Plan

The contractor will be required to provide protocols for emergency response and spills. The document will include the following requirements:

- Provide procedures for the retention, clean-up and disposal of spills;
- Materials for clean-up of spills will be kept on the construction site;

- All spills will be reported to the Ontario Ministry of the Environment Spills Action Centre; and
- First Aid equipment will be on the construction site in compliance with the *Occupational Health and Safety Act*.
- Town of Shelburne's emergency plan to run parallel to sit emergency plan. The Town will be notified immediately of any emergency.

12.2.1 Erosion and Sediment Control Plan

The contractor will be required to implement BMPs to avoid erosion and sedimentation in nearby watercourses. Possible BMPs that may be implemented include:

- Silt fencing along watercourses to avoid sedimentation;
- Culverts and sediment traps or straw bails to filter runoff;
- Covering stockpiles to avoid erosion and runoff into watercourses;
- Erosion blankets; and
- Dust control measures including sprinkling water on stockpiles.
- Weekly inspection reports to be completed and copied to the town.

12.2.2 Traffic Management Plan

The contractor will implement a Traffic Management Plan which outlines adequate traffic control measures during the construction phase in accordance with Book 7 of the Ontario Traffic Manual (2001). The traffic control measures will focus on the installation of the watermain along 2nd Line SW and Highway 89. The following provisions will be integrated into the Traffic Management Plan:

- Traffic signs identifying construction work and lane restrictions;
- Barriers delineating the construction area and lane restrictions;
- Flag persons or temporary lights to direct traffic; and
- Requirements to keep roads affected by construction open at all times for the duration of the construction phase.

12.2.3 Health and Safety Plan

Current legislative requirements dictate the implementation of health and safety protocols in which the contractor will have to follow during the construction phase. These requirements include:

- Access to necessary First Aid equipment and materials in accordance with the Occupational Health and Safety Act and the Ministry of Labour; and

- Submission of a Clearance Certificate from the Workplace Safety and Insurance Board.
- Copy of general contractor's site specific health and safety policy.

12.2.4 Hydrostatic Pressure Testing Plan

The contractor will be required to complete hydrostatic testing of the watermain and piping internal of the system. The components of the testing protocol will include the following:

- Prior to testing the general contractor and the Town and OCWA will meet to go over the Hydrostatic Pressure Testing Plan.
- Town staff will be present during testing.
- Testing will be completed on the entire completed watermain. The test sections will be gradually filled with water and air will be removed from the pipe. The water will be supplied through a temporary connection and will be equipped with a backflow device.
- A minimum of two swabs will be passed through each section of the new watermain to ensure no blockage or debris is present.
- The test protocol will be in compliance with applicable Ontario Provincial Standard Specifications (OPSS) and Town requirements. Testing of each section will take place over two hours.
- AWWA Watermain Commissioning Forms to be completed (This is now a requirement under the new drinking water works permit Schedule B: General, section 2.0.
- If leakages are found, the leakage will be compared with the allowable leakage calculated for the test sections. If the leakage exceeds the allowable limit, the leakage will be located and repaired, as well as tested again until the satisfactory results are obtained.
- When all the testing requirements have been satisfied, the Town will approve the connection into the existing distribution system.
- The contract administrator must be on-site during testing, during the removal of the temporary connection and until connection into the existing distribution system is complete.

12.2.5 Operations Plan

An operating and maintenance manual will be developed for the proposed new well site, which will provide public works staff and OCWA with a guide for system operations, as well as protocols for addressing emergency situations, malfunctions and accidents. The manual will provide and overview of the system and the requirements under O. Reg. 170/03 and the current CofA. Table 12.1.6-1 provides a summary of details contained in the Operations Plan for the new well site. The purpose of the plan is to operate within MOE standards, including water quality standards.

Table 12.1.6-1: Operations Plan Procedures

Component	Procedure
Well Maintenance	To ensure the new well is well maintained and operating under suitable conditions to maintain water quality standards, the following inspections will be completed and documented: ■ Visual Inspection; ▪ Ensure well cap is securely in place and gasket is present; ▪ Ensure all connections and openings are sealed; and ▪ Ensure vent screen is secure and in place. ■ Raw Water Quality; ▪ Follow MOE sampling and testing requirements; ▪ Check raw water tests as they become available; ▪ Re-test raw water if exceedances occur; and ▪ Implement correctional measures as required and as directed by MOE and local Health Unit. ■ Down Hole Inspection ▪ Complete video inspection of the well and well casing when the well pump is removed for maintenance, or every 10 years after the first video inspection All work is to be completed in accordance with O. Reg. 903 (last amended O. Reg. 486/10).
Pumphouse Monitoring	■ A regular preventative maintenance program will be implemented including records of all maintenance checks and equipment repairs completed on the pumphouse.

12.2.6 Contingency Plan

The current CofA includes provisions for the inclusion of a Contingency Plan in the Operation Plan. The Contingency Plan outlines appropriate actions to provide adequate equipment and material to deal with emergencies, upset and equipment breakdown. The Town, along with their operating authority OCWA, must be in compliance with the procedures outlined in the Contingency Plan.

The Contingency Plan provides mitigation measures for adverse effects from the following:

- Supply and treatment problems (i.e., exceedances on water quality results, etc.);

- Distribution system problems (i.e., watermain break);
- Storage facility problems (i.e., on-site chemicals); and
- Emergency situations (i.e., security issues, explosion, fire, etc.).

Corrective actions are dependent on the nature of the situation. The Contingency Plan sets out procedures to assess the situation, defines steps to address and mitigate the situation, determine necessary agency contacts and support, notify the public (as required), determine if the situation poses a health and safety risk, undertake appropriate remedial action and monitor the outcome. The plan will outline a notification procedure, as required, for example, notifying the local health unit or the MOE Spills Action Centre.

Table 12.1.7-1 summarizes the most predictable malfunctions and accidents during the operational life of the water system, as outlined in the Contingency Plan.

Town of Shelburne Emergency Management plan will be updated to incorporate this new facility.

Table 12.1.7-1: Potential Malfunctions and Accidents Addressed in the Contingency Plan

Component	Malfunction or Accident	Effect Trigger
Water Quantity	Low water levels	■ Well level during pumping is below normal values. ■ Pumping rate is decreasing as noted by metering. ■ Observation. ■ Storage decreasing. ■ Loss of pressure. ■ Alarms.
	Excessive consumption	■ System pressure is dropping below recommended levels. ■ Customer complaints. ■ Elevated tank levels are dropping to below recommended levels.
Water Quality	Bacteriological contamination	■ Routine analysis. ■ Observation.
	Foreign matter in well supply	■ Routine analysis.

Component	Malfunction or Accident	Effect Trigger
		■ Observation.
Climatic Conditions	Frozen watermain	■ Customer complaint. ■ Loss of service to an area. ■ Lower than normal pressure.
	Power failure	■ Observation. ■ Alarm. ■ Loss of pressure.
	Flooding	■ Weather report/flood warning. ■ Observation.
Other Natural Situations	Watermain break	■ Observation. ■ Loss of pressure.
	Structural failure	■ Observation.
	Fire or explosion	■ Observation. ■ Alarm.

The procedures for those malfunctions and accidents listed in Table 12.1.7-1 and contained in the Contingency Plan are short term measures designed to protect public health and safety and resolve problems quickly. Additional action strategies are also provided for those situations more long term in duration, in particular for those pertaining to water quality and quantity. These action strategies include more detail on monitoring and the procurement of alternative water sources.

12.3 Commitments

The following are commitments made by the Town for the Project as part of the EA/EIS:

- The project will meet all Provincial Water Quality Objectives and Guidelines for Canadian Drinking Water Quality and Recreational Water Quality.
- All phases of the project will adhere to relevant standards and guidelines for noise and air quality.
- Erosion and sediment plan, including the following BMPs outlined in Section 12.1.2.
- The construction contractor will implement a traffic control plan for the construction phase.

- The contractor will be required to provide an emergency response and spills plan, as well as a copy of their health and safety policy.
- Plans and procedures outlined in Section 12.1 will be kept onsite during the construction phase for reference by the construction team.
- Reporting spills to necessary regulatory agencies, including MOE Spills Action Centre and Town of Shelburne.
- Construction safety will be conducted according to Ontario Ministry of Labour requirements.
- Appropriate mitigation measures will be required during construction to provide the mitigation necessary to avoid killing, harming or harassing these species during construction.
- The Town will refer to DFO Operational Policy Statements during planning for watermain installation at watercourse crossings (Section 1.5).
- To confirm the groundwater withdrawals at the proposed municipal well site have negligible effects on existing groundwater supplies and surface water resources, a groundwater and surface water level monitoring program will be implemented.
- Continuous monitoring of the system by a supervisory panel and data acquisition system will occur during operations, including having the capability to stop pumping if a malfunction occurs.
- Operation staff will be called to the site through an alarm system to address operating issues if a malfunction should occur.
- Watermain repairs will be made in compliance with existing Town and MOE protocols to ensure safety of the drinking water.
- The Six Nations of the Grand River First Nation will be invited to a meeting to discuss the results of the EIS.
- The Town will complete a follow-up monitoring program once designs for the project are finalized.

13.0 CAPACITY OF RENEWABLE RESOURCES

The groundwater pumping test results indicate that the well can sustain a minimum yield of 1,635 m^3/d in the long-term. The maximum potential yield of the well will be constrained by the available groundwater level drawdown within the well (i.e., primarily a function of well efficiency). The pumping level within the well should not be lowered below the top of the Gasport Formation. Exposure of Gasport Formation to atmospheric conditions could result in mineral precipitation within the borehole and as a result could reduce well efficiency in the long-term. Based on hydrogeological investigations, it is concluded that the well can sustain the pumping rate for the duration of the Project.

14.0 ECONOMIC AND SOCIAL BENEFITS OF THE PROJECT

The Town of Shelburne Official Plan (2006) predicts an average population growth rate of 2.2% per year through 2032. As a result of this rapid growth in population, expanding water supply from municipal water services is necessary to accommodate future growth for the Town, as indicated its Official Plan. It is estimated that by 2032, the Town's water supply requirements of 5,983 m^3/d will exceed the current capacity of 4,916 m^3/d), resulting in a shortfall of 1,067m^3/d (J. Graham, P.Eng. Genivar-Town Engineer, personal communication, September 2012). The proposed Project includes the development of a new production well and backup well with a permitted capacity of 1,067 m^3/d that would satisfy the projected water supply deficit through 2032.

This pumping rate would result in an additional 568 m^3/d beyond the required 1,067 m^3/d. This additional supply will result in a greater overall water supply security for Town of Shelburne by reducing demand from existing production wells, as the supply from some of these wells is not considered "firm", as no backup well or generator is present.

The Town is located within the designated Greater Golden Horseshoe Growth Plan (GGHGP) area under the *Places to Grow Act* (Ministry of Public Infrastructure Renewal, 2006). The GGHGP considers policies specifically focusing on water supply, which focuses on directing major growth to settlement areas that offer municipal water, such as the Town of Shelburne, and away from settlement areas that are serviced privately.

The GGHGP builds upon the Provincial Policy Statement (2005), which was issued under the *Planning Act*. The Town has made an effort to be consistent with the policies of the PPS, including those related to water supply and water infrastructure projects. The Town's current Official Plan maintains water-related policies with the objectives to:

- Ensure that land use planning within the Town contributes to the protection, maintenance and enhancement of water and water-related resources and aquatic ecosystems, on an integrated watershed management basis;
- Ensure that growth and development within the Town occurs in a manner that will minimize public health and safety issues, including the protection of human life and property from water related hazards, such as flooding and erosion; and
- Ensure that all land use decisions promote water conservation and support the efficient use of water resources on a watershed basis.

As mentioned above, the Town's Official Plan with consideration of the PPS focuses on public health and safety to prevent water related hazards. This also includes ensuring adequate water quality for supplying the Town's drinking water.

15.0 BENEFITS TO CANADIANS

The Ontario Ministry of the Environment (MOE) has indicated that the ODWQS for arsenic will be reduced from 25 to 10 µg/L. The current arsenic concentrations in the Town of Shelburne's drinking water meet current standards but are slightly above the potential new standard. The funding from the Ontario Potable Water Program will allow the Town to install the proposed new well in order to be in compliance with the potential change in the ODWQS for arsenic.

16.0 ASSESSMENT SUMMARY AND CONCLUSION

Table 16-1 summarizes the potential environmental effects, impact mitigation and residual adverse effects from the Project, including malfunctions and accidents, effects of the environment on the Project and cumulative effects.

Taking into consideration the existing environmental conditions, the potential environmental effects, mitigation measures to minimize, reduce or eliminate potential adverse effects and the evaluation of significance of residual adverse effects, the EA/EIS does not identify any likely significant adverse environmental effects from the Project.

Public consultation and Aboriginal engagement conducted for the Project did not identify any concerns that are not addressed and/or mitigated by measures presented in the EA/EIS.

Table 16-1: Environmental Effect Summary Checklist

Environmental Component	Potential Project Effects				Residual Adverse Effects	
	Potential effects?		Can it be mitigated?		Is it significant?	
	Yes	No	Yes	No	Yes	No
Physical environment						
Groundwater quantity and quality	✓		✓			✓
Surface water quantity and quality	✓		✓			✓
Terrain and soils	✓		✓			✓
Biological environment						
Fish and fish habitat, aquatic ecosystems	✓		✓			✓
Vegetation	✓		✓			✓
Wildlife and wildlife habitat	✓		✓			✓
Atmospheric environment						
Noise and/or vibration levels	✓		✓			✓
Air quality	✓		✓			✓
Socio-economic environment						
Human health	✓		✓			✓
Aboriginal land use and resource use	✓		✓			✓
Physical and cultural heritage (archaeological)	✓		✓			
Malfunctions and accidents						
Construction and operations phase malfunctions and accidents	✓		✓			✓
Cumulative effects						
Cumulative effects	✓		✓			✓

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APPENDIX A

Consultation Record

09-1113-6007

Shelburne Water Supply Project - Stakeholder Distribution List

Public

Name	Title	Organization	Address 1	Address 2	City	Province	Postal Code	Email	Telephone
Kim Goodman	General Manager	Centre for Sustainable Watersheds	14 Water Street, ON	P.O. Box 280	Portland,	Ontario	K0G1V0	info@watersheds.ca	
Dufferin County Forest	County Forest Manager	Dufferin County Forest	c/o Duffern County Museum & Archives			Ontario	L0N 1R0	forestmanager@dufferinmuseum.com	
Stephen Best	Director	Environmental Voters	PO Box 998, , ON		Shelburne	Ontario	L0N 1S0		
Tony Hopkins	President	Dufferin Hi-Land Bruce Trail Club	P O Box 698, Ontario		Alliston	Ontario	L9R 1V9	ahopkins@primus.ca	
Janice McClelland	President	Caledon Hills Bruce Trail Club	P O Box 65 Stn, , ON	Caledon Village	Caledon	Ontario	L7K 3L3	info@caledonbrucetrail.org	
Mono Mulmur Citzens' Coalition		Mono Mulmur Citizens' Coalition	P O Box 686, , ON		Shelburne	Ontario	L0N 1S0	yourcomments@monomulmur.com	
Karren Wallace	WANTS TO RECIEVE NOTICES BY EMAIL	karrenwallace@sympatico.ca				Ontario			
Norm MacEachern		Conserve Our Rural Environment	746269 30th Side Road, , , ON	R.R. #3	Shelburne	Ontario	L0N1S7	norm@informationpackaging.ca	

Review Agencies

Name	Title	Organization	Address 1	Address 2	City	Province	Postal Code	Email	Telephone
Pam Wheaton	Director Aboriginal & Ministry Relationships Branch	Ministry of Aboriginal Affairs	720 Bay Street, 4th Floor, ON		Toronto	Ontario	M5G 2K1	Pam.Wheaton@Ontario.ca	416 326 4053
The Secretary (Attn: Lise Hansen)	Sr. Negotiator	Ministry of Aboriginal Affairs	720 Bay Street, 4th Floor, ON		Toronto	Ontario	M5G 2K2	Lise.Hansen@jus.gov.on.ca	416 326 4765
Mr. Gregg Dahl	Senior Policy Analyst Office of the Federal Interlocutor for Métis and Non-status Indians	Department of Indian and Northern Affairs	66 Slater Street	Room 1218	Ottawa	Ontario	K1A 0H4	dahlg@inac.gc.ca	
Glenn Gilbert	Manager Environment Unit Lands and Trusts Services	Indian and Northern Affairs Canada	25 St. Clair Ave. East	8th Floor	Toronto	Ontario	M4T 1M2	Gilbertg@inac.gc.ca	
Mr. David Cooper	Manager Environmental and Land Use Policy	Ministry of Agriculture, Food and Rural Affairs	1 Stone Road W, 3rd Floor, ON		Guelph	Ontario	N1G 4Y2	david.cooper@ontario.ca	519 826 3117
Ms. Carol Neumann	Rural Planner West Central Region	Ministry of Agriculture, Food and Rural Affairs	1 Stone Road W, 3rd Floor, ON		Guelph	Ontario	N1G 4Y3	carol.neumann@ontario.ca	519 845 3393
Mr. Mario Veronesi	Manager Accommodations and Leasing Unit Facilities Branch	Ministry of Community Safety and Correctional Services	25 Grosvenor Street, 13 Floor, ON		Toronto	Ontario	M7A 1Y6	mario.veronesi@ontario.ca	416 327 1468
Lynn Peterson	Manager Special Projects	Ministry of Municipal Affairs & Housing	777 Bay Street, 14th Floor, ON		Toronto	Ontario	M5G 2E5	Lynne.Peterson2@ontario.ca	416 585 6348
Mr. Victor Doyle	Manager Planning Inovation Section Provincial Policy Planning Branch	Ministry of Municipal Affairs & Housing	777 Bay Street, 2nd Floor, ON		Toronto	Ontario	M5G 2E6	Victor.doyle@ontario.ca	416 585 6109
Sharon Rew	Manager, Policy	Ministry of Natural Resources	300 Water Street, PO Box 7000 5th Floor, North Tower, ON		Peterborough	Ontario	K9J4R5	sharon.rew@ontario.ca	705 755 5273
Mark Shoreman	District Manager	Ministry of Natural Resources	2284 Nursury Road, ON		Midhurst	Ontario		mark.shoreman@ontario.ca	705 725 7504
Kevin Pal	Manager Strategic Policy Branch Conservation & Strategic Policy Division	Ministry of Energy and Infrastructure	777 Bay Street, 4th Floor, Suite 425, ON		Toronto	Ontario	M7A 2C1	Kevin.pal@ontario.ca	
Ms. Tija Dirks	Director Growth Policy, Planning and Analysis	Ministry of Infrastructure	777 Bay Street, 4th Floor, Suite 425, ON		Toronto	Ontario	M7A 2C2	Tija.Dirks@ontario.ca	416 325 1546
Louise Knox	Director Ontario Regional Office	Canadian Environmental Assessment Agency	55 St. Clair Avenue East, 9th Floor, ON		Toronto	Ontario	M4T 1M2	Louise.Knox@ceaa-acee.gc.ca	416 952 1575
Joe Farwell	Chief Administrative Officer	Grand River Conservation Authority	400 Clyde Road P.O. Box 729, ON		Cambridge	Ontario	N1R 5W7	jfarwell@grandriver.ca	
Lorrie Minshall	Director of Water Management Plan, Source Protection	Grand River Conservation Authority	400 Clyde Road P.O. Box 729, ON		Cambridge	Ontario	N1R 5W8	lminshall@grandriver.ca	
Antonia Capotorto	Project Officer - EA Project Coordination Section	Ministry of the Environment	2 St. Clair Avenue West, 14th Floor		Toronto	Ontario	M4V 1L5	antonia.capotorto@ontario.ca	416 314 1181
Rob Dobos	Manager Environmental Assessment Section Environmental Protection Operations Division - Ontario Region	Environment Canada	PO Box 5050, 867 Lakeshore Rd., ON		Burlington	Ontario	L7R 4A6	rob.dobos@ec.gc.ca	905 336 4953
Wayne Wilson	CAO/Secretary-Treasurer	Nottawasaga Valley Conservation Authority	8195 8th Line, ON		Utopia	Ontario	L0M 1T0	wwilson@nvca.on.ca	
Glenn Switzer	Director, Engineering & Technical Services	Nottawasaga Valley Conservation Authority	8195 8th Line, ON		Utopia	Ontario	L0M 1T0	gswitzer@nvca.on.ca	
Chris Hibberd	Director, Planning Services	Nottawasaga Valley Conservation Authority	8195 8th Line, ON		Utopia	Ontario	L0M 1T0	chibberd@nvca.on.ca	
Barbara Slattery	EA/Planning Coordinator, Environment	Ministry of the Environment, West Central Region	119 King Street West, 12th Floor, ON		Hamilton	Ontario	L8P 4Y7	barbara.slattery@ontario.ca	905 521 7864

Municipalities

Name	Title	Organization	Address 1	Address 2	City	Province	Postal Code	Email	Telephone
Ed Crewson	Mayor	Town of Shelburne	203 Main Street East		Shelburne	Ontario	L0N 1S0	shelburne@townofshelburne.on.ca	

Scott Wheeldon	Director of Public Works	Town of Shelburne	203 Main Street East		Shelburne	Ontario	L0N 1S1	swheeldon@townofshelburne.on.ca	
Walter Benotto	Councillor	Town of Shelburne	203 Main Street East		Shelburne	Ontario	L0N 1S2	wbenotto@townofshelburne.on.ca	
A.J.Cavey	Councillor	Town of Shelburne	203 Main Street East		Shelburne	Ontario	L0N 1S3	ajcavey@townofshelburne.on.ca	
Randy Chambers	Councillor	Town of Shelburne	203 Main Street East		Shelburne	Ontario	L0N 1S4	rchambers@townofshelburne.on.ca	
Geoff Dunlop	Councillor	Town of Shelburne	203 Main Street East		Shelburne	Ontario	L0N 1S5	gdunlop@townofshelburne.on.ca	
Tom Egan	Councillor	Town of Shelburne	203 Main Street East		Shelburne	Ontario	L0N 1S6	tegan@townofshelburne.on.ca	
Laura Ryan	Mayor	Town of Mono	347209 Mono Centre Road	R.R.#1	Orangeville	Ontario	L9W 2Y8	Mayor@townofmono.com	
Elaine Capes	Councillor	Town of Mono	347209 Mono Centre Road	R.R.#1	Orangeville	Ontario	L9W 2Y9	elaine.capes@townofmono.com	
Bob Mitchell	Councillor	Town of Mono	347209 Mono Centre Road	R.R.#1	Orangeville	Ontario		bob.mitchell@townofmono.com	
Fred Nix	Councillor	Town of Mono	347209 Mono Centre Road	R.R.#1	Orangeville	Ontario		fred.nix@townofmono.com	
Don MacIver	Mayor	Township of Amaranth	424067 25 Sideroad Amaranth	R.R.#1	Shelburne	Ontario	L0N 1S5	mayor.maciver@hotmail.com	
Jane Aultman	Councillor	Township of Amaranth	424067 25 Sideroad Amaranth	R.R.#1	Shelburne	Ontario	L0N 1S6	jgaultman@hsfx.ca	
Brian Besley	Councillor	Township of Amaranth	424067 25 Sideroad Amaranth	R.R.#1	Shelburne	Ontario	L0N 1S7	bdbesley@gmail.com	
Heather Foster	Councillor	Township of Amaranth	424067 25 Sideroad Amaranth	R.R.#1	Shelburne	Ontario	L0N 1S8	foster.amaranthcouncil@hotmail.com	
Christine Gervais	Township Planner	Township of Amaranth	424067 25 Sideroad Amaranth	R.R.#1	Shelburne	Ontario	L0N 1S9	cgervais@amaranth-eastgary.ca	
Bill Hill	Mayor	Township of Melancthon	P.O. Box 465		Shelburne	Ontario	L0N 1S0	bhill@melancthontownship.ca	
John Crowe	Councillor	Township of Melancthon	157101 Highway # 10	R.R. #6	Shelburne	Ontario	L0N 1S8	jcrowe@melancthontownship.ca	
Janice Elliott	Councillor	Township of Melancthon	157101 Highway # 10	R.R. #6	Shelburne	Ontario	L0N 1S8	jelliott@melancthontownship.ca	
Nancy Malek	Councillor	Township of Melancthon	157101 Highway # 10	R.R. #6	Shelburne	Ontario	L0N 1S8	nmalek@melancthontownship.ca	
GW Jorden	Contract Planner	Township of Melancthon	157101 Highway # 10	R.R. #6	Shelburne	Ontario	L0N 1S13	planner@melancthontownship.ca	
Paul Mills	Mayor	Township of Mulmur	758070 2nd Line E	R.R. #2	Lisle	Ontario	L0M 1M0	pmills@mulmurtownship.ca	
Lynn Hilchey	Councillor	Township of Mulmur	758070 2nd Line E.	R.R. #2	Lisle	Ontario	L0M 1M1	lhilchey@mulmurtownship.ca	
Earl Hawkins	Councillor	Township of Mulmur	758070 2nd Line E.	R.R. #2	Lisle	Ontario	L0M 1M2	ehawkins@mulmurtownship.ca	
Heather Hayes	Councillor	Township of Mulmur	758070 2nd Line E.	R.R. #2	Lisle	Ontario	L0M 1M2	hhayes@mulmurtownship.ca	519-925-1786
Rhonda Campbell Moon	Deputy Mayor	Township of Mulmur	758070 2nd Line E.	R.R. #2	Lisle	Ontario	L0M 1M3	rcampbellmoon@mulmurtownship.ca	
Ron Mills	Planner	Township of Mulmur	758070 2nd Line E.	R.R. #2	Lisle	Ontario	L0M 1M4	rmills@mulmurtownship.ca	
John Willmetts	Director of Public Works	Township of Mulmur	758070 2nd Line E.	R.R. #2	Lisle	Ontario	L0M 1M5	jwillmetts@mulmurtownship.ca	
Trevor Lewis	Director of Public Works	Dufferin County	53 Zina Street		Orangeville	Ontario	L9W 1E5	directorofpublicworks@dufferincounty.on.ca	
Walter Kolodziechuk	Warden	Dufferin County	51 Zina Street		Orangeville	Ontario	L9W 1E6	warden@dufferincounty.on.ca	

First Nations and Aboriginal Peoples

Name	Title	Organization	Address 1	Address 2	City	Province	Postal Code	Email	Telephone
Donna B. Canoe	Chief	Chippewas of Georgina Island	R.R.#2	Box N-13	Sutton West	Ontario	L0E 1R0		705-437-1337
Randall Kahgee	Chief	Saugeen First Nation	RR 1		SOUTHAMPTON	Ontario	N0H 2L0		(519) 797-2781
Ronald Monague	Chief	Beausoleil First Nation	1 Ogema Street		Christian Island	Ontario	L0K1C0		(705) 247-2051
Scott Lee	Chief	Chippewas of Nawash Unceded First Nation	RR 5		WIARTON	Ontario	N0H 2T0		(519) 534-1689
Blaine Commandant	Chief	Wahta Mohawks	PO Box 260		Bala	Ontario	P0C 1A0		(705) 762-2354

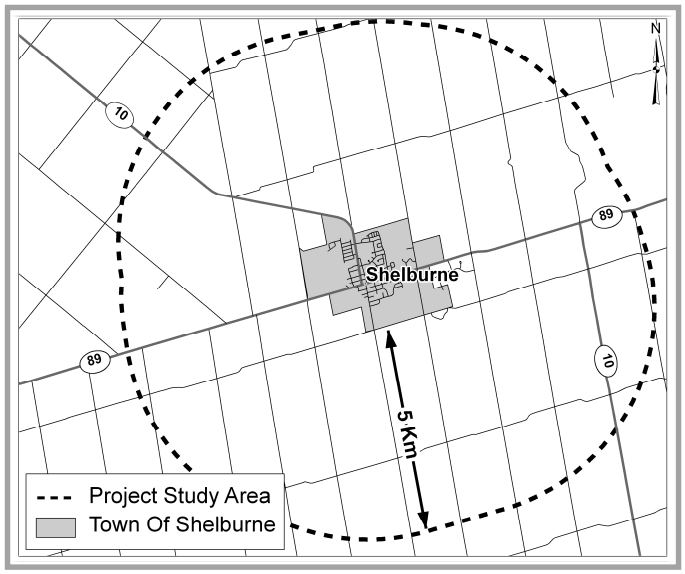
Sharon Stinson Henry	Chief	Chippewas of Rama First Nation	5884 Rama Road	Suite 200	Rama	Ontario	L0K 1T0		(705) 325-3611
Tracy Gauthier	Chief	Mississaugas of Scugog Island First Nation	22521 Island Road		Port Perry	Ontario	L9L 1B6		905-985-3337
M. Bryan LaForme	Chief	Mississaugas of the New Credit First Nation	8545 Townline Road	RR 1	Hagersville	Ontario	N0A 1H0		(905) 768 3858
Melanie Paradis	Director	Métis Nation of Ontario	75 Sherbourne St.	Suite 222	Toronto	Ontario	M5A 2P9		416-977-9881 xt.114
Thomas Bressette	Chief	Chippewas of Kettle and Stoney Point	R.R.#2		Forest	Ontario	N0N1J0		519-786-2125
		Ogemawahj Tribal Council	5984 Rama Road	PO Box 46	Rama	Ontario	L0K 1T0		
		Union of Ontario Indians	1 Miigizi Mikan		North Bay	Ontario	P1B 8G5		
William Montour	Chief	Six Nations of the Grand River Territory	1695 Chiefswood Rd.		Ohsweken	Ontario	N0A 1M0		519-445-2201
Gord Peters	Grand Chief	Association of Iroquois and Allied Indians	London Office	387 Princess Ave.	London	Ontario	N6B 2A7	gpeters@aiai.on.ca	519-434-2761x24
Hazel Hill		Haudenosaunee Development Institue	16 Sunrise Court	P.O. Box 714	Ohsweken	Ontario	N0A 1M0		

Town of Shelburne
Hydrogeological Study and
Class Environmental Assessment
For Additional Water Supply

Notice of Study Commencement

Background

The Town of Shelburne (the Town) currently operates five groundwater supply wells to support its municipal water distribution system. In the next twenty years, the Town's water supply estimated requirements of 6,256 m^3/day are expected to exceed the current capacity of 4,910 m^3/day. Additionally, the town has observed decreased performance in one of its existing wells. In order to accommodate future growth and provide security for the Town's water supply, we are conducting a study to identify additional new supply sources in and around Shelburne (see adjacent figure).



Class EA Study

The Town has initiated a study to identify, evaluate and document a recommended solution for new supply sources in the identified study area with consideration for environmental, cultural, social, natural, technical and economic factors. This study is being developed as a Schedule "B" Municipal Class Environmental Assessment (Class EA) under Ontario's *Environmental Assessment Act*.

Public Involvement

Public involvement is an important part of the Class EA process. Residents and community organizations are encouraged to participate by providing their comments to the contacts identified below and attending a Public Information Centre (PIC) that will be held in the upcoming months. Details regarding the PIC will be publicized in local newspapers, distributed through direct mail and posted on the town's website at www.townofshelburne.on.ca.

Please contact either of the following team members if you would like more information or to be added to the mailing list to receive direct notice of future study events.

Kelly McDowell, Project Coordinator
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600 x252
Fax: 519-925-6134
Email: kmcdowell@townofshelburne.on.ca

Ian Callum, Project EA Leader
Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON L5N 5Z7
Tel: 905-567-4444
Fax: 905-567-6561
Email: Ian_Callum@golder.com

Kim Goodman
General Manager
Centre for Sustainable Watersheds
14 Water Street
P.O. Box 280
Portland, Ontario
K0G1V0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Kim Goodman,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

The Town currently operates five groundwater supply wells to support our municipal water distribution system. In the next twenty years, the Town's water supply requirements are expected to exceed its current capacity. We have also observed decreased performance in one of the Town's existing wells.

Our study of potential new water supply sources is being developed as a Schedule "B" Municipal Class Environmental Assessment (Class EA) under Ontario's *Environmental Assessment Act*. The Class EA will consider the environmental, cultural, social, natural, technical and economic components of a new water supply source. In addition, we have been granted federal funding and, due to the volumes of water that would be extracted, this study has triggered a comprehensive study under the *Canadian Environmental Assessment Act*.

We are planning a Public Information Centre scheduled on October 22nd, 2012, details for which are provided in the attached notice. Please feel free to contact me by email at the address provided below, or call me at 519-925-2600.

Sincerely

John Telfer, CAO
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

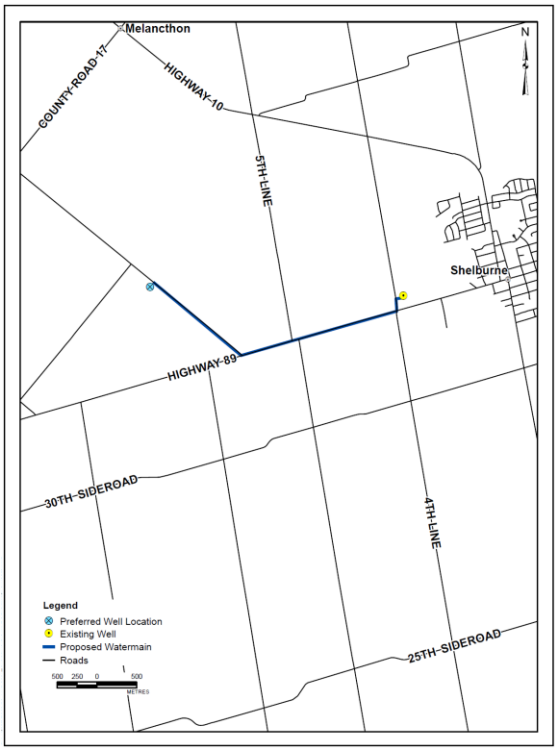
Notice for a Public Information Centre

Town of Shelburne Long-Term Well for Additional Water Supply Project

Municipal Class Environmental Assessment Study and Federal Comprehensive Study

The Study

The Town of Shelburne has initiated a Municipal Class Environmental Assessment and Federal Comprehensive Study to increase the Town's water supply.



The Process

The Town of Shelburne, through its consultants Golder Associates and Banks Groundwater Engineering, is undertaking a Schedule "B" Municipal Class Environmental Assessment Study in accordance with Ontario's *Environmental Assessment Act*. As Infrastructure Canada will be providing funding for the Project, and in consideration of the desired water supply pumping rate, a Federal Comprehensive Study is also required in accordance with the *Canadian Environmental Assessment Act*. Both studies will be presented in a single report that evaluates the preferred means of providing a safe, secure, and sustainable water supply system while avoiding significant environmental effects.

Public Information Centre

You are invited to attend a Public Information Centre (PIC) to review the alternatives considered by the Town and to the assessment of environmental effects associated with the Project.

Date: **Monday October 22, 2012**

Time: **Afternoon: 2:00 to 4:00 p.m.**
Evening: 7:00 to 9:00 p.m.

Location: **Grace Tipling Hall at 203 Main Street East, (Town Hall), Shelburne , Ontario**

Comments Invited

Comment sheets will be provided at the PIC and will be received by the municipality until November 12, 2012.

Please contact either of the following team members if you would like more information or to be added to the mailing list to receive direct notice of future study events.

John Telfer, CAO
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

Ian Callum, Project EA Leader
Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON L5N 5Z7
Tel: 905-567-4444
Email: Ian_Callum@golder.com

With the exception of personal information, all comments will become part of the Public Record.
This Notice posted 27 September, 2012.

Dufferin County Forest
County Forest Manager
Dufferin County Forest
c/o Duffern County Museum & Archives
Orangeville, Ontario
L0N 1R0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Dufferin County Forest,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

The Town currently operates five groundwater supply wells to support our municipal water distribution system. In the next twenty years, the Town's water supply requirements are expected to exceed its current capacity. We have also observed decreased performance in one of the Town's existing wells.

Our study of potential new water supply sources is being developed as a Schedule "B" Municipal Class Environmental Assessment (Class EA) under Ontario's *Environmental Assessment Act*. The Class EA will consider the environmental, cultural, social, natural, technical and economic components of a new water supply source. In addition, we have been granted federal funding and, due to the volumes of water that would be extracted, this study has triggered a comprehensive study under the *Canadian Environmental Assessment Act*.

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Sincerely

John Telfer, CAO
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

Notice for a Public Information Centre

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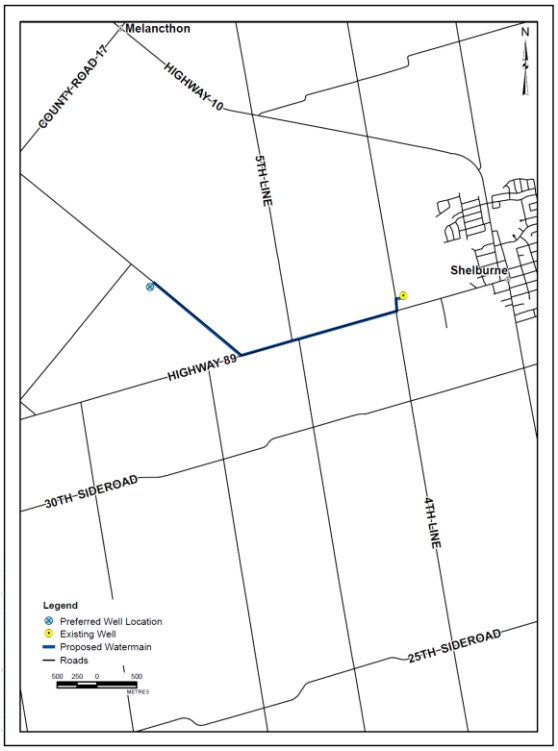

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Evening: 7:00 to 9:00 p.m.

Location: **Grace Tipling Hall at 203 Main Street East, (Town Hall), Shelburne , Ontario**

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John Telfer, CAO
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

Ian Callum, Project EA Leader
Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON L5N 5Z7
Tel: 905-567-4444
Email: Ian_Callum@golder.com

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This Notice posted 27 September, 2012.

Stephen Best
Director
Environmental Voters
PO Box 998
Shelburne, Ontario
L0N 1S0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Stephen Best,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Notice for a Public Information Centre

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The Study

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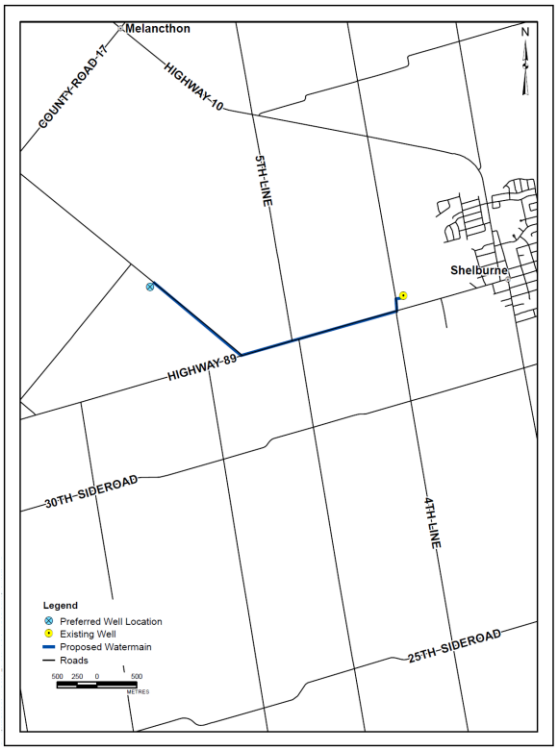

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Tony Hopkins
President
Dufferin Hi-Land Bruce Trail Club
P O Box 698
Alliston, Ontario
L9R 1V9

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Tony Hopkins,

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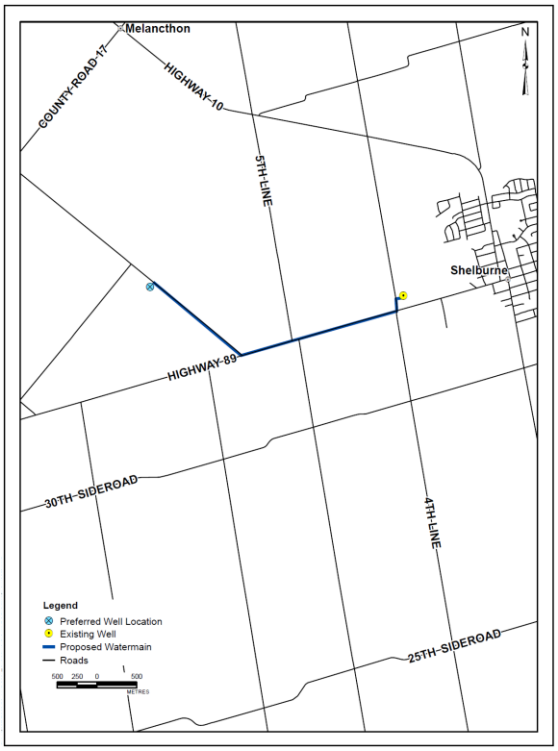

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Janice McClelland
President
Caledon Hills Bruce Trail Club
P O Box 65 Stn
Caledon Village
Caledon, Ontario
L7K 3L3

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Janice McClelland,

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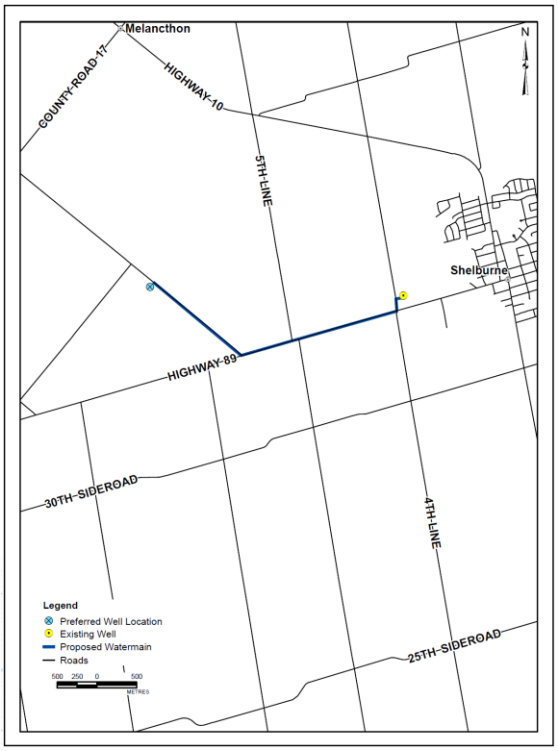

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Mono Mulmur Citzens' Coalition
Mono Mulmur Citizens' Coalition
P O Box 686
Shelburne, Ontario
L0N 1S0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Mono Mulmur Citzens' Coalition,

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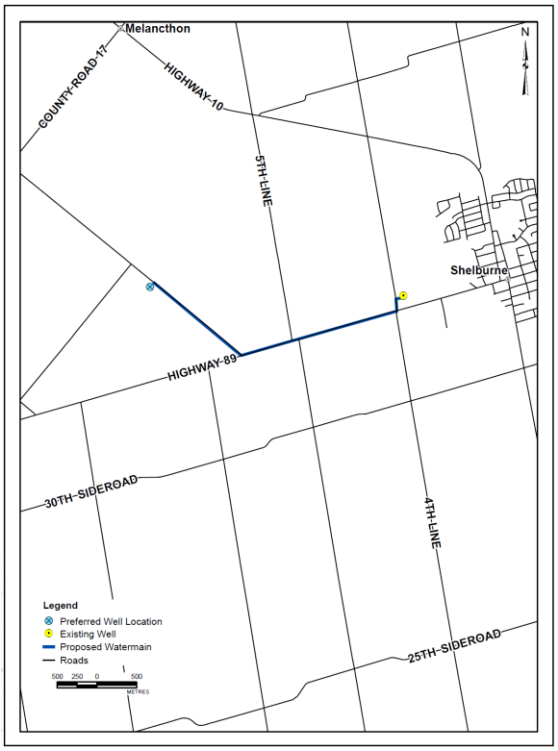

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Norm MacEachern
Conserve Our Rural Environment
746269 30th Side Road
R.R. #3
Shelburne, Ontario
L0N1S7

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Norm MacEachern,

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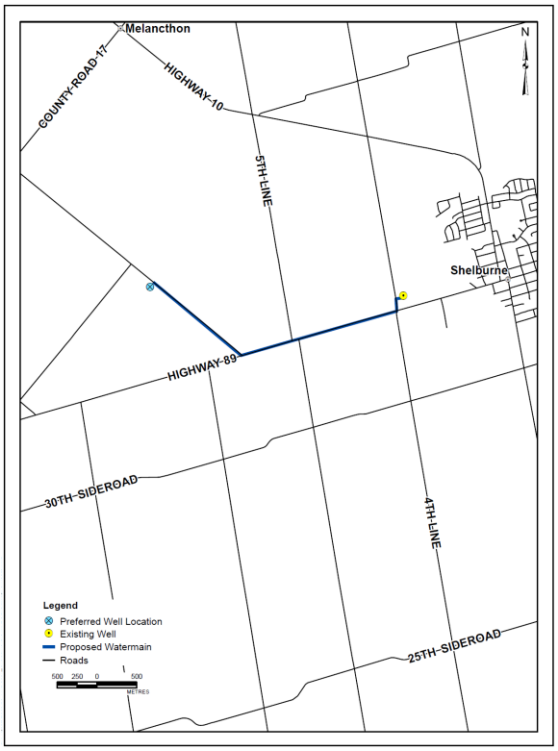

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Pam Wheaton
Director Aboriginal & Ministry Relationships Branch
Ministry of Aboriginal Affairs
720 Bay Street, 4th Floor
Toronto, Ontario
M5G 2K1

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Pam Wheaton,

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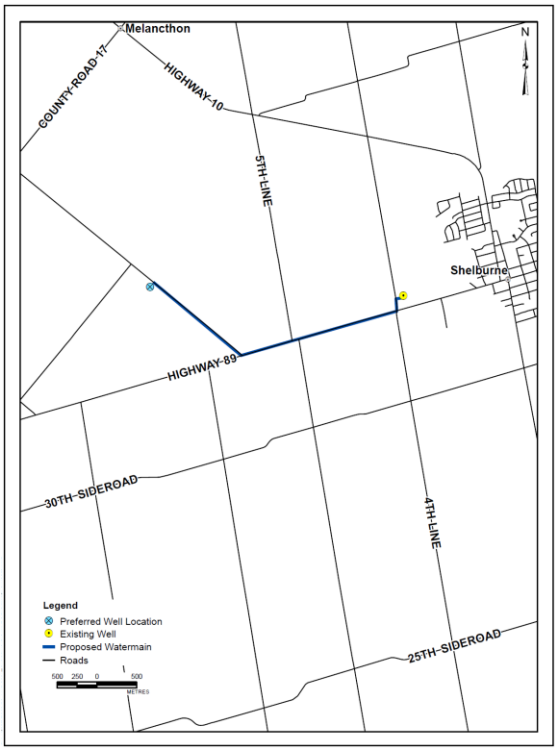

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The Secretary (Attn: Lise Hansen)
Sr. Negotiator
Ministry of Aboriginal Affairs
720 Bay Street, 4th Floor
Toronto, Ontario
M5G 2K2

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear The Secretary (Attn: Lise Hansen),

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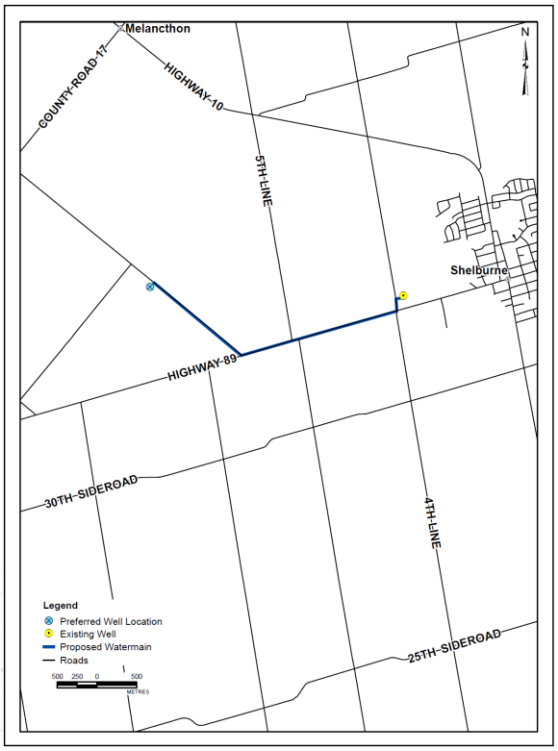

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Mr. Gregg Dahl
Senior Policy Analyst Office of the Federal Interlocutor for Métis and Non-status Indians
Department of Indian and Northern Affairs
66 Slater Street
Room 1218
Ottawa, Ontario
K1A 0H4

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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Sincerely

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Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

Notice for a Public Information Centre

Town of Shelburne Long-Term Well for Additional Water Supply Project

Municipal Class Environmental Assessment Study and Federal Comprehensive Study

The Study

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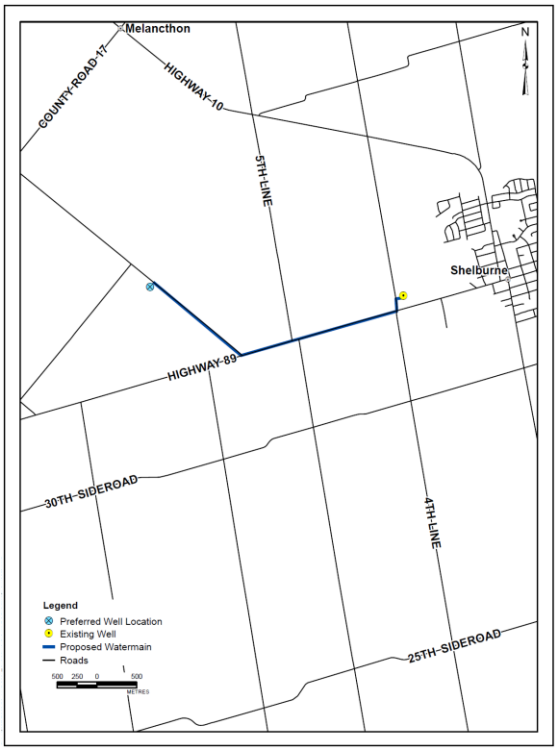

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This Notice posted 27 September, 2012.

Glenn Gilbert
Manager Environment Unit Lands and Trusts Services
Indian and Northern Affairs Canada
25 St. Clair Ave. East
8th Floor
Toronto, Ontario
M4T 1M2

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Glenn Gilbert,

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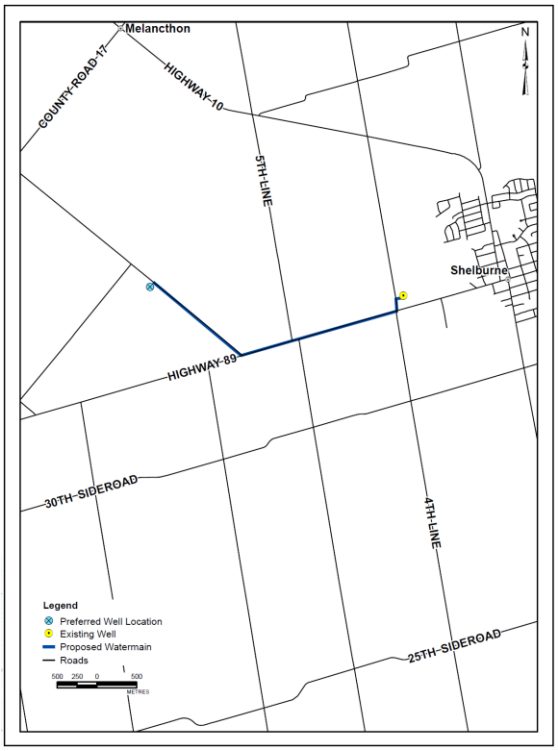

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Mr. David Cooper
Manager Environmental and Land Use Policy
Ministry of Agriculture, Food and Rural Affairs
1 Stone Road W, 3rd Floor
Guelph, Ontario
N1G 4Y2

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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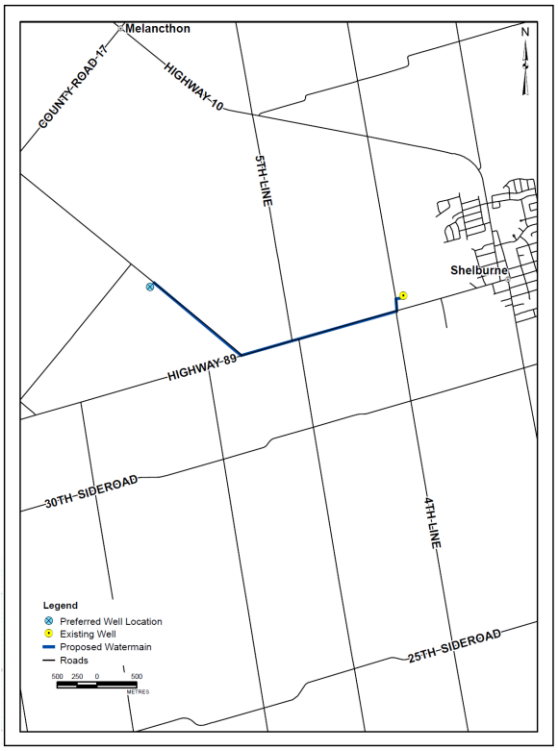

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Ms. Carol Neumann
Rural Planner West Central Region
Ministry of Agriculture, Food and Rural Affairs
1 Stone Road W, 3rd Floor
Guelph, Ontario
N1G 4Y3

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Ms. Carol Neumann,

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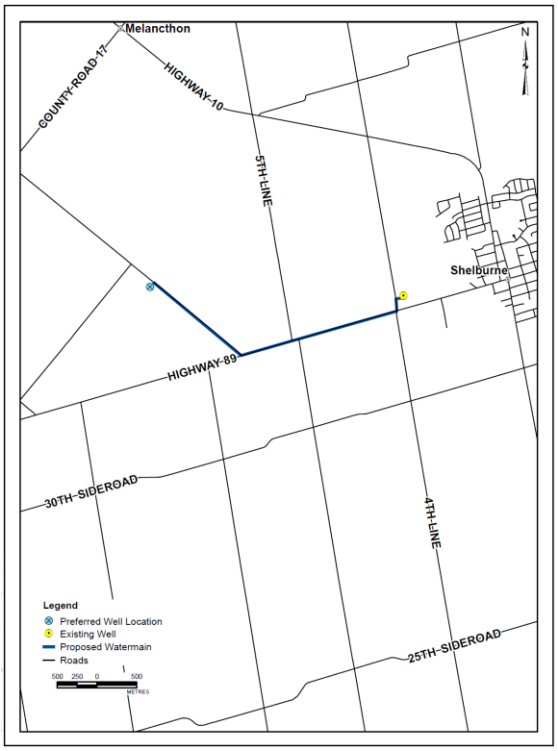

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Mr. Mario Veronesi
Manager Accommodations and Leasing Unit Facilities Branch
Ministry of Community Safety and Correctional Services
25 Grosvenor Street, 13 Floor
Toronto, Ontario
M7A 1Y6

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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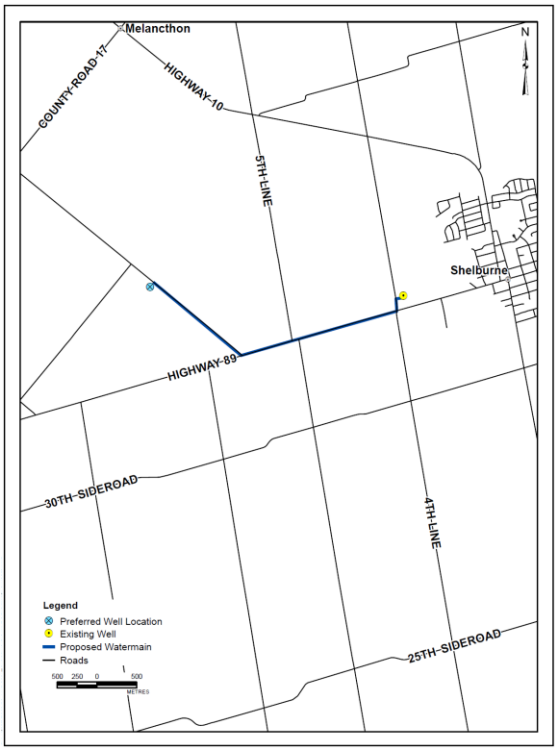

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Lynn Peterson
Manager Special Projects
Ministry of Municipal Affairs & Housing
777 Bay Street, 14th Floor
Toronto, Ontario
M5G 2E5

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Lynn Peterson,

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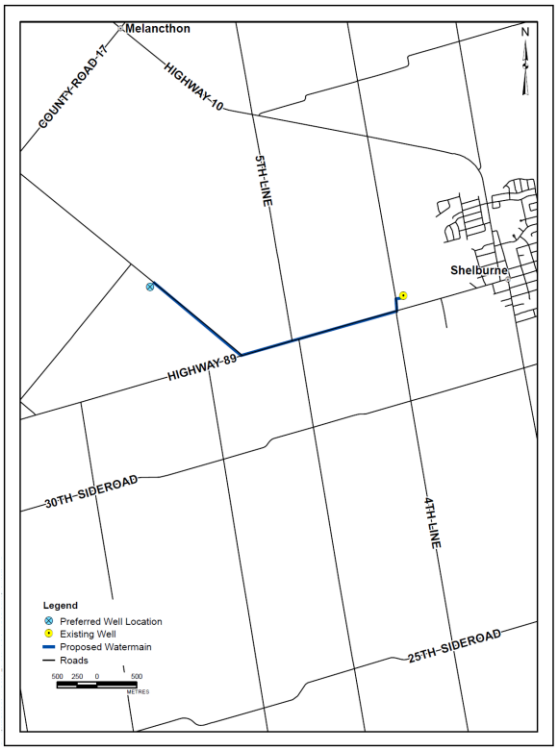

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Mr. Victor Doyle
Manager Planning Inovation Section Provincial Policy Planning Branch
Ministry of Municipal Affairs & Housing
777 Bay Street, 2nd Floor
Toronto, Ontario
M5G 2E6

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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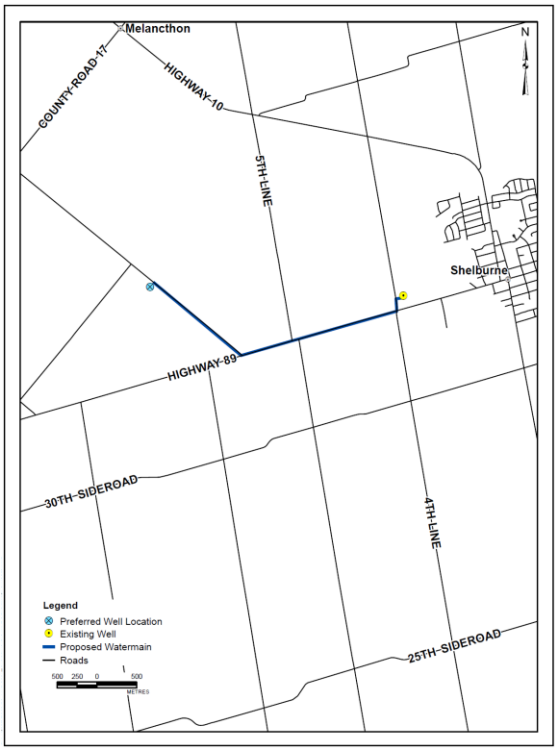

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Sharon Rew
Manager, Policy
Ministry of Natural Resources
300 Water Street, PO Box 7000 5th Floor, North Tower
Peterborough, Ontario
K9J4R5

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Sharon Rew,

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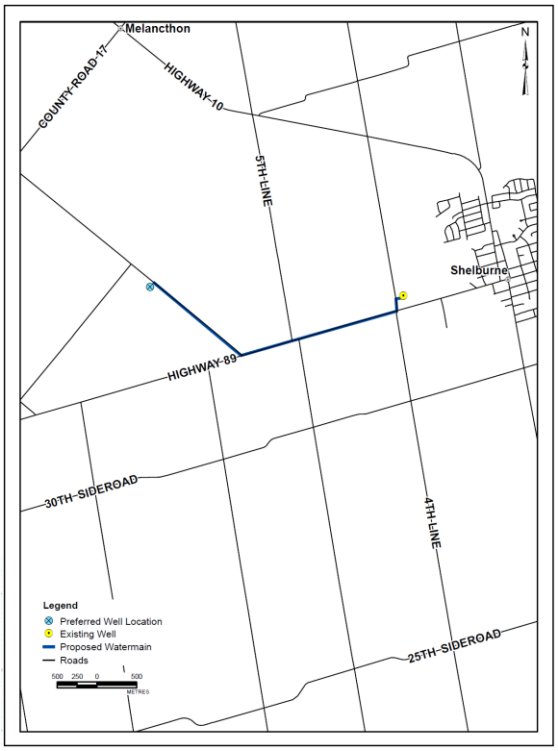

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Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

Ian Callum, Project EA Leader
Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON L5N 5Z7
Tel: 905-567-4444
Email: Ian_Callum@golder.com

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This Notice posted 27 September, 2012.

Mark Shoreman
District Manager
Ministry of Natural Resources
2284 Nursury Road
Midhurst, Ontario

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Mark Shoreman,

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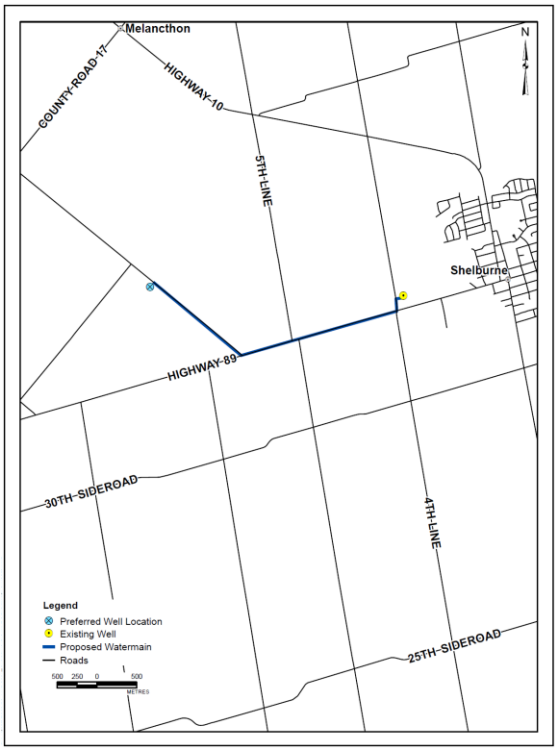

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Kevin Pal
Manager Strategic Policy Branch Conservation & Strategic Policy Division
Ministry of Energy and Infrastructure
777 Bay Street, 4th Floor, Suite 425
Toronto, Ontario
M7A 2C1

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Kevin Pal,

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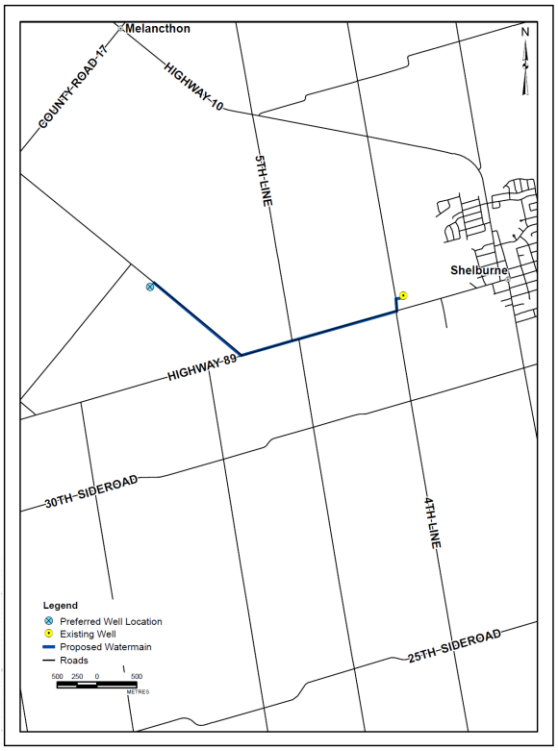

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Ms. Tija Dirks
Director Growth Policy, Planning and Analysis
Ministry of Infrastructure
777 Bay Street, 4th Floor, Suite 425
Toronto, Ontario
M7A 2C2

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Ms. Tija Dirks,

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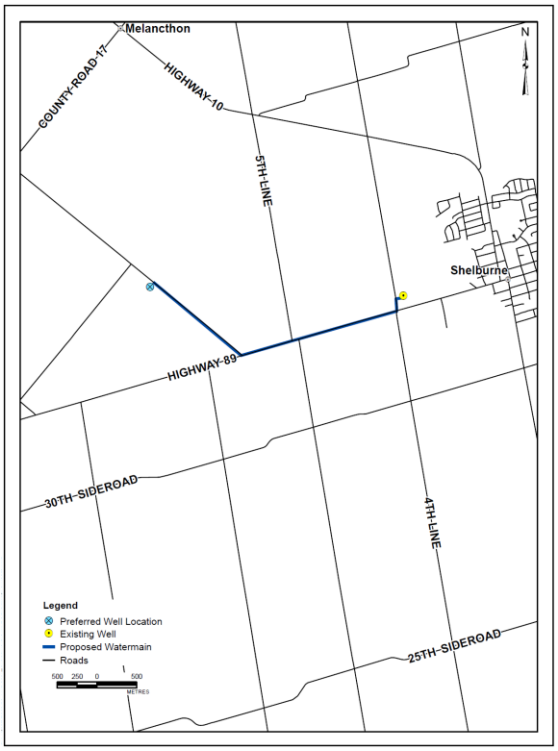

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Louise Knox
Director Ontario Regional Office
Canadian Environmental Assessment Agency
55 St. Clair Avenue East, 9th Floor
Toronto, Ontario
M4T 1M2

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Louise Knox,

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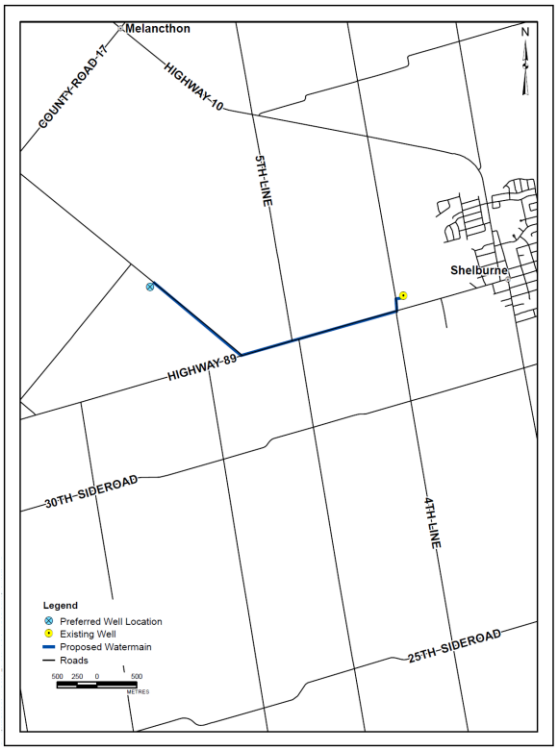

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Joe Farwell
Chief Administrative Officer
Grand River Conservation Authority
400 Clyde Road P.O. Box 729
Cambridge, Ontario
N1R 5W7

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Joe Farwell,

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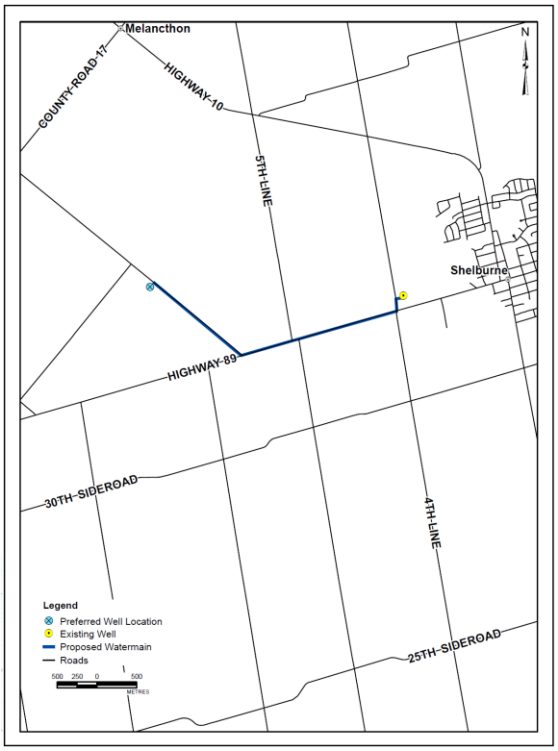

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Lorrie Minshall
Director of Water Management Plan, Source Protection
Grand River Conservation Authority
400 Clyde Road P.O. Box 729
Cambridge, Ontario
N1R 5W8

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Lorrie Minshall,

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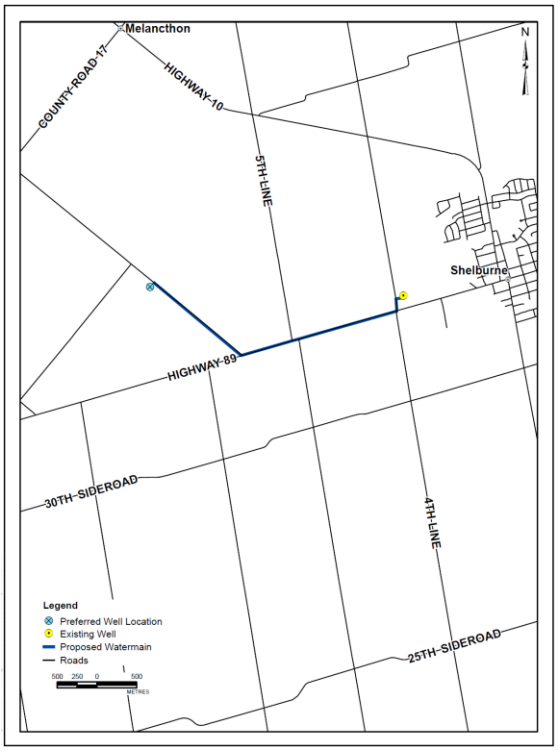

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Antonia Capotorto
Project Officer - EA Project Coordination Section
Ministry of the Environment
2 St. Clair Avenue West, 14th Floor
Toronto, Ontario
M4V 1L5

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Antonia Capotorto,

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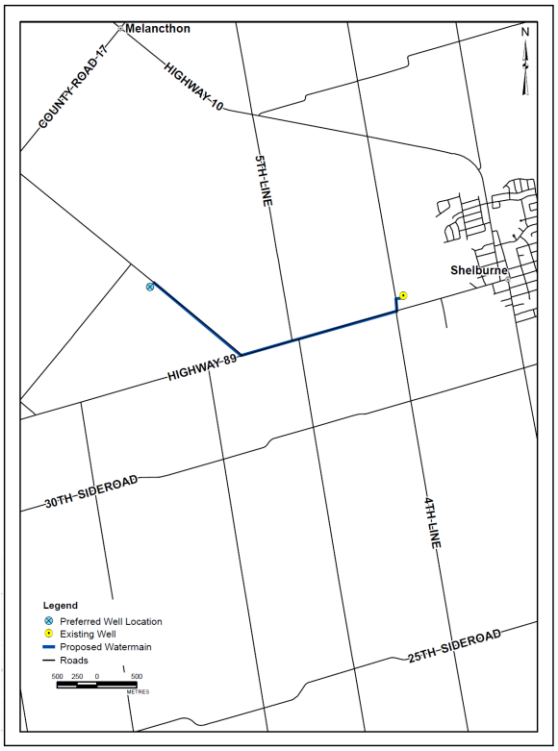

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Rob Dobos
Manager Environmental Assessment Section Environmental Protection Operations Division - Ontario Region
Environment Canada
PO Box 5050, 867 Lakeshore Rd.
Burlington, Ontario
L7R 4A6

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203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

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Municipal Class Environmental Assessment Study and Federal Comprehensive Study

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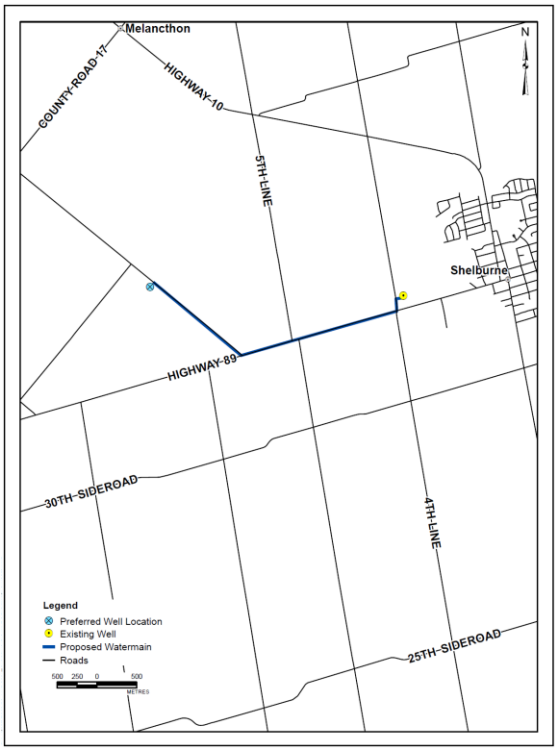

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Wayne Wilson
CAO/Secretary-Treasurer
Nottawasaga Valley Conservation Authority
8195 8th Line, ON
Utopia, Ontario
L0M 1T0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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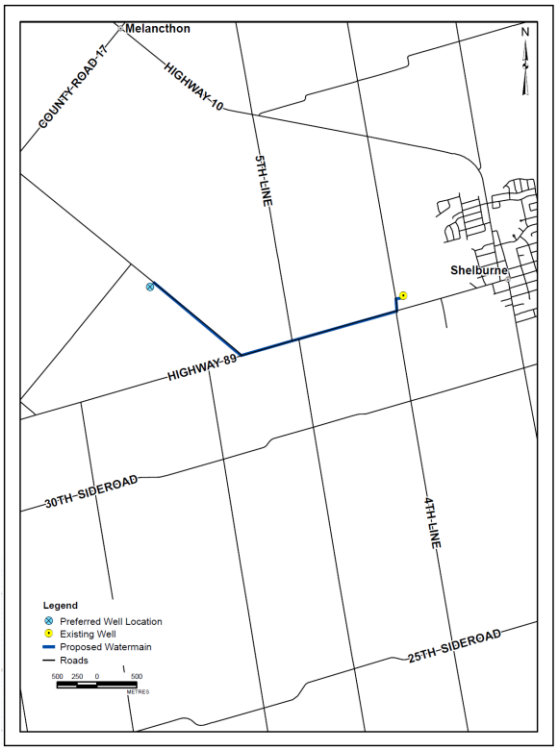

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Glenn Switzer
Director, Engineering & Technical Services
Nottawasaga Valley Conservation Authority
8195 8th Line
Utopia, Ontario
L0M 1T0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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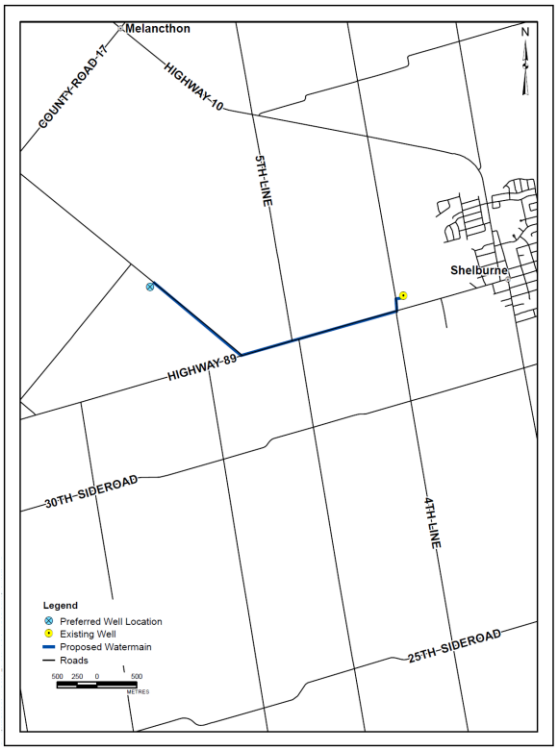

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Chris Hibberd
Director, Planning Services
Nottawasaga Valley Conservation Authority
8195 8th Line
Utopia, Ontario
L0M 1T0

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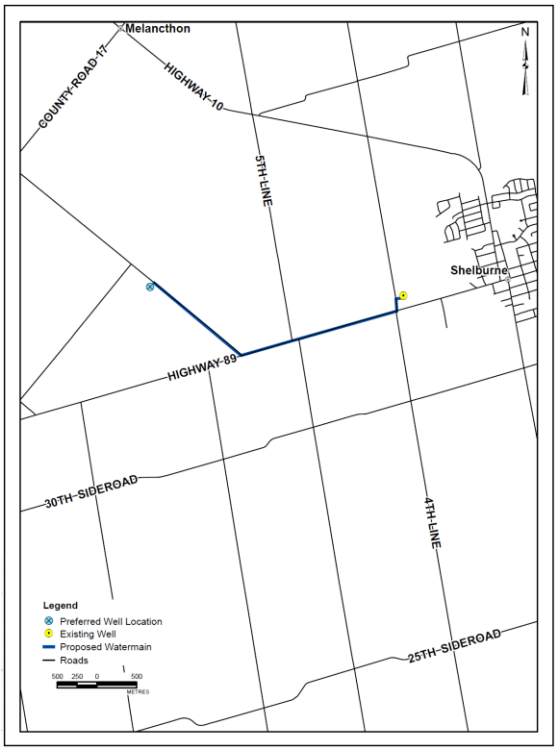

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Barbara Slattery
EA/Planning Coordinator, Environment
Ministry of the Environment, West Central Region
119 King Street West, 12th Floor
Hamilton, Ontario
L8P 4Y7

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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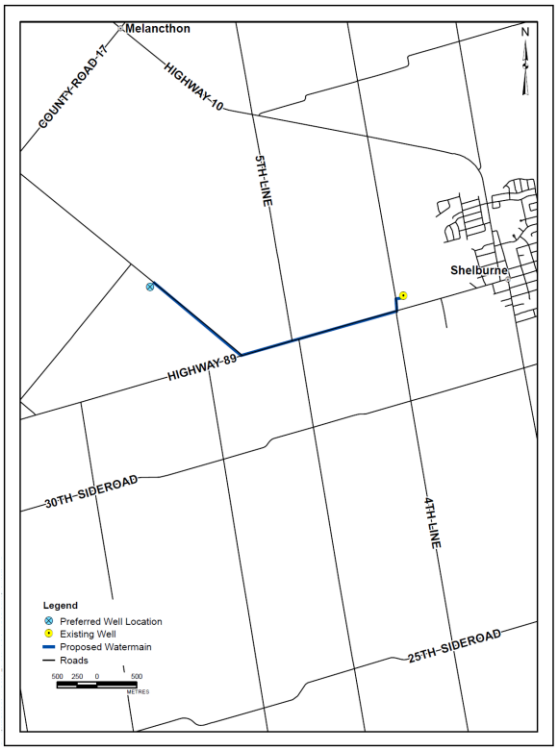

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Ed Crewson
Mayor
Town of Shelburne
203 Main Street East
Shelburne, Ontario
L0N 1S0

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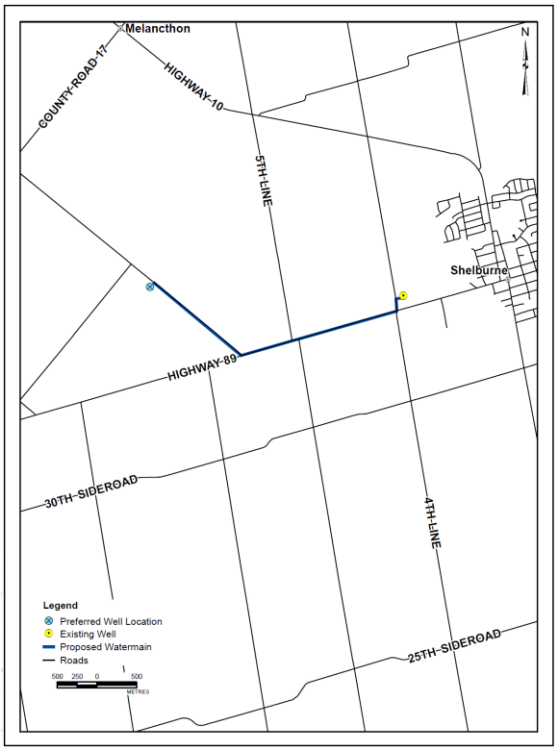

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Scott Wheeldon
Director of Public Works
Town of Shelburne
203 Main Street East
Shelburne, Ontario
L0N 1S1

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Dear Scott Wheeldon,

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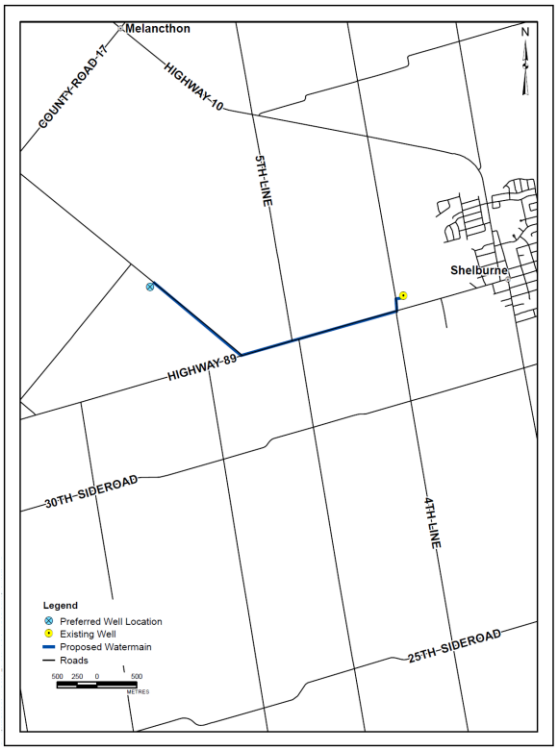

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Walter Benotto
Councillor
Town of Shelburne
203 Main Street East
Shelburne, Ontario
L0N 1S2

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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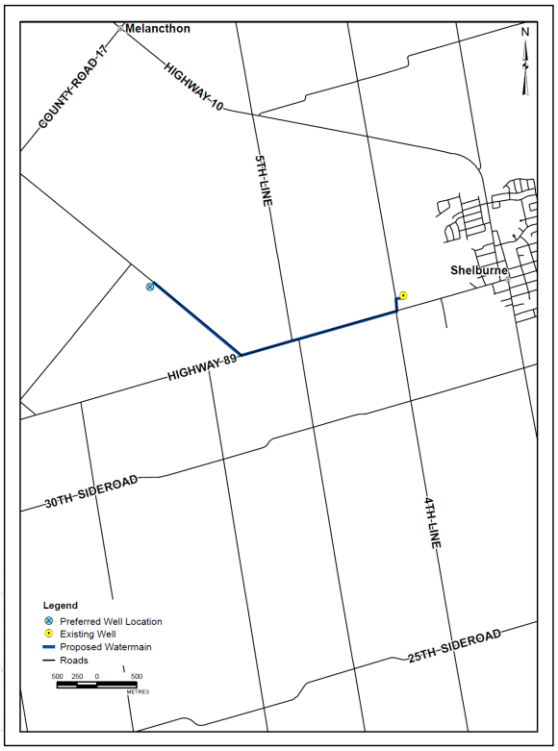

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Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
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Ian Callum, Project EA Leader
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Tel: 905-567-4444
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A.J.Cavey
Councillor
Town of Shelburne
203 Main Street East
Shelburne, Ontario
L0N 1S3

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear A.J.Cavey,

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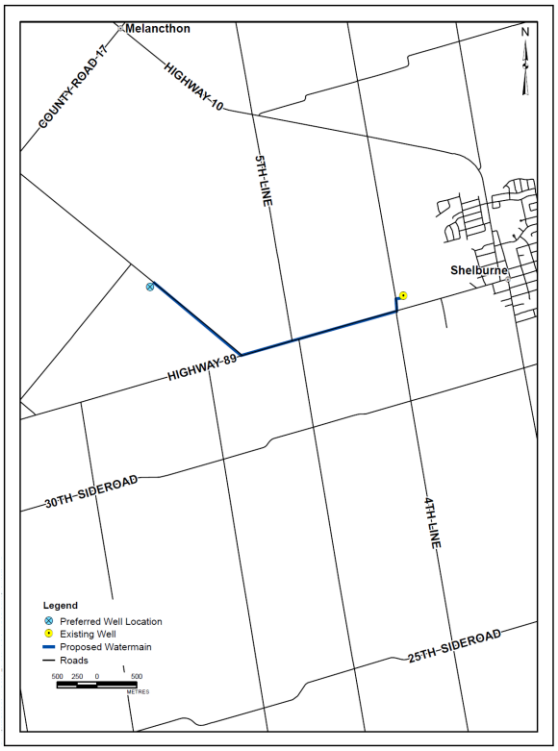

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Randy Chambers
Councillor
Town of Shelburne
203 Main Street East
Shelburne, Ontario
L0N 1S4

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Randy Chambers,

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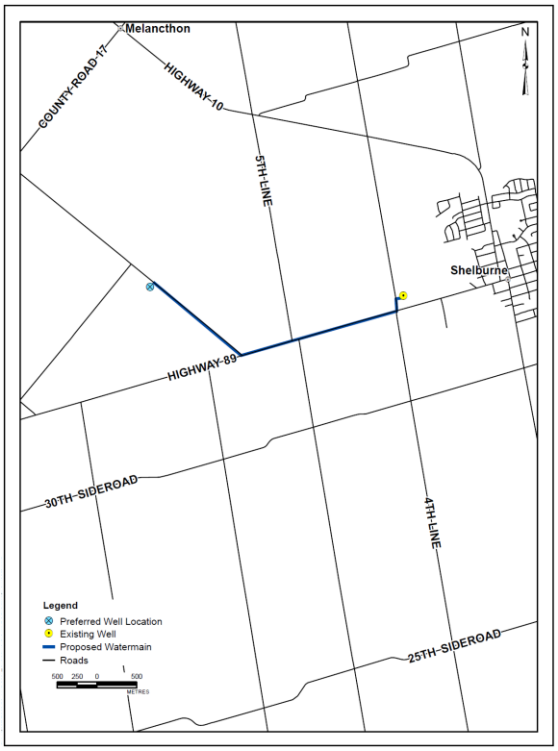

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Geoff Dunlop
Councillor
Town of Shelburne
203 Main Street East
Shelburne, Ontario
L0N 1S5

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Geoff Dunlop,

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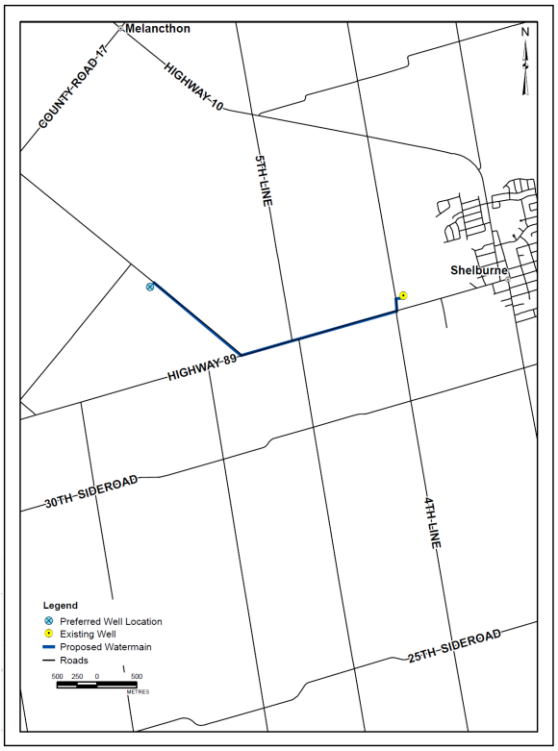

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Tom Egan
Councillor
Town of Shelburne
203 Main Street East
Shelburne, Ontario
L0N 1S6

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Tom Egan,

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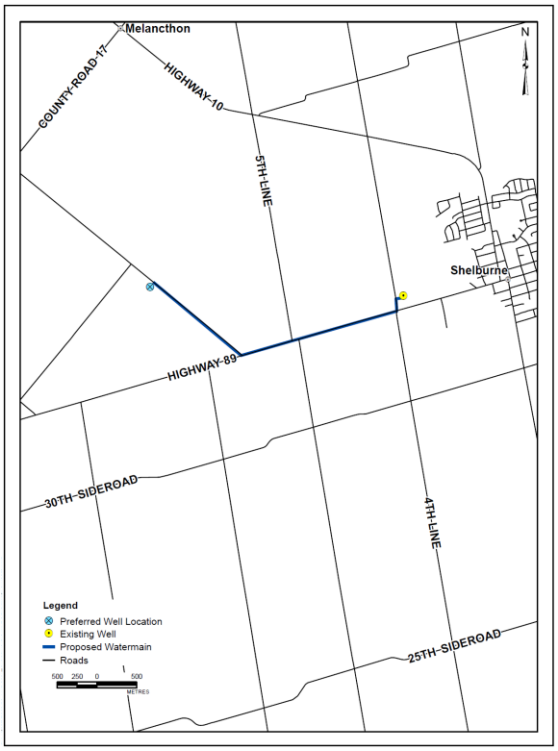

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Laura Ryan
Mayor
Town of Mono
347209 Mono Centre Road
R.R.#1
Orangeville, Ontario
L9W 2Y8

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Laura Ryan,

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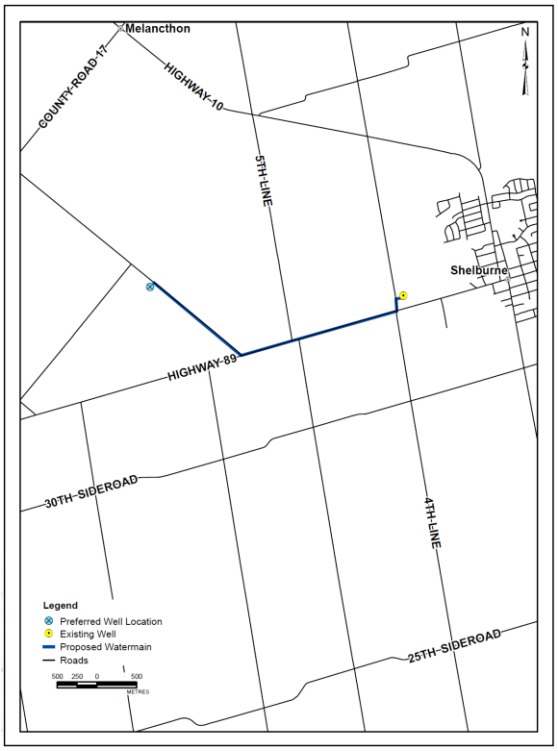

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Elaine Capes
Councillor
Town of Mono
347209 Mono Centre Road
R.R.#1
Orangeville, Ontario
L9W 2Y9

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Elaine Capes,

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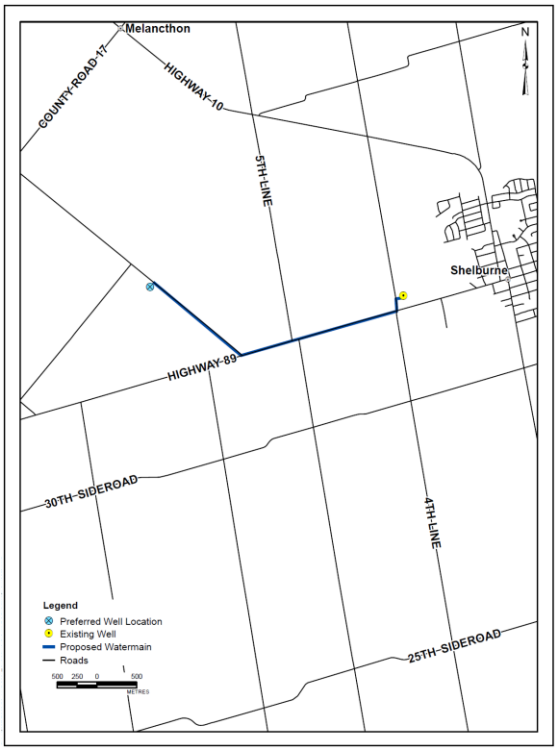

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Councillor
Town of Mono
347209 Mono Centre Road
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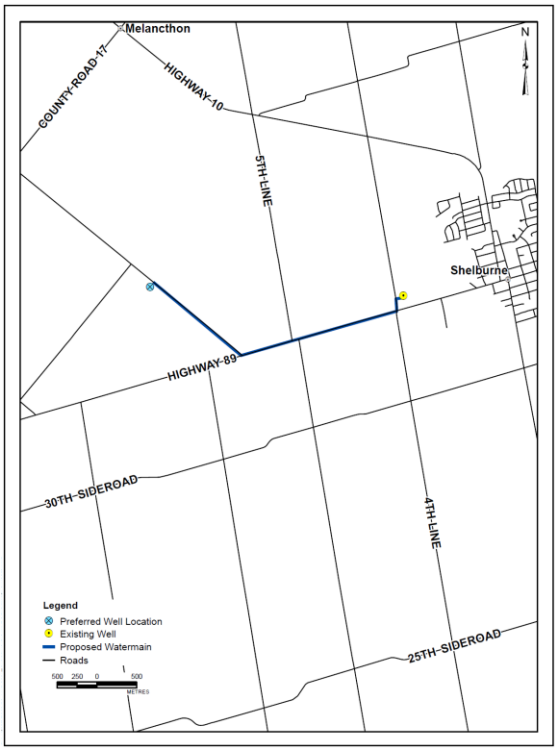

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Councillor
Town of Mono
347209 Mono Centre Road
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Orangeville, Ontario

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Fred Nix,

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We are planning a Public Information Centre scheduled on October 22nd, 2012, details for which are provided in the attached notice. Please feel free to contact me by email at the address provided below, or call me at 519-925-2600.

Sincerely

John Telfer, CAO
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

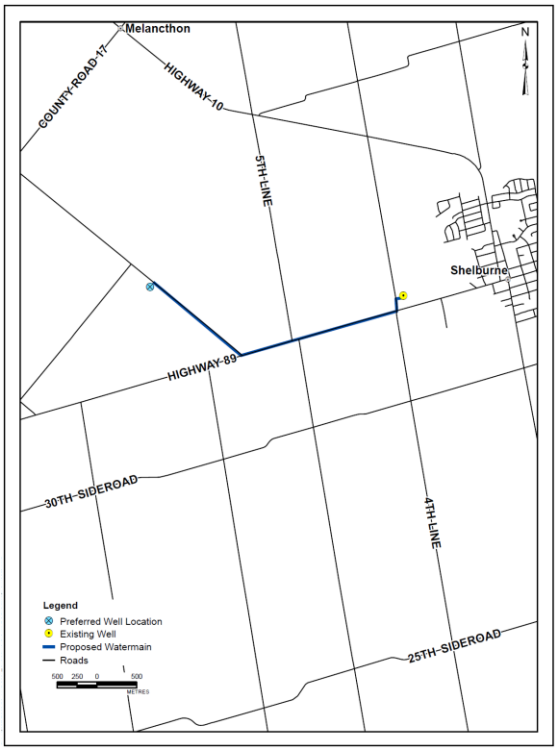
Notice for a Public Information Centre

Town of Shelburne Long-Term Well for Additional Water Supply Project

Municipal Class Environmental Assessment Study and Federal Comprehensive Study

The Study

The Town of Shelburne has initiated a Municipal Class Environmental Assessment and Federal Comprehensive Study to increase the Town's water supply.



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Ian Callum, Project EA Leader
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This Notice posted 27 September, 2012.

Don MacIver
Mayor
Township of Amaranth
424067 25 Sideroad Amaranth
R.R.#1
Shelburne, Ontario
L0N 1S5

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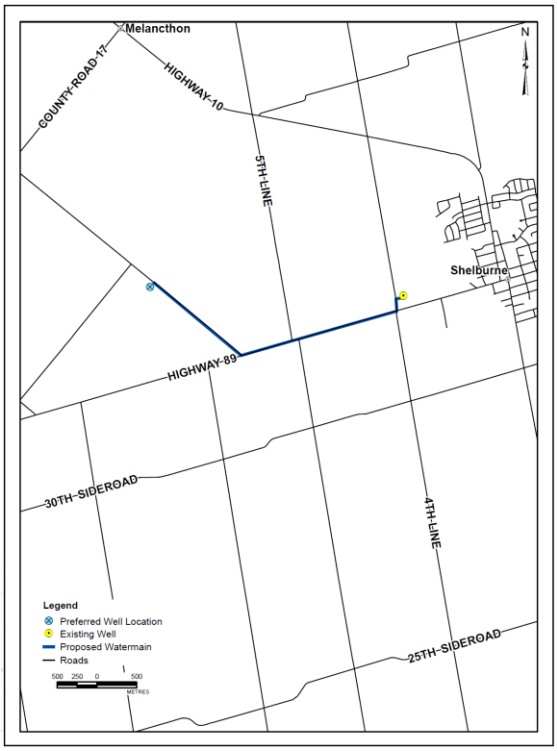

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Tel: 905-567-4444
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Jane Aultman
Councillor
Township of Amaranth
424067 25 Sideroad Amaranth
R.R.#1
Shelburne, Ontario
L0N 1S6

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Jane Aultman,

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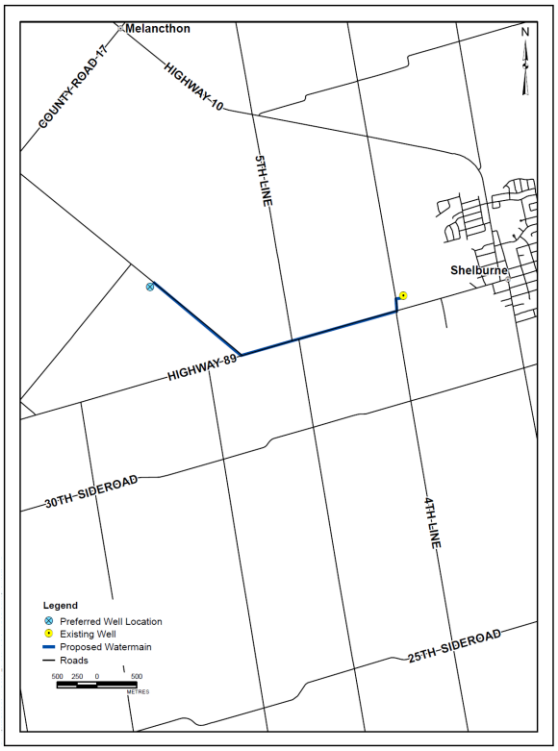

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Brian Besley
Councillor
Township of Amaranth
424067 25 Sideroad Amaranth
R.R.#1
Shelburne, Ontario
L0N 1S7

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Brian Besley,

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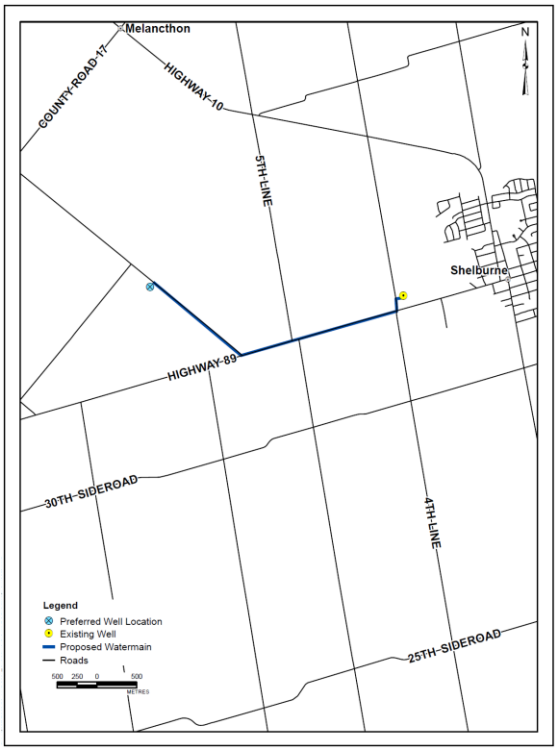

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Heather Foster
Councillor
Township of Amaranth
424067 25 Sideroad Amaranth
R.R.#1
Shelburne, Ontario
L0N 1S8

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Heather Foster,

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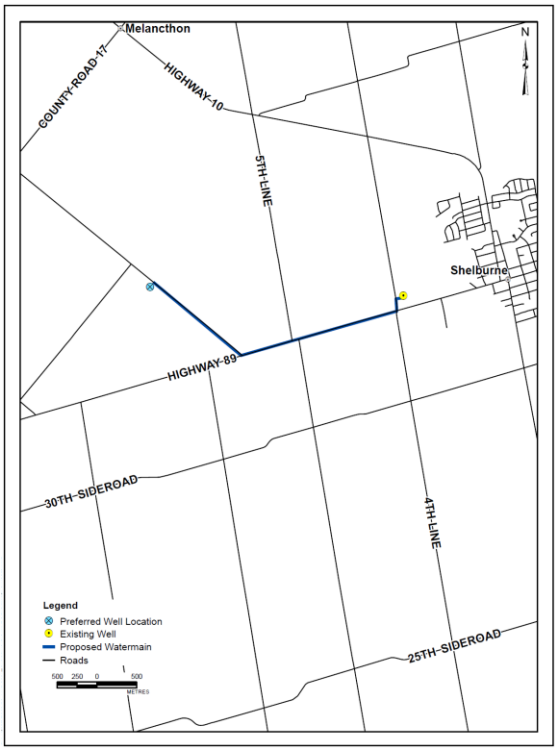

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Christine Gervais
Township Planner
Township of Amaranth
424067 25 Sideroad Amaranth
R.R.#1
Shelburne, Ontario
L0N 1S9

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Christine Gervais,

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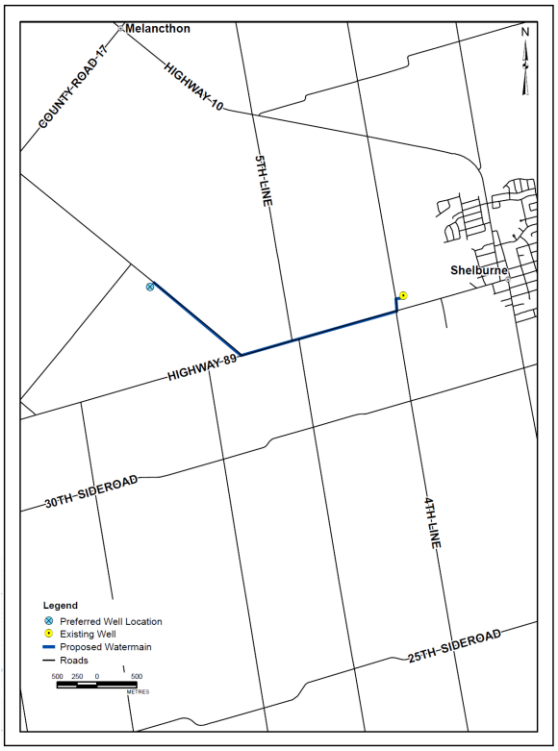

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Bill Hill
Mayor
Township of Melancthon
P.O. Box 465
Shelburne, Ontario
L0N 1S0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Bill Hill,

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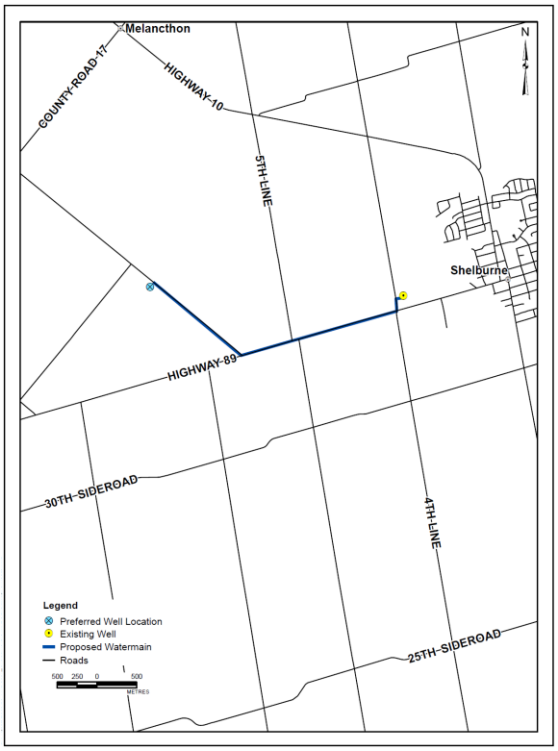

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John Crowe
Councillor
Township of Melancthon
157101 Highway # 10
R.R. #6
Shelburne, Ontario
L0N 1S8

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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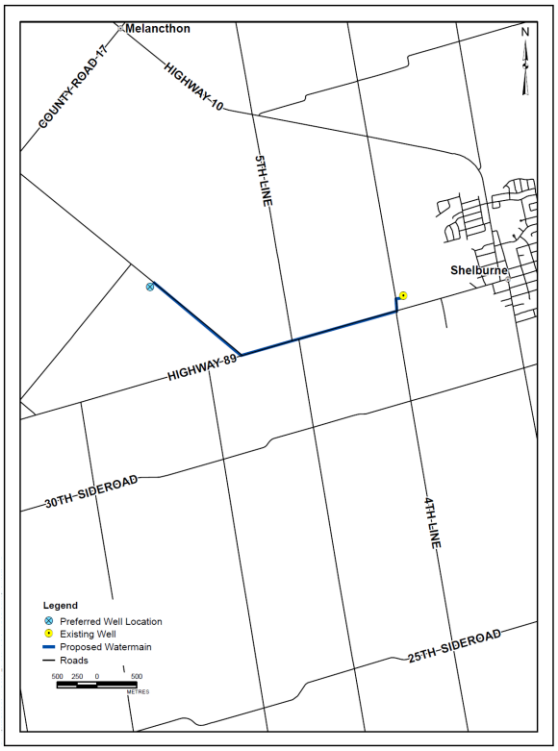

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Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

Ian Callum, Project EA Leader
Golder Associates Ltd.
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Tel: 905-567-4444
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This Notice posted 27 September, 2012.

Janice Elliott
Councillor
Township of Melancthon
157101 Highway # 10
R.R. #6
Shelburne, Ontario
L0N 1S8

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Janice Elliott,

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Town of Shelburne
203 Main Street East
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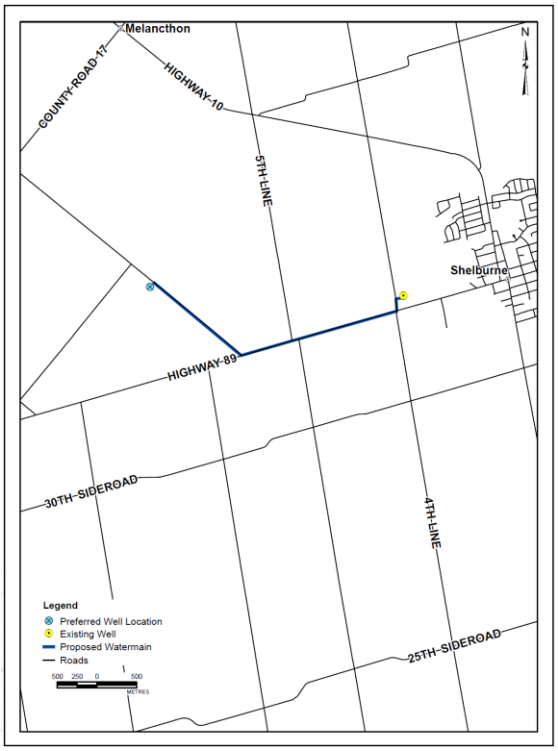

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Nancy Malek
Councillor
Township of Melancthon
157101 Highway # 10
R.R. #6
Shelburne, Ontario
L0N 1S8

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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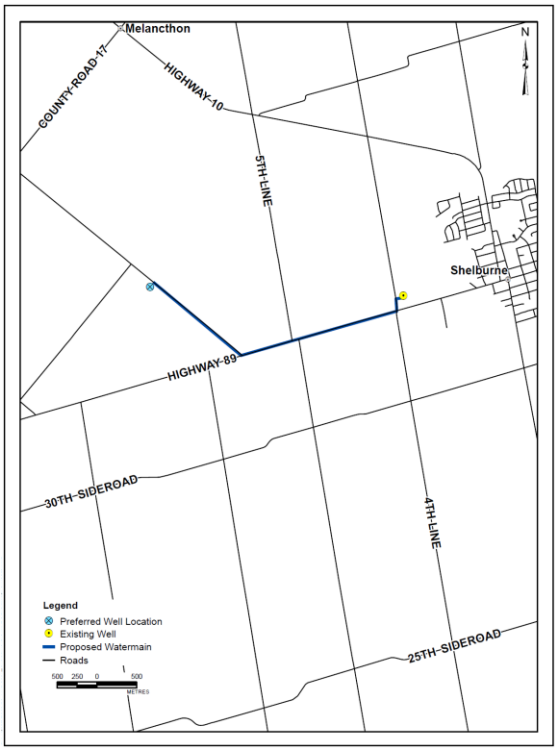

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GW Jorden
Contract Planner
Township of Melancthon
157101 Highway # 10
R.R. #6
Shelburne, Ontario
L0N 1S13

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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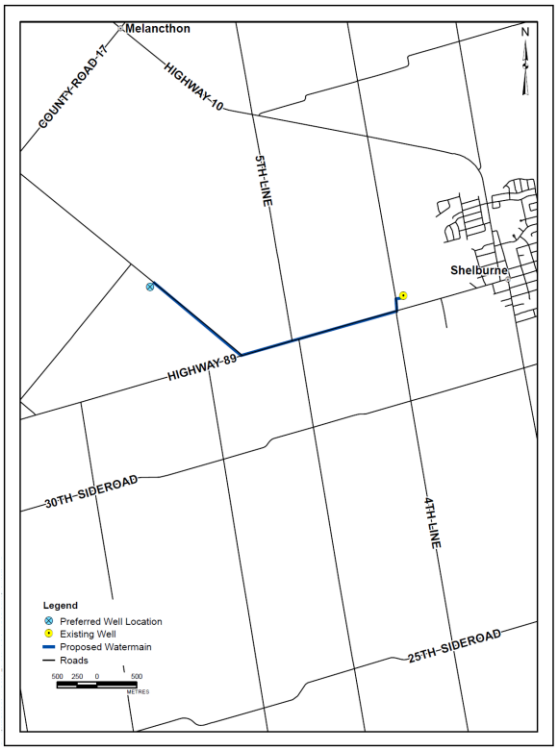

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Paul Mills
Mayor
Township of Mulmur
758070 2nd Line E
R.R. #2
Lisle, Ontario
L0M 1M0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Paul Mills,

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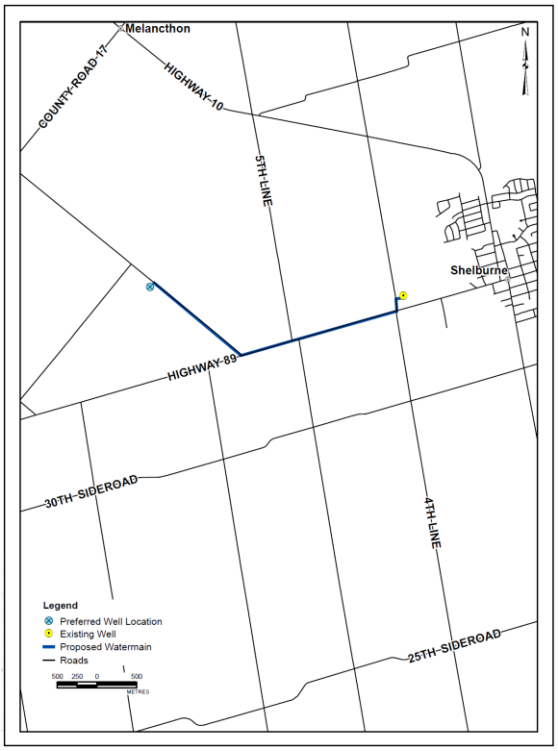

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Lynn Hilchey
Councillor
Township of Mulmur
758070 2nd Line E.
R.R. #2
Lisle, Ontario
L0M 1M1

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Lynn Hilchey,

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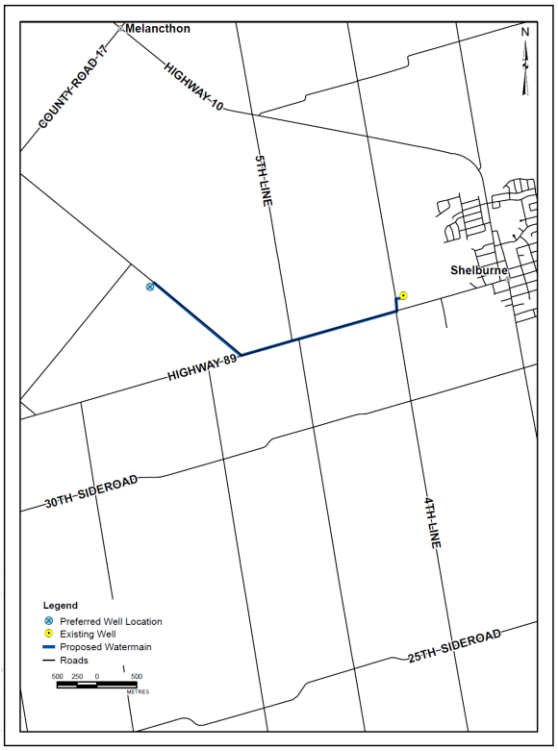

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Earl Hawkins
Councillor
Township of Mulmur
758070 2nd Line E.
R.R. #2
Lisle, Ontario
L0M 1M2

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Earl Hawkins,

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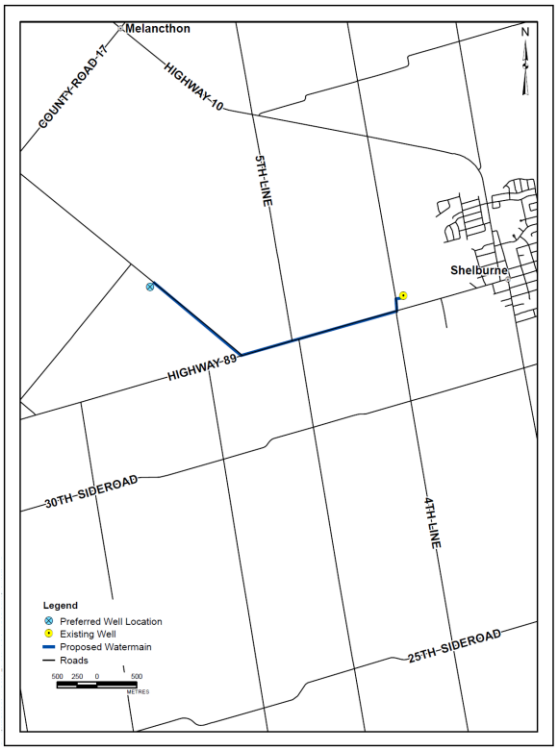

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Heather Hayes
Councillor
Township of Mulmur
758070 2nd Line E.
R.R. #2
Lisle, Ontario
L0M 1M2

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Heather Hayes,

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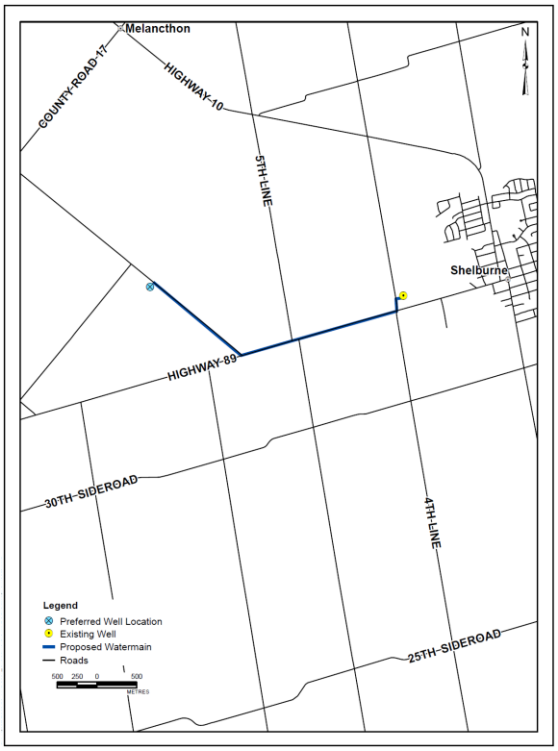

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Rhonda Campbell Moon
Deputy Mayor
Township of Mulmur
758070 2nd Line E.
R.R. #2
Lisle, Ontario
L0M 1M3

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Rhonda Campbell Moon,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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We are planning a Public Information Centre scheduled on October 22nd, 2012, details for which are provided in the attached notice. Please feel free to contact me by email at the address provided below, or call me at 519-925-2600.

Sincerely

John Telfer, CAO
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

Notice for a Public Information Centre

Town of Shelburne Long-Term Well for Additional Water Supply Project

Municipal Class Environmental Assessment Study and Federal Comprehensive Study

The Study

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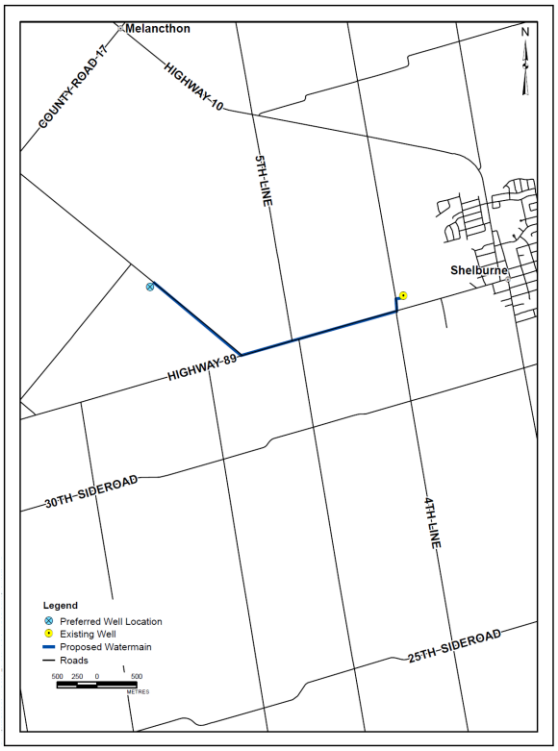

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Tel: 905-567-4444
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Ron Mills
Planner
Township of Mulmur
758070 2nd Line E.
R.R. #2
Lisle, Ontario
L0M 1M4

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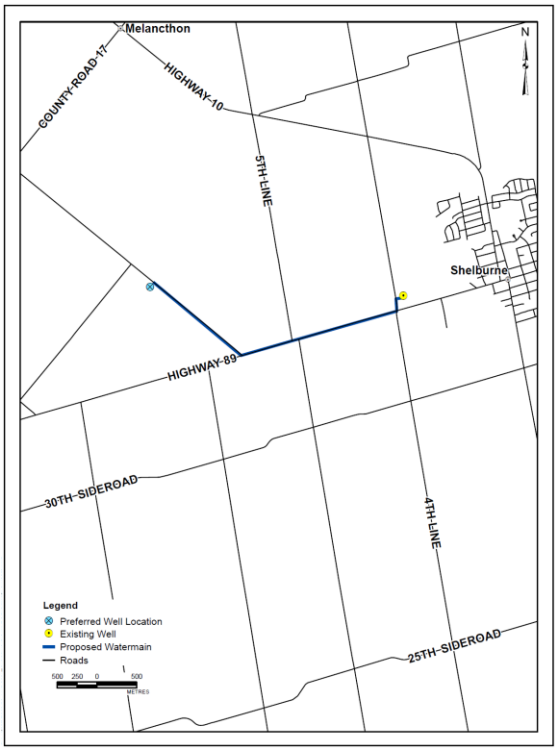

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John Willmetts
Director of Public Works
Township of Mulmur
758070 2nd Line E.
R.R. #2
Lisle, Ontario
L0M 1M5

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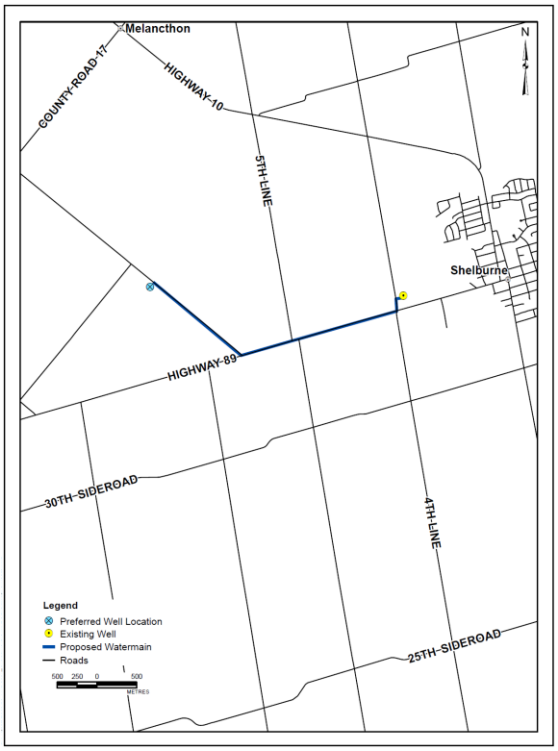

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Trevor Lewis
Director of Public Works
Dufferin County
53 Zina Street
Orangeville, Ontario
L9W 1E5

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Dear Trevor Lewis,

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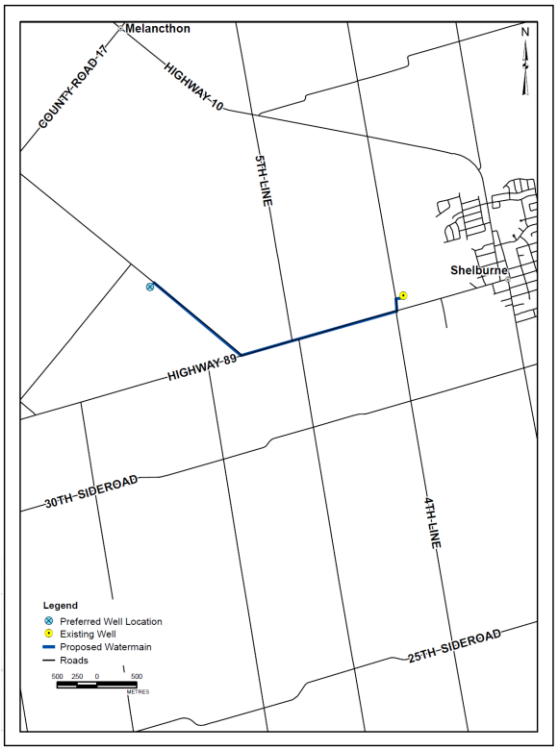

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Walter Kolodziechuk
Warden
Dufferin County
51 Zina Street
Orangeville, Ontario
L9W 1E6

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

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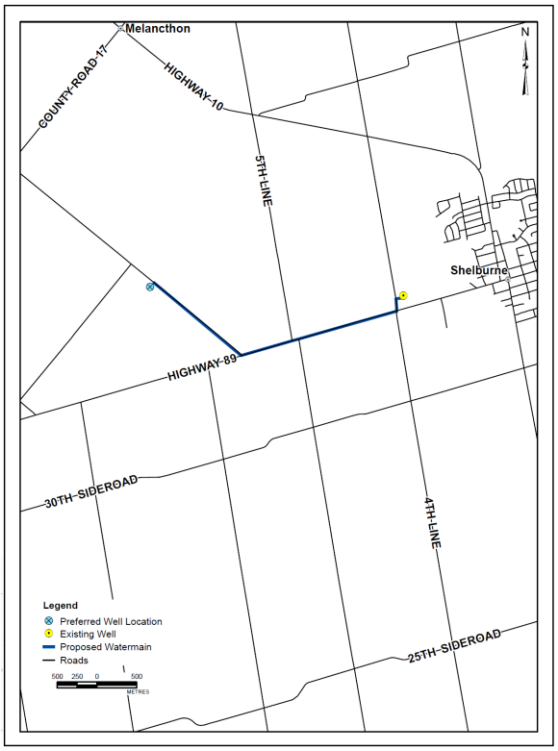

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Donna B. Canoe
Chief
Chippewas of Georgina Island
R.R.#2
Box N-13
Sutton West, Ontario
L0E 1R0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Donna B. Canoe,

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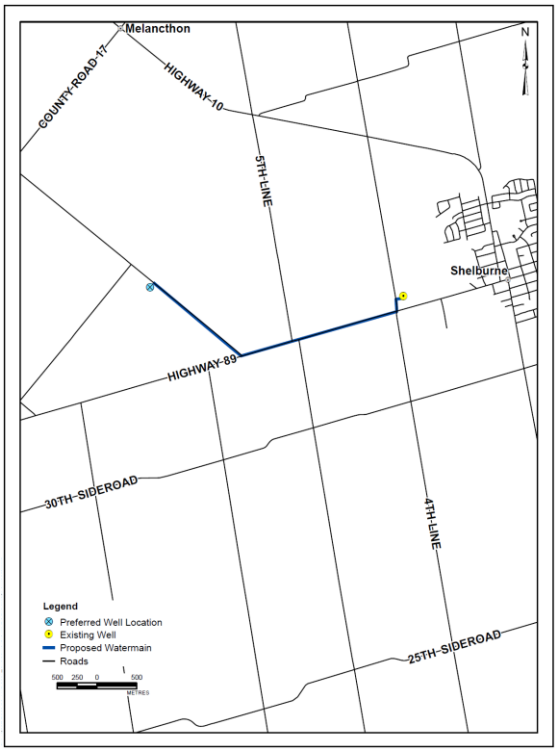

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Randall Kahgee
Chief
Saugeen First Nation
RR 1
SOUTHAMPTON, Ontario
N0H 2L0

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Dear Randall Kahgee,

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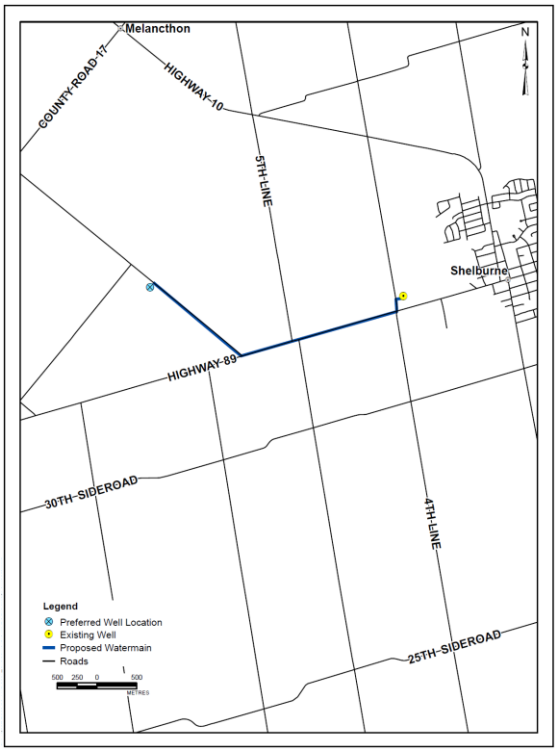

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Ronald Monague
Chief
Beausoleil First Nation
1 Ogema Street
Christian Island, Ontario
L0K1C0

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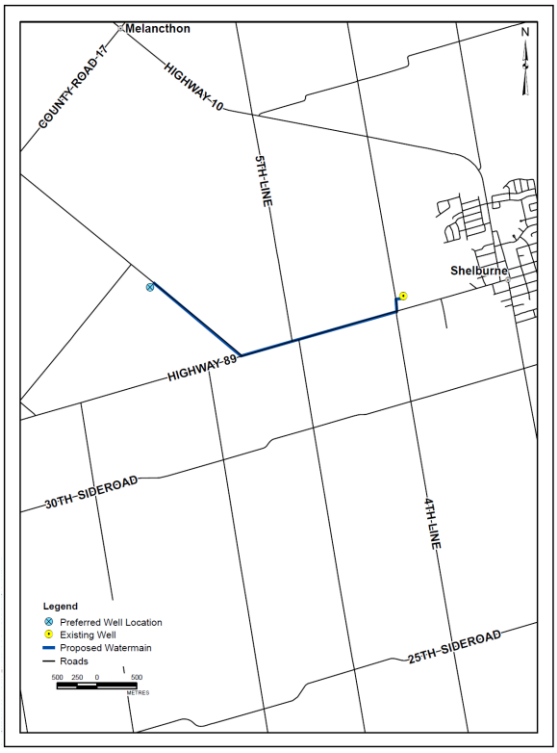

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Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

Ian Callum, Project EA Leader
Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON L5N 5Z7
Tel: 905-567-4444
Email: Ian_Callum@golder.com

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Scott Lee
Chief
Chippewas of Nawash Unceded First Nation
RR 5
WIARTON, Ontario
N0H 2T0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Scott Lee,

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Sincerely

John Telfer, CAO
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

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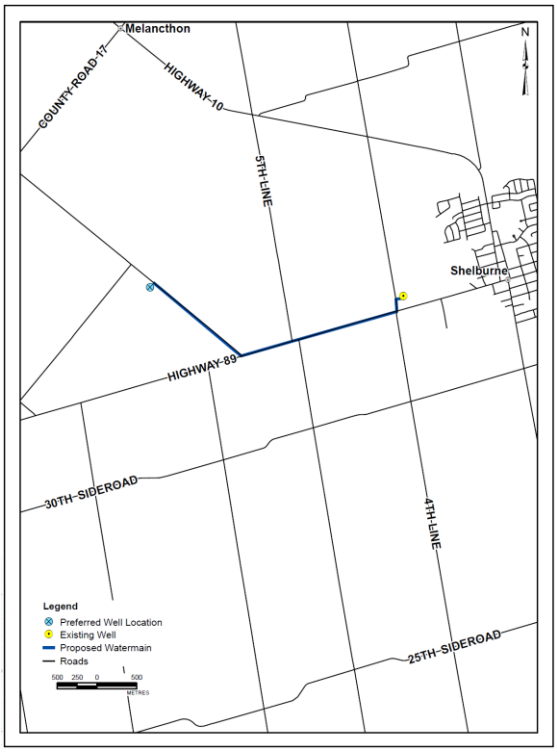

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Blaine Commandant
Chief
Wahta Mohawks
PO Box 260
Bala, Ontario
P0C 1A0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Blaine Commandant,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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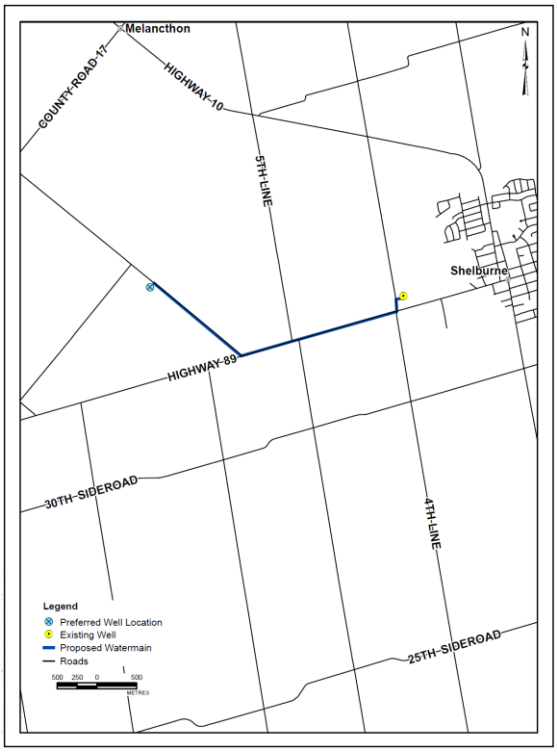

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Sharon Stinson Henry
Chief
Chippewas of Rama First Nation
5884 Rama Road
Suite 200
Rama, Ontario
L0K 1T0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Sharon Stinson Henry,

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Shelburne, ON L0N 1S0
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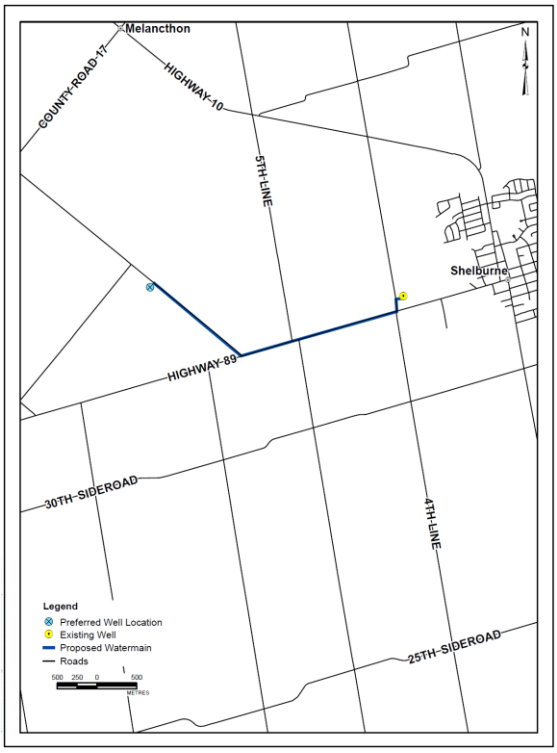

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Tel: 905-567-4444
Email: Ian_Callum@golder.com

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Tracy Gauthier
Chief
Mississaugas of Scugog Island First Nation
22521 Island Road
Port Perry, Ontario
L9L 1B6

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Tracy Gauthier,

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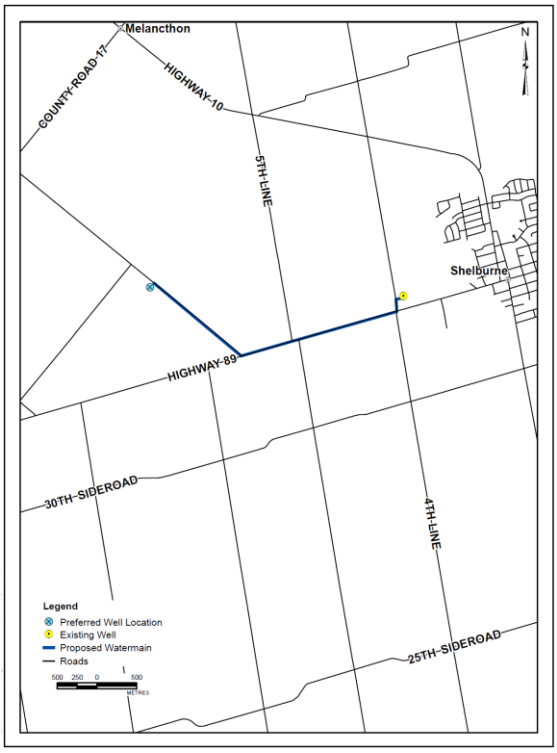

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Golder Associates Ltd.
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Tel: 905-567-4444
Email: Ian_Callum@golder.com

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M. Bryan LaForme
Chief
Mississaugas of the New Credit First Nation
8545 Townline Road
RR 1
Hagersville, Ontario
N0A 1H0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear M. Bryan LaForme,

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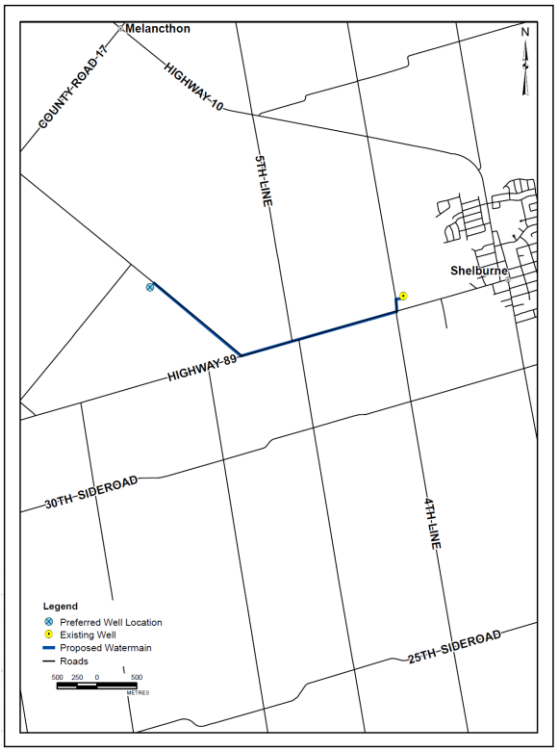

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Thomas Bressette
Chief
Chippewas of Kettle and Stoney Point
R.R.#2
Forest, Ontario
N0N1J0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Thomas Bressette,

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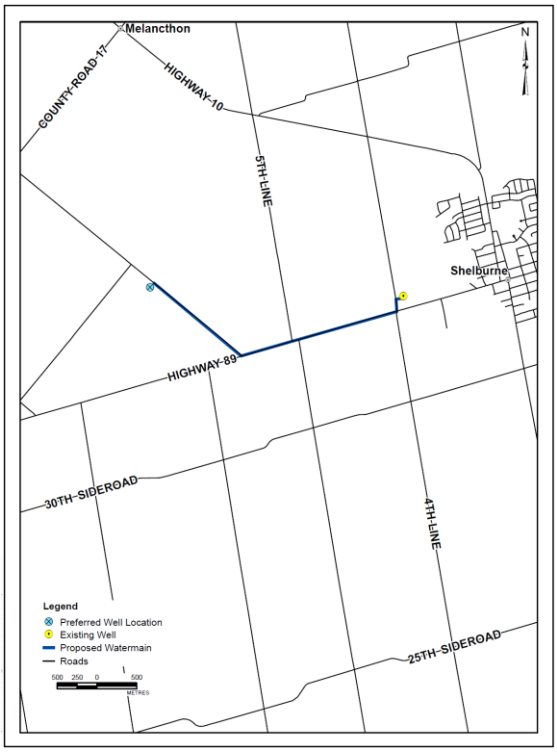

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Ogemawahj Tribal Council
5984 Rama Road
PO Box 46
Rama, Ontario
L0K 1T0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear ,

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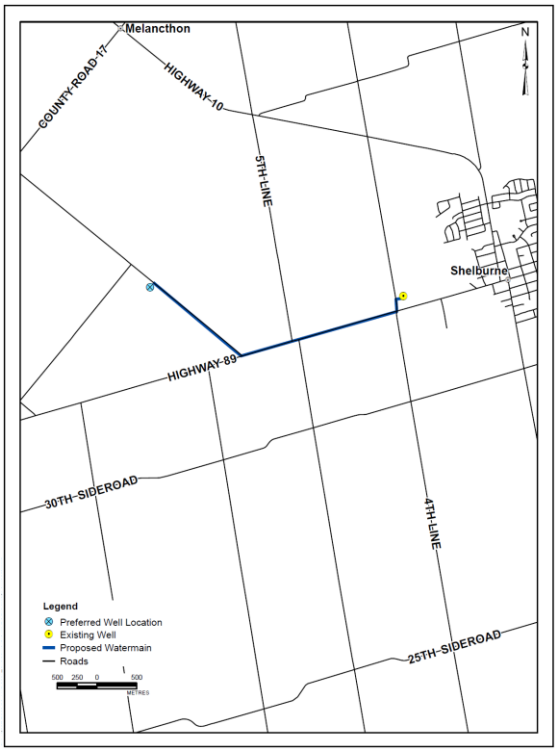

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John Telfer, CAO
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600
Email: jtelfer@townofshelburne.on.ca

Ian Callum, Project EA Leader
Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON L5N 5Z7
Tel: 905-567-4444
Email: Ian_Callum@golder.com

With the exception of personal information, all comments will become part of the Public Record.
This Notice posted 27 September, 2012.

Union of Ontario Indians
1 Miigizi Mikan
North Bay, Ontario
P1B 8G5

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear ,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Town of Shelburne Long-Term Well for Additional Water Supply Project

Municipal Class Environmental Assessment Study and Federal Comprehensive Study

The Study

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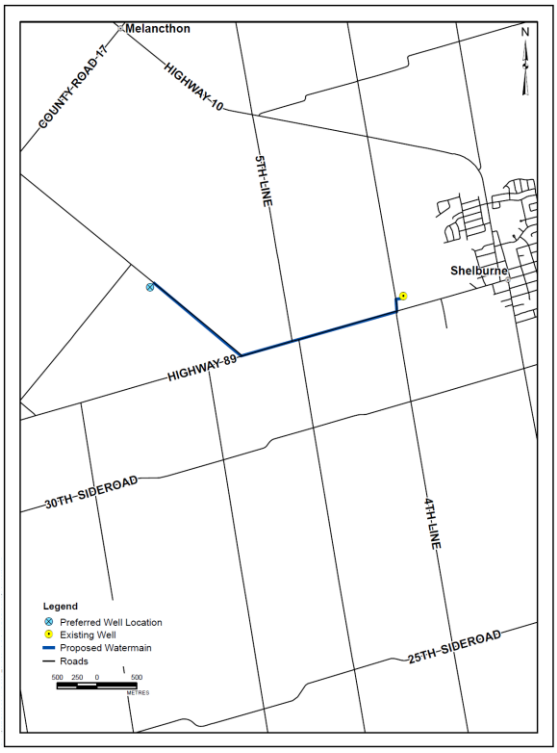

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Time: **Afternoon: 2:00 to 4:00 p.m.**
Evening: 7:00 to 9:00 p.m.

Location: **Grace Tipling Hall at 203 Main Street East, (Town Hall), Shelburne , Ontario**

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Email: Ian_Callum@golder.com

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William Montour
Chief
Six Nations of the Grand River Territory
1695 Chiefswood Rd.
Ohsweken, Ontario
N0A 1M0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear William Montour,

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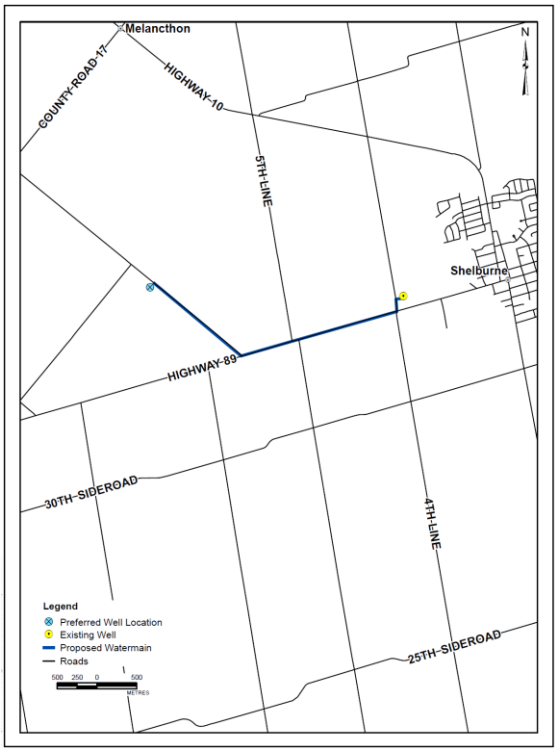

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Gord Peters
Grand Chief
Association of Iroquois and Allied Indians
London Office
387 Princess Ave.
London, Ontario
N6B 2A7

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Gord Peters,

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Shelburne, ON L0N 1S0
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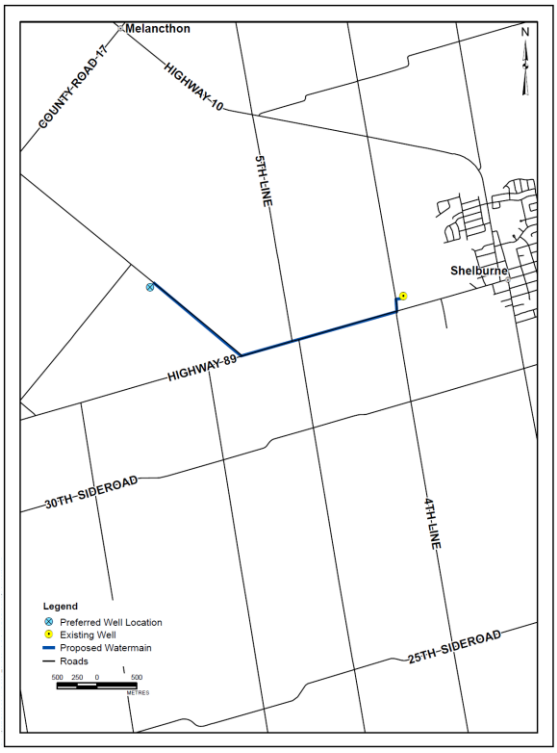

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Hazel Hill
Haudenosaunee Development Institue
16 Sunrise Court
P.O. Box 714
Ohsweken, Ontario
N0A 1M0

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Hazel Hill,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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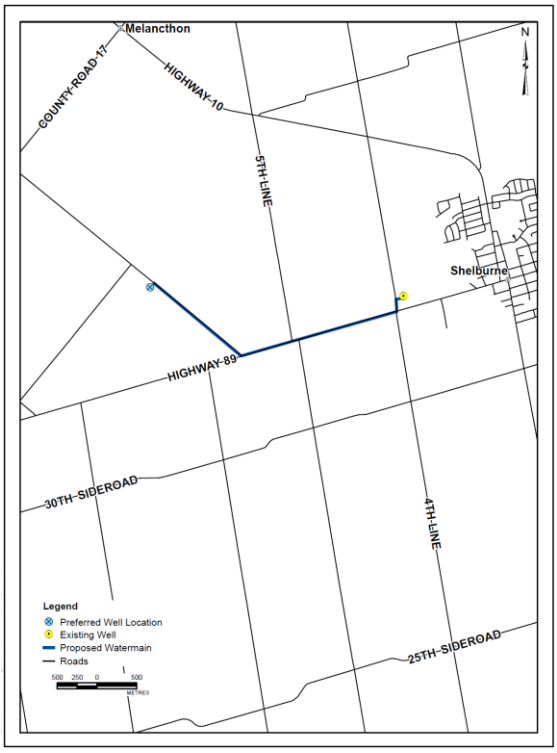

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Melanie Paradis
Director
Métis Nation of Ontario
75 Sherbourne St.
Suite 222
Toronto, Ontario
M5A 2P9

TOWN OF SHELBURNE LONG-TERM WELL FOR ADDITIONAL WATER SUPPLY PROJECT: PUBLIC INFORMATION CENTRE

Dear Melanie Paradis,

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We acknowledge the importance of engaging Métis communities and want to provide leaders and community members with the opportunity to comment on the Class EA. We are planning a Public Information Centre scheduled on October 22nd, 2012, details for which are provided in the attached notice. Please feel free to contact me by email at the address provided below, or call me at 519-925-2600.

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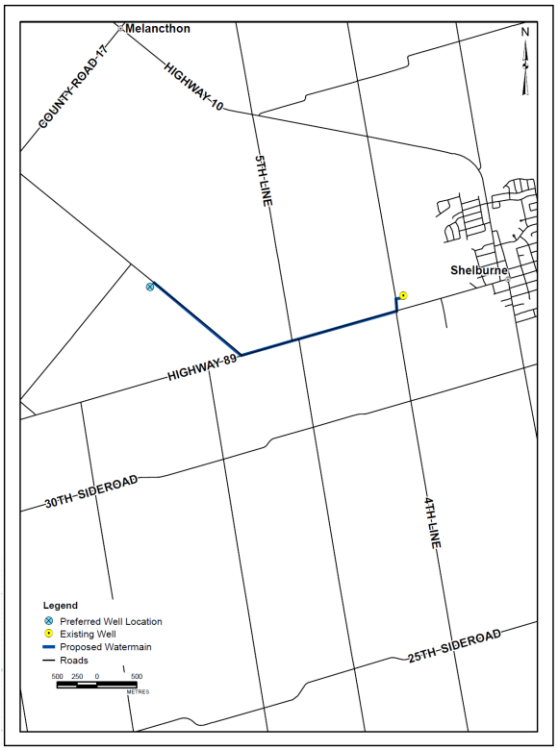

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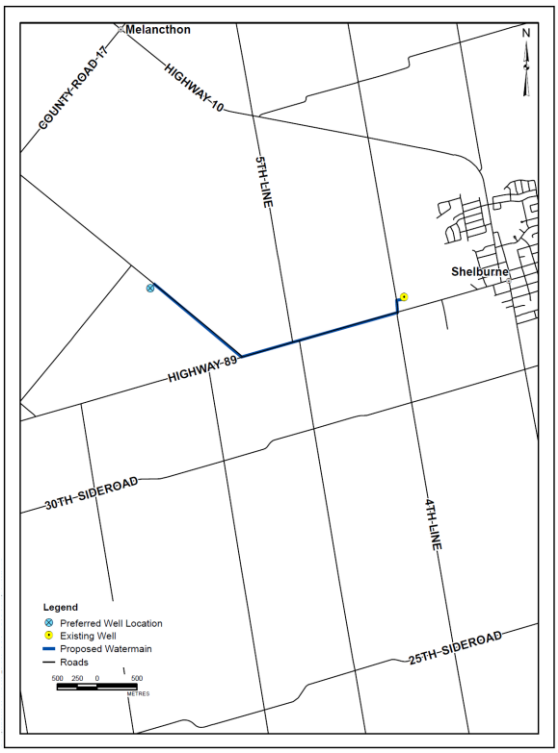

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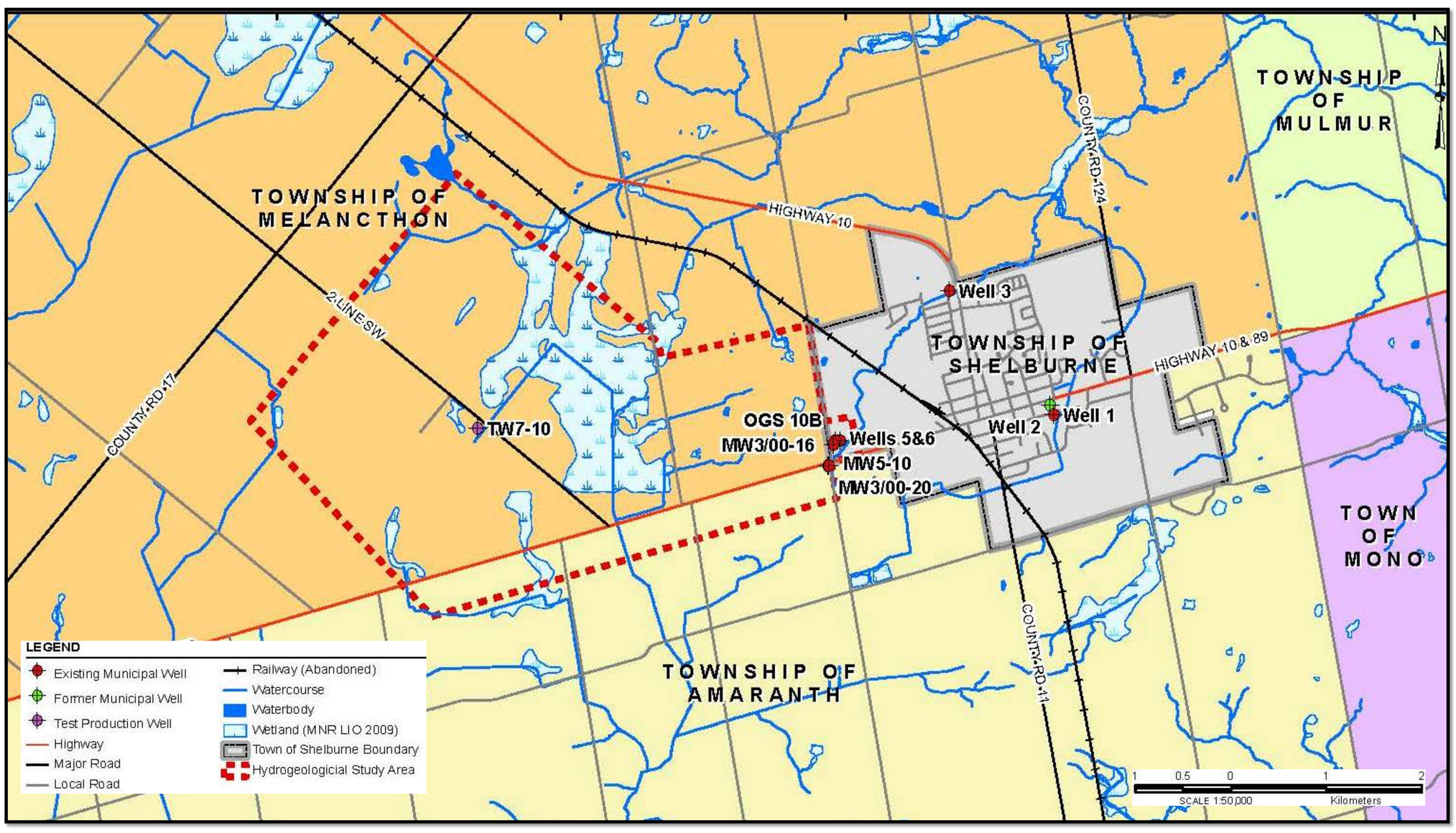
Town of Shelburne Long-Term Well for Additional Water Supply Project

Welcome

Thank you for coming to learn about the
Town of Shelburne
Long-Term Well for Additional Water Supply Project

We want to hear what you think



Municipal Class Environmental Assessment and
Federal Comprehensive Study
Public Information Centre
Grace Tipling Hall (Town Hall)
Monday October 22nd, 2012

Golder Associates

SHELBURNE

Background

- The Town's Water Supply System currently consists of:
  - four groundwater supply wells (PW1, PW3, PW5 and PW6);
  - three pumphouses
  - an elevated storage reservoir ("water tower"); and
  - a distribution system

- The Town's current water supply capacity is 4,916 cubic metres per day (m^3/d). It is estimated that by 2032, the Town's water supply requirement will reach 5,983 m^3/d. This represents 1,067 m^3/d more than the current capacity.

- Regular monitoring of water quality of the Town's water supply has revealed concentrations of naturally-occurring arsenic ranging up to 14 and 22 micrograms per litre (µg/L).

- The Town is currently in compliance with the Ontario Drinking Water Quality Standard of 25 µg/L for arsenic.

- MOE has indicated that the standard for arsenic could be reduced from 25 to 10 µg/L, at which time the Town would be out of compliance in some of their wells.

Problem/Opportunity Statement

In order to accommodate future growth in the Town of Shelburne, a new water supply source must be identified in or adjacent to the Town. This source of water must result in a safe, secure, and sustainable water supply system for the Town that meets Ontario Drinking Water Quality Standards, including anticipated new Provincial arsenic standards.

Golder Associates

SHELBURNE

Environmental Assessment Process

- The Project is undergoing a Schedule “B” Municipal Class Environmental Assessment (EA)
    - A planning process that meets the requirements of Ontario’s Environmental Assessment Act.
- This Project is also undergoing a federal environmental assessment process, called a Comprehensive Study.
    - This process is required because the Town has pursued Federal funding that would be administered by the Federal Economic Development Agency for Southern Ontario.
- Both EA processes are planning processes that guide the evaluation of possible Project Alternatives as well as assessing potential environmental effects of the Preferred Project.

Provincial Environmental Assessment Process		Federal Environmental Assessment Process	
September 18, 2009	Notice of Commencement		December 15, 2011
October 22, 2012	Public Information Centre		October 22, 2012
Winter 2013	Notice of Completion	Post Final Comprehensive Study Report	Spring 2013
Winter 2013	30-day Public / Agency Review	Public Comment Period	4 Weeks
Spring 2013	Statement of Completion	Minister Decision	Summer 2013

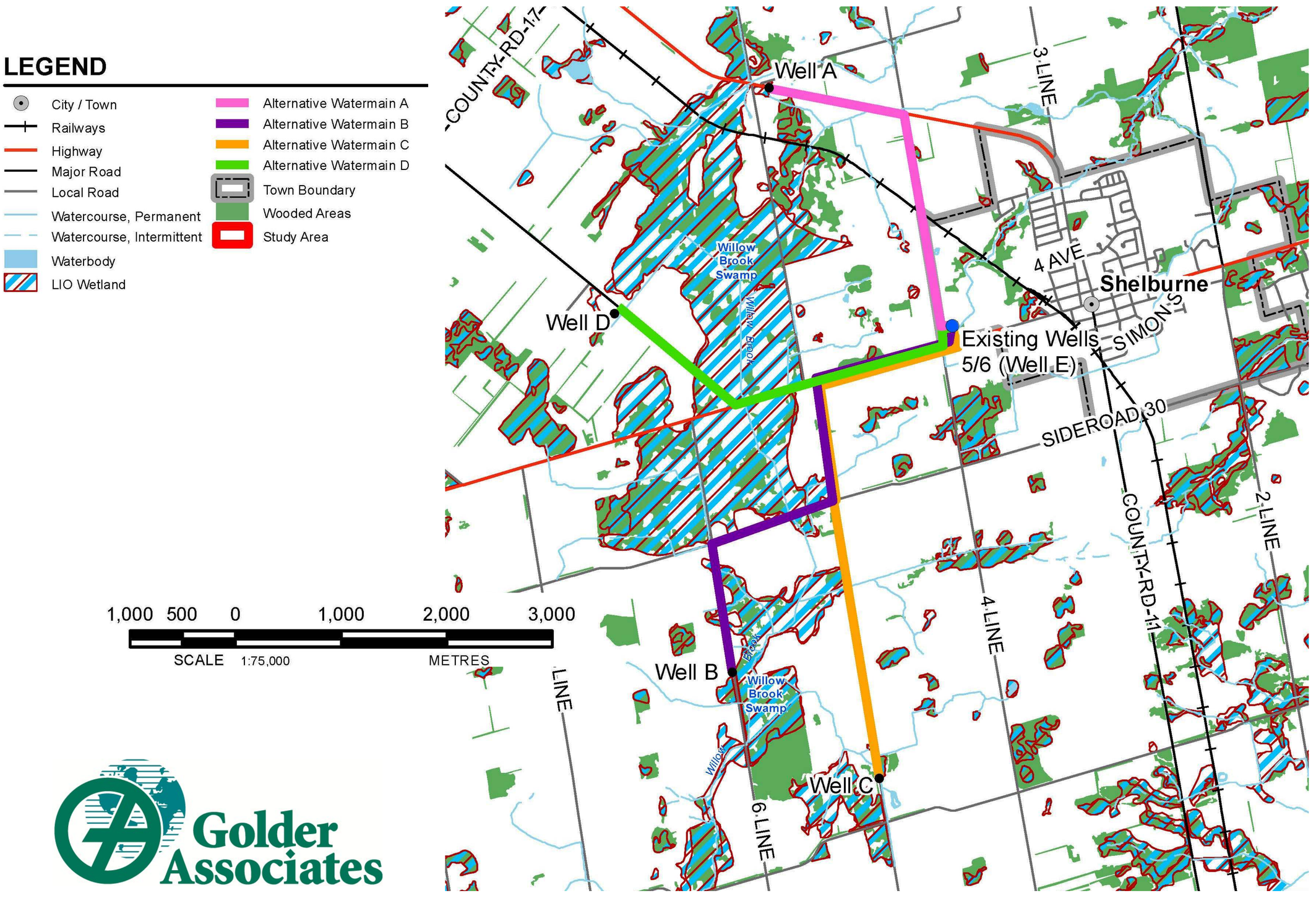
Golder Associates

SHELBURNE

Project Alternatives

Alternatives Considered

- The EA/EIS has evaluated alternatives to the Project as a means of addressing the Municipal Class EA problem/opportunity statement and as a requirement of a Comprehensive Study.
- The Project Alternatives considered included:
  - Do nothing;
  - Implement water conservation;
  - Limit community growth;
  - Develop a new well; and
  - Implement arsenic treatment at existing water sources.
- The assessment concluded that the development of a new well was the Project Alternative that best addressed the problem/opportunity statement.
- The EA/EIS also considered alternative means of delivering the Project, shown on the map below.
- Well location D was selected as the Preferred Project Alternative, primarily considering that it provided the most reliable water supply in terms of quality and quantity.



Golder Associates

SHELBURNE

Project Description for Preferred Alternative

- The proposed works will include the development of a new production well and a backup well, with a permitted capacity of 1,635 m^3/d.
- The raw water pumped from the well will be conveyed to the existing water supply system.
- A new pumphouse building will be constructed adjacent to the wells.
- The extension of the water supply system to the well site requires that a new 12-inch diameter watermain be installed for a distance of approximately 4 km along right-of-ways.
    - The new watermain would terminate at existing Municipal Wells 5/6.
- It is anticipated that the treatment (chlorination) of the raw water from the new well site will be undertaken at the existing treatment facilities at Municipal Wells 5/6.
- Therefore, upgrading of the chlorination facilities at the Well 5/6 site will be required.
- Also, it is anticipated that a new water storage facility will be constructed at the Well 5/6 site to blend the water from the new well with the treated water from the existing Wells 5/6.

Golder Associates

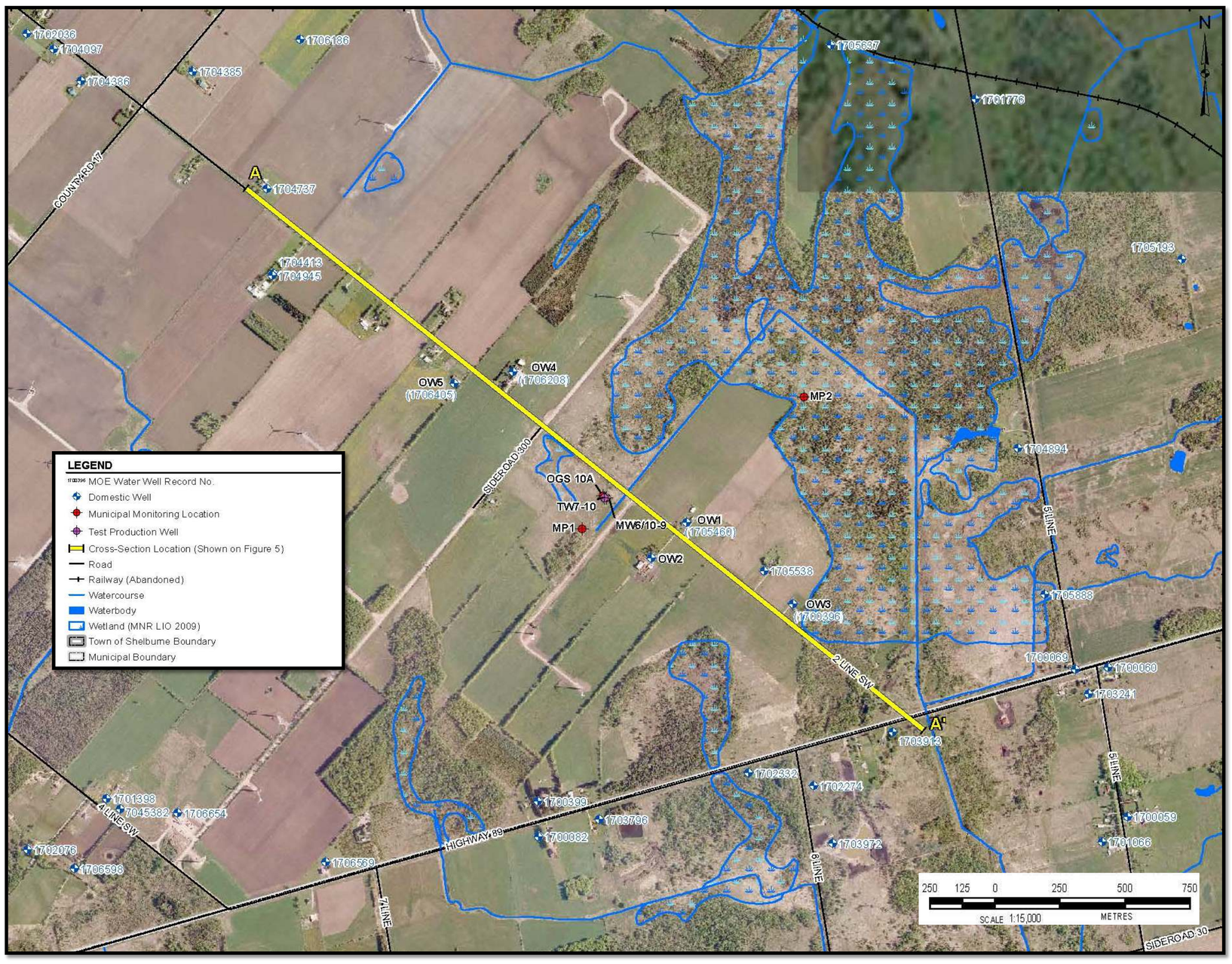
SHELBURNE

TW7-10 Performance Testing

- **Purpose** – To monitor environmental response to pumping and evaluate long-term water supply potential.

DATE	PUMPING TEST DETAILS
Nov 25, 2010	Step Testing within open borehole of TW7-10
Nov 26,2010	Step Testing below packer installed within TW7-10 (47 m bgs, approximately 450 masl)
Nov 29 – Dec 2, 2010	72-hour groundwater pumping test (from below the packer within TW7-10) at a constant rate of 1,635 m^3/d.

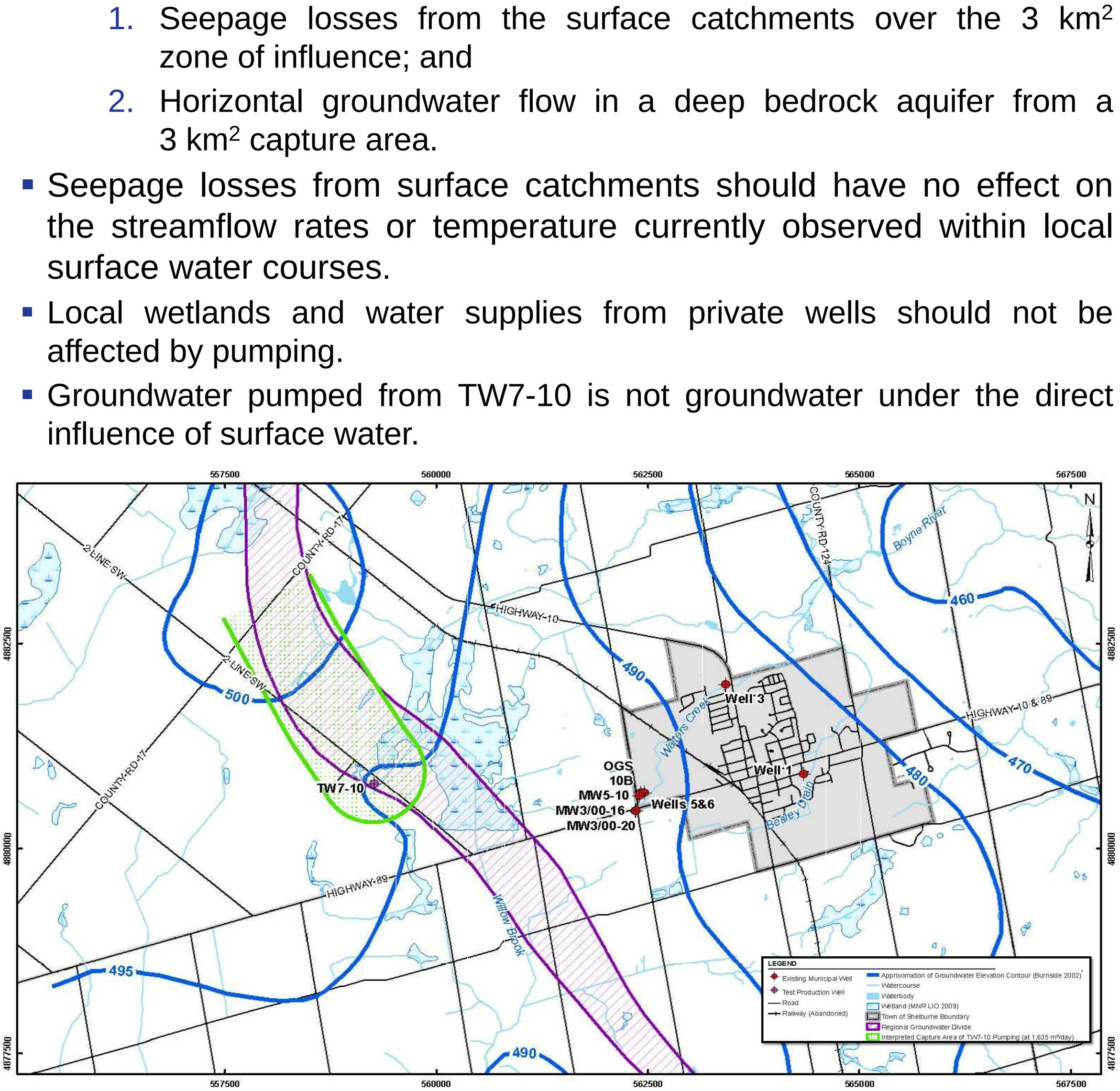
- Regular monitoring carried out at 14 stations during testing:
  - 5 Municipally-owned monitoring wells
  - 2 OGS test wells
  - 5 Private residential wells
  - 2 Drive-point piezometers installed in wetlands



Monitoring Locations

Conclusions from TW7-10 Pumping Test Results

- Groundwater levels stabilized (i.e., reached steady state) near the end of the test.
- The pumping rate of 1,635 m^3/d is sustainable in the long-term.
- Steady-state pumping from TW7-10 (at 1,635 m^3/d) is sustained by:
    1. Seepage losses from the surface catchments over the 3 km^2 zone of influence; and
    2. Horizontal groundwater flow in a deep bedrock aquifer from a 3 km^2 capture area.
- Seepage losses from surface catchments should have no effect on the streamflow rates or temperature currently observed within local surface water courses.
- Local wetlands and water supplies from private wells should not be affected by pumping.
- Groundwater pumped from TW7-10 is not groundwater under the direct influence of surface water.



Capture Area of TW7-10 Pumping (at 1,636 m^3/day)

Golder Associates

SHELBURNE

Town of Shelburne Water Supply

Environmental Assessments

Public Information Centre
Grace Tipling Hall (Town Hall) - October 22, 2012

Event Feedback Form

Thank you for taking the time to fill out this comment form. Please submit to the project team, or mail it to the address below. Your input is important. Comments will become part of the public record with the exception of personal information.

1. **How did you learn about this Public Information Event (please check all that apply)?**

- ☐ Newspaper Advertisement
- ☐ Personal Letter or Email
- ☐ Word of Mouth
- ☐ Website
- ☐ Other: _____

2. **What was your main reason for attending this Public Information Event?**

3. **Did this Public Information Event meet your information needs?**

- ☐ Yes
- ☐ Somewhat
- ☐ No

Please explain: _____

We thank you for your participation.

4. **If you asked a question, did the representatives from the Town of Shelburne answer your question sufficiently?**

☐ Yes

☐ Somewhat

☐ No

Please explain: _____

_____

_____

_____

5. **Other questions or comments:**

_____

_____

_____

_____

_____

_____

If you would like to receive updates please provide your name and contact information:

Name: _____

Affiliation: _____

Address: _____

City/Province: _____ Postal Code: _____

Email: _____

Thank you for taking the time to fill out this comment form. If you require more time, you are welcome to take the comment form home and return it by November 30, 2012 to:

Ian Callum, EA Manager
Golder Associates Ltd.
2390 Argentia Road
Mississauga, Ontario
L5N 5Z7
Ian_Callum@golder.com

We thank you for your participation.

The Corporation of
THE TOWN OF SHELBURNE
Municipal Offices:
203 Main Street East, Shelburne, Ont. L0N 1S0 - Telephone: (519) 925-2600 - Fax (519) 925-6134
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Office of the Mayor
ED CREWSON, B. ADMIN.

JOHN TELFER, AMCT, CAO/Clerk
CECILE GRANT, AMCT, Treasurer
SCOTT WHEELDON, C.E.T.
Director of Public Works

May 26, 2011

Chief Donna B. Canoe
Chippewas of Georgina Island
RR#2
Box N-13
Sutton West Ontario L0E 1R0

Town of Shelburne Hydrogeological Study and Class Environmental Assessment
Dear Chief Donna B. Canoe,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Sincerely

Roseann Rutledge
Project Coordinator
Tel: 519-925-2600 x253
Fax: 519-925-6134
Email: rrutledge@townofshelburne.on.ca

John Telfer
CAO/Clerk
Tel: 519-925-2600 x226
Fax: 519-925-6134
Email: jtelfer@townofshelburne.on.ca

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CECILE GRANT, AMCT, Treasurer
SCOTT WHEELDON, C.E.T.
Director of Public Works

May 26, 2011

Chief Randall Kahgee
Saugeen First Nation
RR#1
Southampton Ontario N0H 2L0

Town of Shelburne Hydrogeological Study and Class Environmental Assessment
Dear Chief Randall Kahgee,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Project Coordinator
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Fax: 519-925-6134
Email: rrutledge@townofshelburne.on.ca

John Telfer
CAO/Clerk
Tel: 519-925-2600 x226
Fax: 519-925-6134
Email: jtelfer@townofshelburne.on.ca

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CECILE GRANT, AMCT, Treasurer
SCOTT WHEELDON, C.E.T.
Director of Public Works

May 26, 2011

Chief Ronald Monague
Beausoleil First Nation
1 Ogema Street
Christian Island Ontario L0K 1C0

Town of Shelburne Hydrogeological Study and Class Environmental Assessment
Dear Chief Ronald Monague,

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Project Coordinator
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John Telfer
CAO/Clerk
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CECILE GRANT, AMCT, Treasurer
SCOTT WHEELDON, C.E.T.
Director of Public Works

May 26, 2011

Chief Ralph Akiwenzie
Chippewas of Nawash Unceded First Nation
RR#5
Wiarton Ontario N0H 2T0

Town of Shelburne Hydrogeological Study and Class Environmental Assessment
Dear Chief Ralph Akiwenzie,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Sincerely

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Project Coordinator
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Email: rrutledge@townofshelburne.on.ca

John Telfer
CAO/Clerk
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CECILE GRANT, AMCT, Treasurer
SCOTT WHEELDON, C.E.T.
Director of Public Works

May 26, 2011

Chief Blaine Commandant
Wahta Mohawks
P.O. Box 260
Bala Ontario P0C 1A0

Town of Shelburne Hydrogeological Study and Class Environmental Assessment
Dear Chief Blaine Commandant,

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Sincerely

Roseann Rutledge
Project Coordinator
Tel: 519-925-2600 x253
Fax: 519-925-6134
Email: rrutledge@townofshelburne.on.ca

John Telfer
CAO/Clerk
Tel: 519-925-2600 x226
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CECILE GRANT, AMCT, Treasurer
SCOTT WHEELDON, C.E.T.
Director of Public Works

May 26, 2011

Chief Sharon Stinson Henry
Chippewas of Rama First Nation
5884 Rama Road
Suite 200
Rama Ontario L0K 1T0

Town of Shelburne Hydrogeological Study and Class Environmental Assessment
Dear Chief Sharon Stinson Henry,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Project Coordinator
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Email: rrutledge@townofshelburne.on.ca

John Telfer
CAO/Clerk
Tel: 519-925-2600 x226
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CECILE GRANT, AMCT, Treasurer
SCOTT WHEELDON, C.E.T.
Director of Public Works

May 26, 2011

Chief Tracy Gauthier
Mississaugas of Scugog Island First Nation
22521 Island Road
Port Perry Ontario L9L 1B6

Town of Shelburne Hydrogeological Study and Class Environmental Assessment
Dear Chief Tracy Gauthier,

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Roseann Rutledge
Project Coordinator
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John Telfer
CAO/Clerk
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Office of the Mayor
ED CREWSON, B. ADMIN.

JOHN TELFER, AMCT, CAO/Clerk
CECILE GRANT, AMCT, Treasurer
SCOTT WHEELDON, C.E.T.
Director of Public Works

May 26, 2011

Chief M. Bryan LaForme
Mississaugas of New Credit First Nation
8545 Townline Road
RR#1
Hagersville Ontario N0A 1H0

Town of Shelburne Hydrogeological Study and Class Environmental Assessment
Dear Chief M. Bryan LaForme,

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Project Coordinator
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CAO/Clerk
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CECILE GRANT, AMCT, Treasurer
SCOTT WHEELDON, C.E.T.
Director of Public Works

May 26, 2011

Director Melanie Paradis
Metis
75 Sherbourne St.
Suite 222
Toronto Ontario M5A 2P9

Town of Shelburne Hydrogeological Study and Class Environmental Assessment
Dear Director Melanie Paradis,

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Office of the Mayor
ED CREWSON, B. ADMIN.

JOHN TELFER, AMCT, Town Clerk/EDO
CECILE GRANT, AMCT, Treasurer

November 5, 2009

Document No. 09-1112-6066

Chief William K. Montour
Six Nations of the Grand River Territory
1695 Chiefswood Rd.
Ohsweken, Ontario
N0A 1M0

TOWN OF SHELBURNE HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT

Dear Chief William K. Montour

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Sincerely,

Kelly McDowell
Project Coordinator
Tel: 519-925-2600 x252
Fax: 519-925-6134
Email: kmcdowell@townofshelburne.on.ca

John Telfer
Acting CAO/Town Clerk/EDO
Tel: 519-925-2600 x226
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Office of the Mayor
ED CREWSON, B. ADMIN.

JOHN TELFER, AMCT, Town Clerk/EDO
CECILE GRANT, AMCT, Treasurer

November 5, 2009

Document No. 09-1112-6066

President Gary Lipinski
Métis Nation of Ontario
500 Old St. Patrick St.
Ottawa, Ontario
K1Y 0Y3

TOWN OF SHELBURNE HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT

Dear President Gary Lipinski

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Sincerely,

Kelly McDowell
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Acting CAO/Town Clerk/EDO
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CECILE GRANT, AMCT, Treasurer

November 5, 2009

Document No. 09-1112-6066

Hazel Hill
Haudenosaunee Development Institute
16 Sunrise Court, PO Box 714
Ohsweken, Ontario
N0A 1M0

TOWN OF SHELBURNE HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT

Dear Hazel Hill

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

The Town currently operates five groundwater supply wells to support our municipal water distribution system. In the next twenty years, the Town's water supply requirements are expected to exceed its current capacity. We have also observed decreased performance in one of the Town's existing wells.

Our study of potential new water supply sources is being developed as a Schedule "B" Municipal Class Environmental Assessment (Class EA) under Ontario's *Environmental Assessment Act*. We have been granted federal funding and, due to the volumes of water that would be extracted, this study has triggered a comprehensive study under the *Canadian Environmental Assessment Act*.

We hope the Class EA will allow us to find and recommend a new water supply source within the Study Area identified in our Notice of Commencement (attached). The Class EA will consider the environmental, cultural, social, natural, technical and economic components of a new water supply source.

We acknowledge the importance of engaging First Nations communities and want to provide leaders and community members with the opportunity to comment on the Class EA. We are planning a Public Information Centre in the near future, and hope you will attend. Please feel free to contact me by email at the address provided below, or call me at 519-925-2600 extension 252.

Sincerely,

Kelly McDowell
Project Coordinator
Tel: 519-925-2600 x252
Fax: 519-925-6134
Email: kmcdowell@townofshelburne.on.ca

John Telfer
Acting CAO/Town Clerk/EDO
Tel: 519-925-2600 x226
Fax: 519-925-6134
Email: jtelfer@townofshelburne.on.ca

The Corporation of
THE TOWN OF SHELBURNE
Municipal Offices:
203 Main Street East, Shelburne, Ont. L0N 1S0 - Telephone: (519) 925-2600 - Fax (519) 925-6134
e-mail: shelburne@townofshelburne.on.ca

Office of the Mayor
ED CREWSON, B. ADMIN.

JOHN TELFER, AMCT, Town Clerk/EDO
CECILE GRANT, AMCT, Treasurer

November 5, 2009

Document No. 09-1112-6066

President Gerry Bedford
Métis Nation of Ontario, Region 8, Georgian Bay
79 Rustic Cr.
Orangeville, Ontario
L9W 1T1

TOWN OF SHELBURNE HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT

Dear President Gerry Bedford

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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We acknowledge the importance of engaging Métis communities and want to provide leaders and community members with the opportunity to comment on the Class EA. We are planning a Public Information Centre in the near future, and hope you will attend. Please feel free to contact me by email at the address provided below, or call me at 519-925-2600 extension 252.

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Office of the Mayor
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JOHN TELFER, AMCT, Town Clerk/EDO
CECILE GRANT, AMCT, Treasurer

November 5, 2009

Document No. 09-1112-6066

Chief Brian LaForme
Mississaugas of the New Credit
2789 Mississauga Rd.
Hagersville, Ontario
N0A 1H0

TOWN OF SHELBURNE HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT

Dear Chief Brian LaForme

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Office of the Mayor
ED CREWSON, B. ADMIN.

JOHN TELFER, AMCT, Town Clerk/EDO
CECILE GRANT, AMCT, Treasurer

November 5, 2009

Document No. 09-1112-6066

Grand Chief Randall Phillips
Association of Iroquois and Allied Indians, London Office
387 Princess Ave
London, Ontario
N6B 2A7

TOWN OF SHELBURNE HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT

Dear Grand Chief Randall Phillips

The Town of Shelburne (the Town) is undertaking an Environmental Assessment to identify a new water supply source outside of the Town boundary in order to accommodate potential future growth and provide security for the Town's water supply. We are committed to providing you with clear and consistent information throughout the planning and community engagement process.

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Sincerely,

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John Telfer
Acting CAO/Town Clerk/EDO
Tel: 519-925-2600 x226
Fax: 519-925-6134
Email: jtelfer@townofshelburne.on.ca

Knell, Mark

From: Moffett, Cathryn
Sent: Tuesday, February 01, 2011 10:40 AM
To: 'heather.levecque@ontario.ca'; 'Gilbertg@inac.gc.ca'
Cc: Callum, Ian
Subject: Shelburne Hydrogeological Study
Attachments: EA Notice of Commencement_15Sept09 _2_.pdf

Hi Heather and Glenn,
I am writing with regards to the Shelburne Hydrogeological Study and Class Environmental Assessment (see Notice attached). I would like to request a list of potentially affected Aboriginal communities who should be engaged as part of this project.
Thanks for your time,
Cathryn

Cathryn Moffett (BSc.) | Public Participation and Aboriginal Engagement | **Golder Associates Ltd.**
2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
T: +1 (905) 567 4444 | **D:** +1 (905) 567-6100 ext 1339 | **M:** +1 (416) 418-3706 |
E: Cathryn_Moffett@golder.com | **www.golder.com**

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Please consider the environment before printing this email.

TECHNICAL MEMORANDUM

DATE April 11, 2011 **PROJECT No.** 09-1112-6007

TO Angela Homewood, Project Manager - Program Services, Great Lakes - St. Lawrence River Basin, MOE

Don Hamilton, Drinking Water Supervisor, MOE
Barbara Slattery, EA Coordinator, West Central Region, MOE
John Telfer, CAO, Town of Shelburne

CC Roseann Rutledge, Project Coordinator, Town of Shelburne
Scott Wheeldon, Director of Public Works, Town of Shelburne
Jeff Graham, Town Engineer, Genivar
Ian Callum, EA Project Lead, Golder Associates Ltd.

FROM Bill Banks, Project Manager
John Petrie, Project Director

EMAIL Bill.Banks@banksgroundwater.ca
jpetrie@golder.com

TOWN OF SHELBURNE – BACKGROUND FOR MOE

The Town of Shelburne (the Town) currently operates four groundwater supply wells to support its municipal water distribution system (i.e., PW1, PW3, PW5 and PW6). Well PW2 was recently abandoned due to declining performance. Groundwater withdrawal from these sources is in accordance with MOE Permit to Take Water Number 1814-7QVK7S, with an expiry date of December 31, 2014.

Within twenty years, the Town's estimated water supply requirements of 6,256 m^3/day are expected to exceed the current capacity of 4,910 m^3/day, resulting in a shortfall of 1,346 m^3/day. Additionally, groundwater quality monitoring of the four active municipal wells, from 2004 to 2010, has indicated that the highest concentration of naturally-occurring arsenic observed in raw water at these wells ranged approximately from 14 to 22 µg/L. The Ontario Ministry of the Environment has indicated that the Ontario Drinking Water Quality Standard for arsenic may be reduced from 25 to 10 µg/L.

In order to accommodate future growth and provide security for the Town's water supply, the Town contracted Golder Associates Ltd. in association with Banks Groundwater Engineering, AECOM and Gerrits Drilling and Engineering, to initiate a Municipal Class Environmental Assessment and a hydrogeological study to locate a new water supply. This study received funding from the Federal Government and is therefore also subject to the requirements of the Federal Environmental Assessment Process. The study will identify, evaluate and document a recommended solution for new supply sources in a defined study area with consideration for environmental, social, technical and economic factors. The recommended solution will identify the following:

- Number, size and location of production wells to be developed;
- Maximum sustained pumping rates;
- Treatment and pumping requirements; and

- Means to connect to the existing distribution system and associated costs.

Currently this study is in Phase 2 of a Schedule "B" Municipal Class EA, under Ontario's Environmental Assessment Act. A Notice of Study Commencement was issued in September 2009.

The Terms of Reference for the Hydrogeological Study required that target areas be identified for the purpose of drilling test wells and selecting one of the test wells for testing to confirm availability and quality of a sustainable groundwater supply. To determine potential target areas, the following criteria were considered:

- The target areas needed to be within a 5 km radius of the Town due to the feasibility of installing a watermain connecting a well to the Town;
- The location of the potential target well to have a potential yield that meets or exceeds a rate of 1,346 m^3/day;
- Avoided overlap with existing municipal well capture areas;
- Potential test well location to minimize interference with existing wells;
- Provides potable water, preferably with negligible arsenic concentrations; and
- Does not have negative impacts on ecological and surface water features.

Initially three potential test well areas were identified based on the above criteria. The three areas were presented to the Town's Project Steering Committee in November 2009 as possible targets for test wells.

In December 2009, following the recommendation of the project team, staff from the Ontario Geologic Society (OGS) were invited to meet with the Project Steering Committee and the project team to discuss the project. OGS staff presented an overview of their research conducted to-date, which had focussed on bedrock formations and aquifers along the Niagara escarpment with a particular emphasis on water quality and the occurrence of naturally occurring arsenic minerals. Based on this work, they considered it was possible that a well completed in a deeper bedrock formation located up to 5 km west of the Town may meet the quantity requirements of the Town. The OGS also explained that the arsenic levels in existing shallow bedrock municipal wells serving the Town were likely a result of the microbial degradation of pyrite under aerobic conditions. The presence of pyrite in some areas, while not present in others would account for some of the variability in arsenic levels. Another factor that was important to the Town, the OGS research had determined that the deeper bedrock formation did not exhibit the same characteristics as the shallow formation in terms of arsenic-producing conditions.

Early in 2010, the OGS offered to drill two deep small-diameter wells at locations established in consultation with the Town and the project team. The two well locations were selected based on the criteria listed above and on the availability of test drilling sites. One was located within the site of Municipal Wells 5 and 6. The other site was located about 3.3 km west of the Town boundary, where Town staff were able to obtain an agreement with a land owner to permit test drilling. The wells were drilled and the bedrock core was logged by OGS staff. Various geophysical logging and testing of the two bedrock test holes were completed by the project team. The test results indicated that conditions in the deep bedrock formation in the western well appeared to have potential for developing a municipal water supply. The well drilled at the Municipal Well 5/6 site encountered conditions in the deep bedrock formation that were not suitable for developing a water supply.

Subsequently, a larger-diameter test well was drilled adjacent to the western OGS well and completed in the deeper bedrock formation. The locations of the municipal wells, the OGS wells and the test well are shown on the attached figure. The UTM coordinates for these wells are summarized in Table 1 below. Once a Category 2 PTTW was obtained from the MOE, a 72-hour pumping test was performed on the test well at a constant pumping rate of 1,635 m^3/day, beginning on November 29, 2010. The results of the test confirmed that the deep bedrock formation could provide a sustainable supply of at least this rate from this well. At this time, it is therefore intended that this well be considered as the preferred alternative solution for the Municipal Class EA.

Table 1: Well Locations

Well Name	Easting	Northing
PW1	564355	4880931
PW3	563167	4881799
PW5	562399	4880655
PW6	562399	4880655
OGS 10A	559259	4880813
OGS 10B	562410	4880689
Test Well 7	559266	4880803

We trust this study overview provides the information you require at this time. There is considerably more detailed information that has been compiled and evaluated since the initiation of the study in August 2009. We therefore welcome any questions or comments that you may have.

Bill Banks, P.Eng.
Senior Hydrogeologist

John M. Petrie, M.Sc., P.Geo.
Senior Hydrogeologist

Attachment: Figure 1 – Great Lakes Watershed Divide

BB/JMP/wlm

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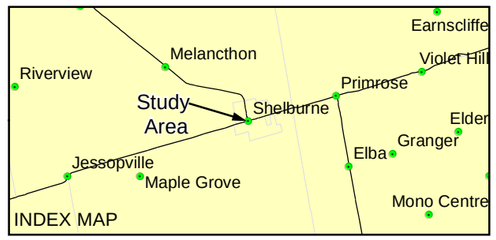
556000
560000
564000
4884000
4880000
4876000
N
HIGHWAY-10
SIDEROAD-280
Canadian Pacific Swamp
Melancthon
5 LINE
SIDEROAD-5
2-LINE-W
Melancthon Wetland Complex #1
3 LINE
COUNTY-RD-124
PW3
HIGHWAY-10 & 89
4 LINE SW
SIDEROAD-300
OGS 10A
Test Well 7
PW5&6
OGS 10B
Shelburne
PW1
SIMON ST
2-LINE SW
Maple Grove North Wetland
Willow Brook Swamp
MONO-AMARANTH-TLINE
Maple Grove Northwest Wetland
COUNTY-RD-17
2 LINE
HIGHWAY-89
SIDEROAD-30
4 LINE
Maple Grove
7 LINE
5 LINE
8 LINE
9 LINE
SIDEROAD-25
Elba-Camilla Wetland Complex
Maple Grove Bog
Crombies Wetland Complex
556000
560000
564000

LEGEND

- Sewage Plant Outfall
- Well Location
- Railway
- Watercourse
- Watershed Divide
- Wetlands
- Waterbody
- Lake Erie Watershed Area
- Lake Huron Watershed Area



DRAFT

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17
Watershed boundary obtained from the Land Information Ontario
(LIO) warehouse, called 'Great Lakes - St. Lawrence River Basin
Watersheds - Ontario Water Resources Act - OWRA'

1 0.5 0 1 2
KILOMETERS
SCALE 1:40,000

PROJECT
TOWN OF SHELBURNE WATER SUPPLY
CLASS EA

TITLE
GREAT LAKES WATERSHED DIVIDE

Golder Associates
Mississauga, Ontario

PROJECT NO. 091112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	KD	8 Apr. 2011		
GIS	KD	11 Apr. 2011		
CHECK	JP	11 Apr. 2011		
REVIEW				

FIGURE: 1

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\Draft\April_2011_Meeting\Watershed_Divide.mxd

TECHNICAL MEMORANDUM

DATE	July 19, 2010	**PROJECT No.**	09-1112-6007
TO	John Telfer, CAO/Clerk, Town of Shelburne		
CC	Kelly McDowell, Project Coordinator, Town of Shelburne		
FROM	Bill Banks, Project Manager John Petrie, Project Director	**EMAIL**	Bill.Banks@banksgroundwater.ca John_Petrie@golder.com

SUPPORTING INFORMATION
APPLICATION FOR CATEGORY 2 PERMIT TO TAKE WATER
SHELBURNE WATER SYSTEM – HYDROGEOLOGICAL STUDY AND ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

The following synopsis is provided in support of an Application for a Category 2 Permit to Take Water. This PTTW is required to perform a longer-term pumping test on a test well that was recently drilled as part of this project.

Golder Associates Ltd. and their sub-consultants Banks Groundwater Engineering Limited and Gerrits Drilling & Engineering Ltd. are retained by the Town of Shelburne to complete a Hydrogeological Study and Class Environmental Assessment for additional water supply. An additional supply well is required to replace an existing municipal well that has declined in efficiency and yield. However, arsenic has been detected in the raw water from some existing municipal wells at concentrations that are below the current Ontario Drinking Water Quality Standard of 0.025 mg/L, but have been above the Health Canada guideline of 0.010 mg/L. A primary goal for this project is therefore to develop an additional groundwater supply source with reduced, preferably non-detectable, levels of arsenic.

Earlier this year, the Ontario Geological Survey completed the drilling of two deep bedrock test holes in the vicinity of Shelburne. The first test hole is located on 2nd Line Southwest, about 3 km west of Shelburne, in Melancthon Township. The second test hole is located adjacent to the Town's production wells 5 and 6. Various logging and testing of the two bedrock test holes has been completed by our project team. The initial test results indicated that conditions at the location on 2nd Line Southwest appear to have potential for developing a municipal water supply.

Based on these results, approval was requested and received from Town Council to proceed with drilling a test well adjacent to the OGS test hole located on 2nd Line Southwest. The test well is located 10 metres southeast of the OGS test hole. A map of the test well location is attached for reference. A copy of the Draft Water Well Record for the test well is also attached.

A Category 2 Permit to Take Water is required solely for the purpose of performing pumping tests on this test supply well (TW7/10). Should the results be favourable, this well will be considered as an alternative solution. This project is being completed as a Municipal Class Environmental Assessment and the notice of study commencement has been issued. As the project proceeds, further information will be presented to the public and stakeholders through Public Information Centres.

50 BEST EMPLOYERS IN CANADA 2009 REPORT ON BUSINESS

50 BEST MANAGED COMPANIES

Golder Associates Ltd.
2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
Tel: +1 (905) 567 4444 Fax: +1 (905) 567 6561 www.golder.com
Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Pumping tests to be performed on the test well will comprise variable rate step testing for a total duration of up to 4 hours, with a maximum pumping rate of up to 1,817 Litres/min. The step testing will be followed by a continuous, constant-rate pumping test period of 72 hours. It is anticipated that the 72-hour test will be performed at a rate of up to 1,817 Litres/min (400 Igpm). The pumping rate and the total volume pumped will be measured by a calibrated in-line meter. Throughout the 72-hour pumping test period the water pumped from TW7/10 will be discharged into an adjacent drainage ditch (i.e. municipal drain), as depicted on the enclosed map. Prior to the 72-hour test, this ditch will be inspected to confirm it is capable of receiving and discharging the anticipated flow rate.

It should be noted that a packer will be set in the test well at about 55 metres below ground surface and the pump will be set below the packer. This will allow testing of the lower section of the well, which is completed in a deeper bedrock formation. All local bedrock wells are completed in the upper Guelph Formation. Water levels will be monitored below and above the packer in test well TW7/10, before, during and after the 72-hour pumping period.

Water levels in the adjacent OGS test hole will be measured and recorded before, during, and after the pumping tests. A packer will also be set at about 55 metres in this well and water levels will be monitored below and above the packer.

If possible, water levels will also be monitored in nearby private wells, located within at least 500 metres of the test well site. Requests for permission to access and monitor these wells will be issued to the well owners, and if granted will be monitored for one week prior to the 72-hour test, during the pumping test, and for one week following the test.

Water levels will also be measured in surface water features (i.e. wetlands and creeks) located within a 500-metre radius of the test well with the use of shallow piezometers or staff gauges. Groundwater is being pumped from a deep, confined bedrock aquifer and no effects are anticipated in local surface water features.

The results of the well construction and testing program will be presented in a technical report. It is the intention of the project team to use this report as support for the Municipal Class EA process, should this test well be selected as the preferred alternative as a new municipal water supply well.

We trust that the information provided herein meets the requirements for granting a Category 2 Permit to Take Water.

Knell, Mark

From: Evers, Andrew
Sent: Monday, March 19, 2012 1:46 PM
To: Barbara.slattery@ontario.ca
Cc: Knell, Mark; Callum, Ian
Subject: Town of Shelburne Additional Water Supply Project
Attachments: MOE meeting minutes Nov 9 2011.pdf; Shelburne CEAA Project Description Sep 2 2011.pdf; Shelburne EIS guidelines FINAL 17022012.pdf; Shelburne Water Supply EA Notice of Commencement_15Sept09.pdf

Hi Barb,

I wanted to provide you with an update on the Town of Shelburne Additional Water Supply Project and where we are in the EA process.

We are currently working on putting together the Environmental Impact Statement (EIS) under the federal Comprehensive Study EA process. The CEAA project officer for the project is Stephanie Davis. We received the EIS guidelines from CEAA on February 17, 2012 and we are working with these guidelines to complete the EIS.

Under the provincial process, we are completing the requirements under Schedule B of the Municipal Class EA process. We have been in contact with Jeff Dea from the MOE with regards to submitting the EIS as the part of the Schedule B Municipal Class EA file. Jeff Dea indicated that there should be no problem with this approach, as long as all of the requirements of the Municipal Class EA are met by the EIS. To satisfy this requirement, we will include a concordance table indicating the location of the Municipal Class EA requirements in the EIS.

I have also been in touch with Angela Homewood with regards to the meeting on November 9, 2011 (minutes attached). She indicated that she would forward you the questions we had from the outcome of this meeting. The questions were:

1) Confirmation that the Project follows a Schedule B Municipal Class EA.
2) Requirements for addressing Intra-basin transfer in our reports. I have attached meeting notes from November 9, 2011, which indicate an action item on page 3 of the notes that a call would be set up to discuss this and effluent criteria and loading in the Boyne River.
3) How to address the Prior Notice and Consultation (PNC) under the Great Lakes Agreement (if required).

Information with regards to the three above questions would be greatly appreciated and we can incorporate this into our reports as we move forward. If you have any questions, please feel free to contact me to discuss.

We have attached the provincial EA notice of commencement, the Project Description for the federal EA process and the EIS guidelines issued by CEAA as background information.

Best regards,

Andrew

Andrew Evers (M.Sc.) | Environmental Assessment Specialist | **Golder Associates Ltd.**
2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
T: +1 (905) 567 4444 | **D:** +1 (905) 567 6100 Ext. 1267 | **F:** +1 (905) 567 6561 | **E:** Andrew_Evers@golder.com | **www.golder.com**

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October 28, 2009 Project No. 09-1112-6007

Mayor and Council
c/o Ms. Susan M. Stone, AMCT, CAO/Clerk-Treasurer
Township of Amaranth
RR#7
Orangeville
ON L9W 2Z3

TOWN OF SHELBURNE
HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

Dear Mayor and Councillors

The Town of Shelburne (the Town) currently operates five groundwater supply wells to support its municipal water distribution system. In the next twenty years, the Town's estimated water supply requirements of 6,256 m^3/day are expected to exceed the current capacity of 4,910 m^3/day. Additionally, the town has observed decreased performance in one of its existing wells. To accommodate future growth and provide security for the Town's water supply, we have commenced a study to identify additional groundwater supply sources.

The Town has retained a consulting team led by Golder Associates to conduct this study. One of the initial tasks is to identify areas in and around the Town where exploratory or test water supply wells could be developed. Three target areas, where the groundwater quality and quantity may be suitable as a municipal drinking water supply source, have been identified as follows:

- Area 1 - Northwest of the Town, in the vicinity of the intersection of Hwy 10 and 5th Line, Melancthon Township;
- Area 2 - Southwest of the Town, in the vicinity of the intersection of 30th Side Road and 6th Line, Amaranth Township; and
- Area 3 - Southwest of the Town, in the vicinity of the intersection of 25th Side Road and 5th Line (County Road 12), Amaranth Township.

As part of the hydrogeological study, the consulting team will be sampling private water wells in the three target areas for analysis of the groundwater quality. Well owners have received letters explaining the program and requesting permission to collect a water sample from their well. The sample will then be submitted for analysis by a water quality testing laboratory. The individual results of the chemical analysis will be provided to the respective well owners, free of charge, in exchange for their approval to use the data in support of our study.

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Tel: +1 (905) 567 4444 Fax: +1 (905) 567 6561 www.golder.com
Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

The next stage of the study will include identifying locations and arranging access with land owners for drilling of test wells, preferably one in each target area.

This study is being developed as part of a Schedule "B" Municipal Class Environmental Assessment (Class EA) under Ontario's Environmental Assessment Act. The study will identify, evaluate and document a recommended solution for new supply sources with consideration for environmental, cultural, social, natural, technical and economic factors.

Public involvement is an important part of the Class EA process. Residents and community organizations are encouraged to participate by providing their comments to the contacts identified below and attending a Public Information Centre (PIC) that will be held in the upcoming months. Details regarding the PIC will be publicized in local newspapers, distributed through direct mail and posted on the Town's website at www.townofshelburne.on.ca.

Kelly McDowell, Project Coordinator
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0
Tel: 519-925-2600 x252
Fax: 519-925-6134
Email: kmcdowell@townofshelburne.on.ca

Ian Callum, Project EA Leader
Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON L5N 5Z7
Tel: 905-567-4444
Fax: 905-567-6561
Email: Ian_Callum@golder.com

We will continue to provide the Township of Amaranth with updates on this study.

Sincerely,

John Telfer, Town Clerk and Acting CAO
Town of Shelburne

William Banks, P.Eng.
Consulting Team Project Manager

WB/AI/SMB/wlm

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May 3, 2010 Project No. 09-1112-6007

Ms. Cecile Grant, Treasurer
Town of Shelburne
203 Main Street East
Shelburne, Ontario
L0N 1S0

SHELBURNE WATER SUPPLY SYSTEM
HYDROGEOLOGICAL STUDY AND ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

Dear Ms. Grant:

We are pleased to provide the following overview of the above-referenced project. As you are aware, Golder Associates, in association with Banks Groundwater Engineering, Gerrits Drilling & Engineering and AECOM, were retained to complete this project in August 2009. The project background, purpose and a summary of the main tasks are provided below.

The Town of Shelburne currently operates five groundwater supply wells to support its municipal water distribution system. In the next twenty years, the Town's water supply estimated requirements of 6,256 m^3/day are expected to exceed the current capacity of 4,910 m^3/day. Additionally, the town has observed decreased performance in one of its existing wells. In order to accommodate future growth and provide security for the Town's water supply, we are conducting a study to identify additional new supply sources in and around Shelburne to develop an additional water supply capacity of 1,346 m^3/day.

This study will identify, evaluate and document a recommended solution for new supply sources in the study area with consideration for environmental, cultural, social, natural, technical and economic factors. The recommended solution will identify:

- Number, location and size of production wells to be developed;
- Maximum sustained pumping rates;
- Treatment and pumping requirements; and
- Means to connect to the existing distribution system and associated costs.

This study is being developed as a Schedule "B" Municipal Class Environmental Assessment (Class EA) under Ontario's Environmental Assessment Act. Public involvement is an important part of the Class EA process.

Residents and community organizations are encouraged to participate by providing their comments to the project team and attending a Public Information Centre (PIC) that will be held in the upcoming months. Details regarding the PIC will be publicized in local newspapers, distributed through direct mail and posted on the Town's website.

Groundwater quality results included within the Shelburne Groundwater Management Study, (Burnside, 2002) indicates that the concentration of arsenic in three of the existing water supply wells (Wells 3, 5 and 6) range from approximately 10.7 to 12.8 µg/L. The Ontario Ministry of Environment (MOE) has indicated that the Ontario Drinking Water Quality Standard (ODWQS) for arsenic could be reduced from 25 to 10 µg/L. This reduction in the regulatory standard would require the Town to treat pumped groundwater from Wells 3, 5 and 6. As such, the Town has placed an emphasis on identifying potential groundwater sources with low concentrations of arsenic.

The project is being completed in a logical sequence of tasks that include the following:

- Hydrogeological Investigation;
- Groundwater Under the Direct Influence of Surface Water Study;
- Class Environmental Assessment; and
- Preliminary Design.

The Hydrogeological Investigation is currently underway and the Class Environmental Assessment was initiated with a Notice of Study Commencement.

We trust this is the information you require at this time. Please contact the undersigned if you have any questions.

Yours truly,

BANKS GROUNDWATER ENGINEERING LIMITED **GOLDER ASSOCIATES LTD.**

William D. Banks, P.Eng.
Project Manager, Senior Hydrogeologist

p.p. John M. Petrie, P.Geo.
Project Director, Senior Hydrogeologist

WDB/SMD/wlm

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October 28, 2009 Project No. 09-1112-6007

Mayor and Council
c/o Ms. Denise B. Holmes, CAO/Clerk-Treasurer
Township of Melancthon
157101 Highway 10
RR#6
Shelburne
ON L0N 1S9

TOWN OF SHELBURNE
HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

Dear Mayor and Councillors

The Town of Shelburne (the Town) currently operates five groundwater supply wells to support its municipal water distribution system. In the next twenty years, the Town's estimated water supply requirements of 6,256 m^3/day are expected to exceed the current capacity of 4,910 m^3/day. Additionally, the town has observed decreased performance in one of its existing wells. To accommodate future growth and provide security for the Town's water supply, we have commenced a study to identify additional groundwater supply sources.

The Town has retained a consulting team led by Golder Associates to conduct this study. One of the initial tasks is to identify areas in and around the Town where exploratory or test water supply wells could be developed. Three target areas, where the groundwater quality and quantity may be suitable as a municipal drinking water supply source, have been identified as follows:

- Area 1 - Northwest of the Town, in the vicinity of the intersection of Hwy 10 and 5th Line, Melancthon Township;
- Area 2 - Southwest of the Town, in the vicinity of the intersection of 30th Side Road and 6th Line, Amaranth Township; and
- Area 3 - Southwest of the Town, in the vicinity of the intersection of 25th Side Road and 5th Line (County Road 12), Amaranth Township.

As part of the hydrogeological study, the consulting team will be sampling private water wells in the three target areas for analysis of the groundwater quality. Well owners have received letters explaining the program and requesting permission to collect a water sample from their well. The sample will then be submitted for analysis by a water quality testing laboratory. The individual results of the chemical analysis will be provided to the respective well owners, free of charge, in exchange for their approval to use the data in support of our study.

2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
Tel: +1 (905) 567 4444 Fax: +1 (905) 567 6561 www.golder.com
Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

The next stage of the study will include identifying locations and arranging access with land owners for drilling of test wells, preferably one in each target area.

This study is being developed as part of a Schedule "B" Municipal Class Environmental Assessment (Class EA) under Ontario's Environmental Assessment Act. The study will identify, evaluate and document a recommended solution for new supply sources with consideration for environmental, cultural, social, natural, technical and economic factors.

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Kelly McDowell, Project Coordinator
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Tel: 905-567-4444
Fax: 905-567-6561
Email: Ian_Callum@golder.com

We will continue to provide the Township of Melancthon with updates on this study.

Sincerely,

John Telfer, Town Clerk and Acting CAO
Town of Shelburne

William Banks, P.Eng.
Consulting Team Project Manager

WB/AI/SMB/wlm

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Town of Shelburne

Hydrogeological Study and Environmental Assessment for Additional Water Supply

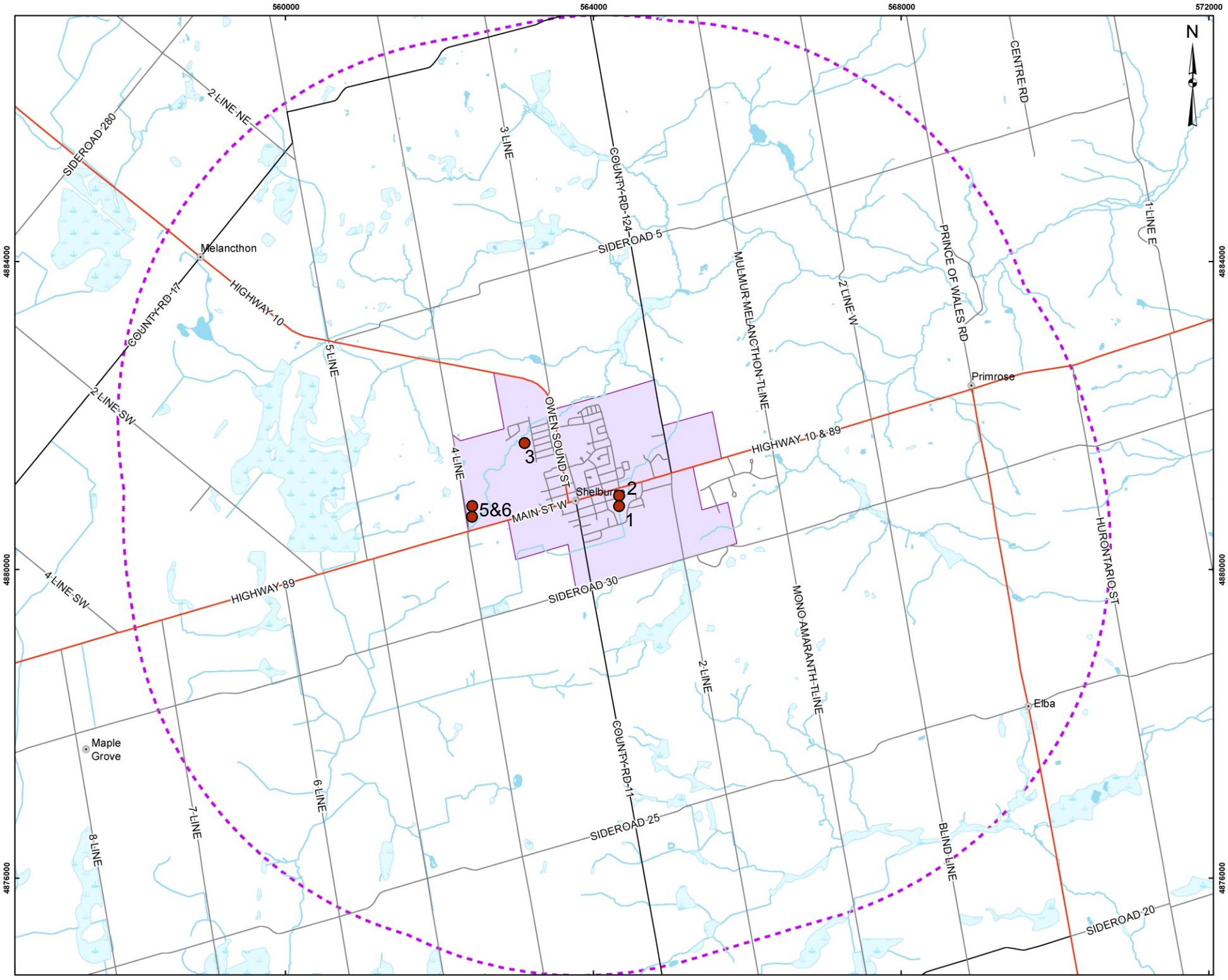
December 21, 2009

Golder Associates

Groundwater Quantity and Quality

- Current maximum capacity = 4,910 m^3/day
- Projected supply required = 6,256 m^3/day
- Additional supply required = 1,346 m^3/day

- 2004 – 2008 Arsenic monitoring
  - PW1: 0.001 to 0.008 mg/L
  - PW2: 0.001 to 0.011 mg/L
  - PW3: 0.009 to 0.014 mg/L
  - PW5: 0.011 to 0.018 mg/L
  - PW6: 0.011 to 0.022 mg/L
- ODWQS for Arsenic = 0.025 mg/L
- Health Canada Guideline = 0.010 mg/L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Melancthon
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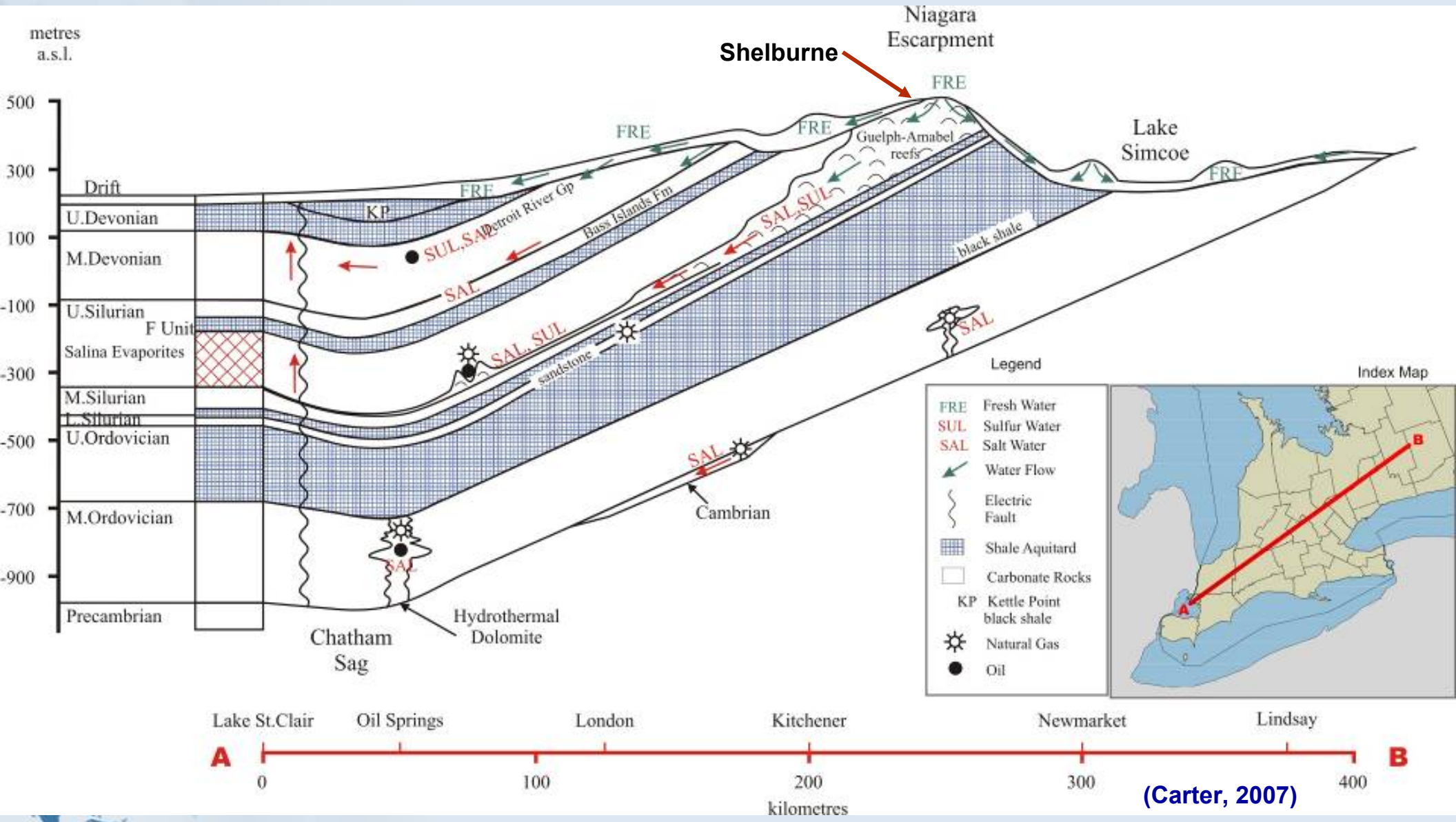
2 LINE SW
MULMUR MELANCTHON TLINE
2 LINE W
PRINCE OF WALES RD
Primrose
OWEN SOUND ST
4 LINE
3
HIGHWAY 10 & 89
Shelburne
2
1
5&6
MAIN ST W
4 LINE SW
HIGHWAY 89
SIDEROAD 30
MONO AMARANTH TLINE
HURONTARIO ST
2 LINE
Elba
Maple Grove
6 LINE
7 LINE
8 LINE
COUNTY RD 11
SIDEROAD 25
BLIND LINE
SIDEROAD 20

Conceptual Topography/Gravity-driven Bedrock Groundwater Flow Paths, S. Ontario



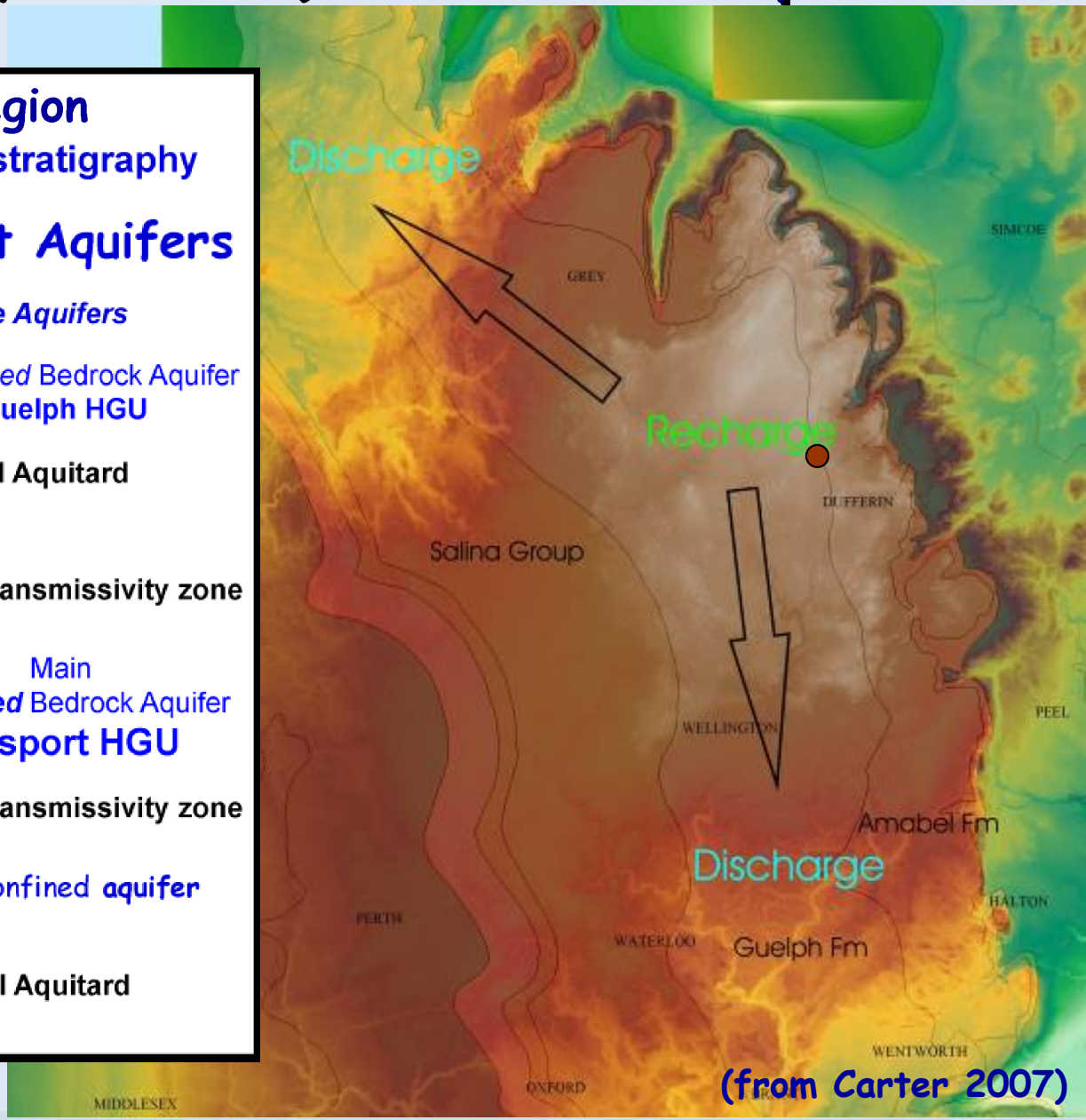
(Carter, 2007)

Regional Hydrogeology of Niagara Escarpment Guelph & Gasport (Amabel) Bedrock Aquifers

Bruce Peninsula to Guelph Region

Preliminary Revisions to Silurian Stratigraphy

Lithology	Formation	*Member*	Hydrostratigraphy
			Karst Aquifers
			← ***Interface Aquifers***
	Guelph	*Hanlon Mbr* *Wellington Mbr*	← *Unconfined* Bedrock Aquifer **Guelph HGU**
	Eramosa	*Stone Rd Mbr* *Ref. Q. Mbr* *Vinemount Mbr*	**Regional Aquitard**
	Goat Island	*Ancaster* *Niagara Falls* (= unsubdivided Amabel Fm)	**Lower transmissivity zone**
	Gasport	*Gothic Hill* (Lions Head Mbr = Rochester Fm) (= previous unsubdivided Amabel Fm)	← Main ***Confined*** Bedrock Aquifer **Gasport HGU**
	Irondequoit (= unsubdivided Amabel Fm)		**Lower transmissivity zone**
	Rockway		← **Minor confined aquifer**
	Merritton (= Fossil Hill Fm)		
	Cabot Head		**Regional Aquitard**



(from Carter 2007)

Recommended Test Drilling Revisions

Task	Original Work Plan	Recommended Revisions
Subtask A.2 – Test Well Installation	Construct 3 test wells 200mm x 30m	Construct 3 test wells 150mm x 76m Geophysical & optical televiewer logging of 3 test wells
Subtask A.2a – Production Well Installation	Not Included	Remove 150mm casing from one test well Construct production well 200mm x 56m well casing and 200mm x 20m open bedrock borehole

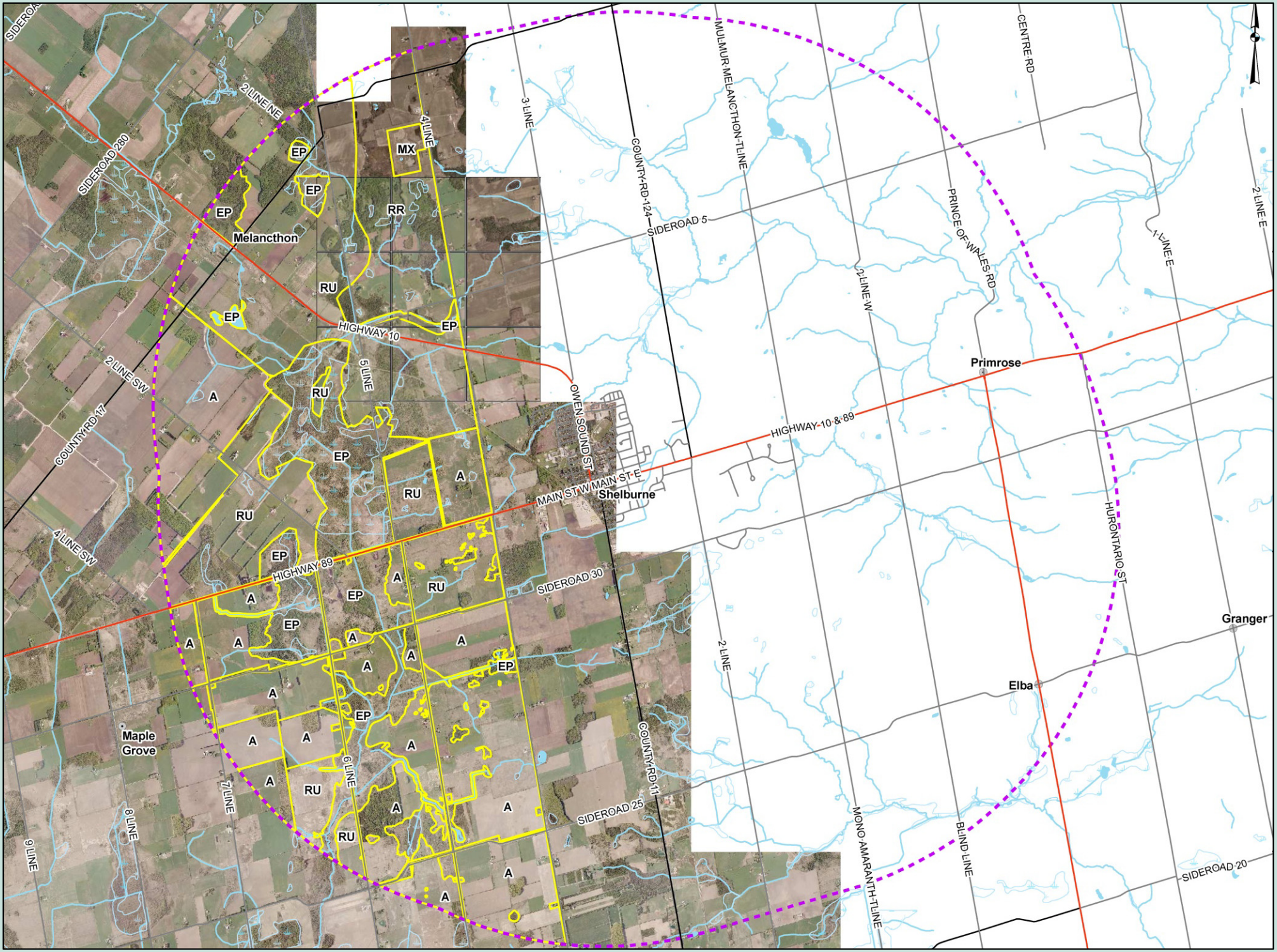
Estimated Costs for Recommended Revisions

Task	Original Work Plan				Revised Work Plan				Additional Cost
	Fees	Disb.	Drilling	Total	Fees	Disb.	Drilling	Total	
Subtask A.2 - Test Well Installation	$ 11,650	$ 871	$ 37,794	$ 50,315	$ 23,650	$ 10,771	$ 39,041	$ 73,462	$ 23,147
Subtask A.2a - Production Well Installation	-	-	-	-	1,980	252	39,596	41,828	41,828
Subtask A.3 - Test Well Testing	12,815	$ 6,666	$ 21,695	41,176	12,815	$ 6,666	$ 21,695	41,176	-
Subtask A.4 - Assessment and Reporting	10,985	$ 125	$ -	11,110	10,985	$ 125	$ -	11,110	-
Total Costs to Complete Tasks A.2 to A.4	**$ 35,450**	**$ 7,662**	**$ 59,489**	**$102,601**	**$ 49,430**	**$ 17,814**	**$100,332**	**$167,576**	**$ 64,975**

Notes:

1. Additional fees for Subtask A.2 are attributed to development of revised work plan, additional meetings with Steering Committee, data analysis and liaison following test well logging
2. Additional disbursements for Subtask A.2 are attributed to additional meetings with Steering Committee, geophysical and optical televiewer logging (logging @ $3,100. per well)
3. Drilling and pumping test costs for Subtask A.2 under the revised work plan are $13,014. per well
4. Based on the above information, the cost breakdown for one, two, and three test wells under Subtask A.2 is as follows:

One Test Well -	$ 35,234	Reduction:	-$ 15,081
Two Test Wells -	$ 54,348	Additional:	$ 4,033
Three Test Wells -	$ 73,462	Additional:	$ 23,147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COUNTY RD 17
OWEN SOUND ST
Primrose
HIGHWAY 10 & 89
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MAIN ST E
Shelburne
HURONTARIO ST
4 LINE SW
HIGHWAY 89
SIDEROAD 30
Granger
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Elba
Maple Grove
6 LINE
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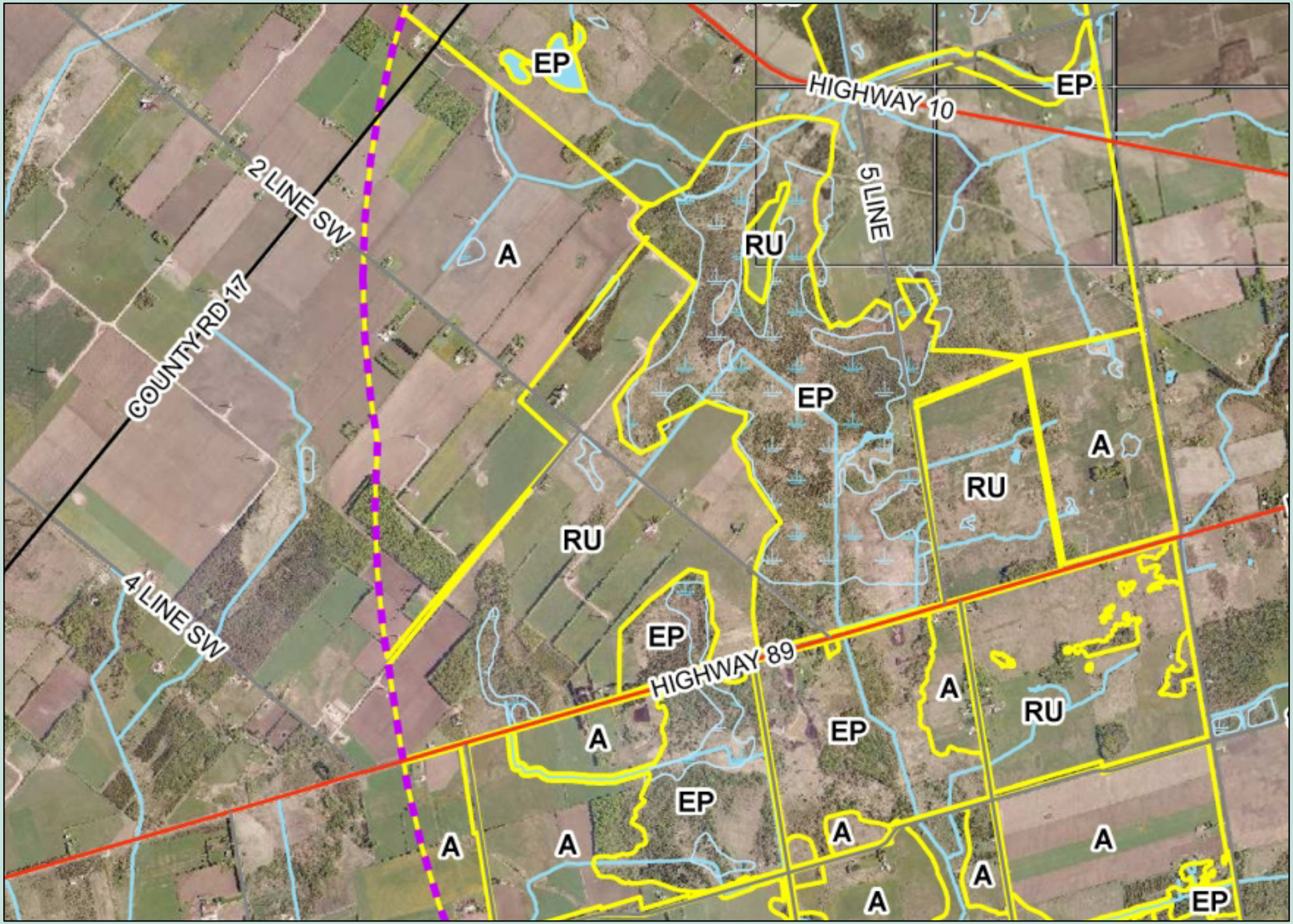
MONO AMARANTH T LINE
BLIND LINE
SIDEROAD 20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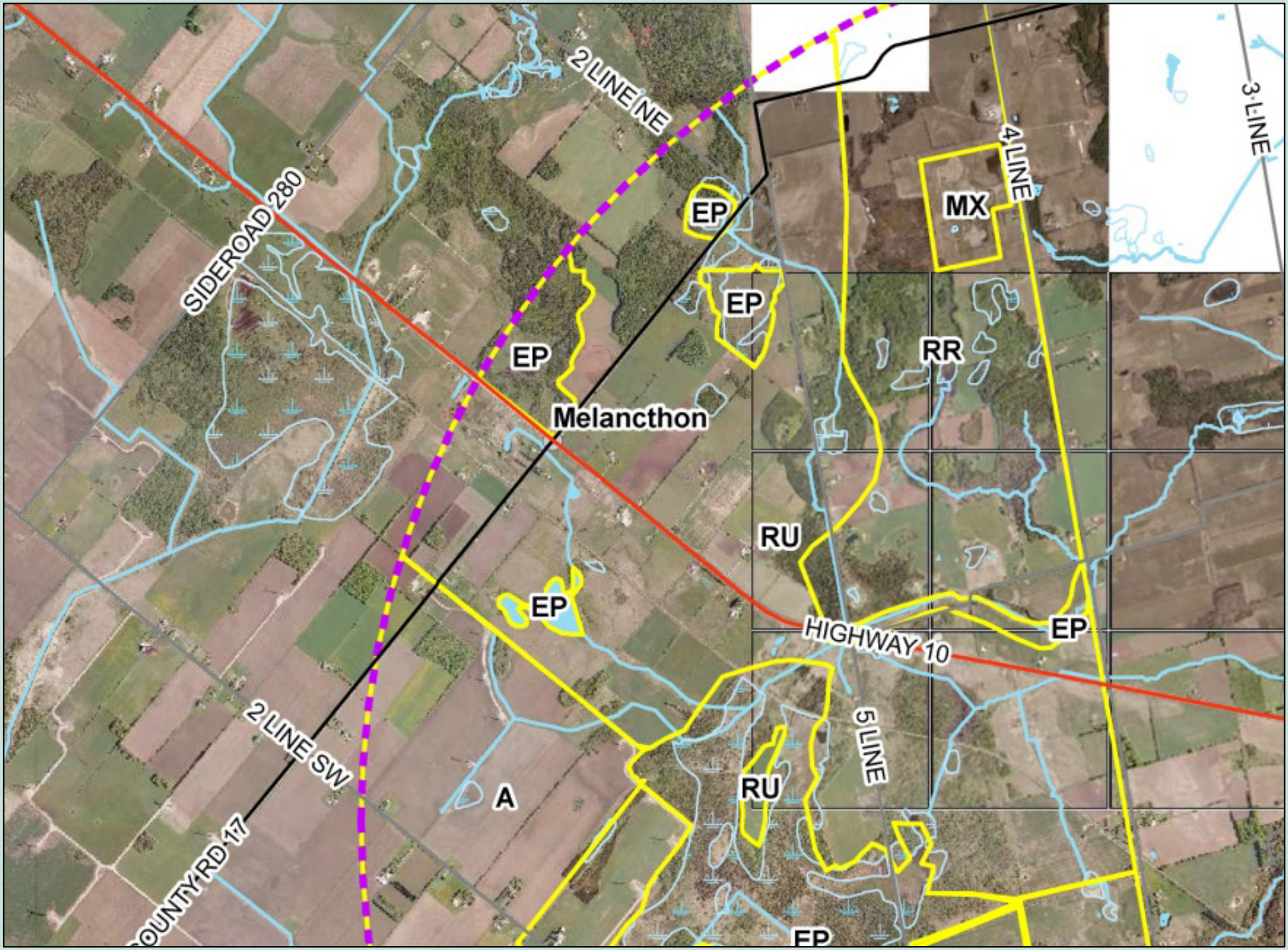
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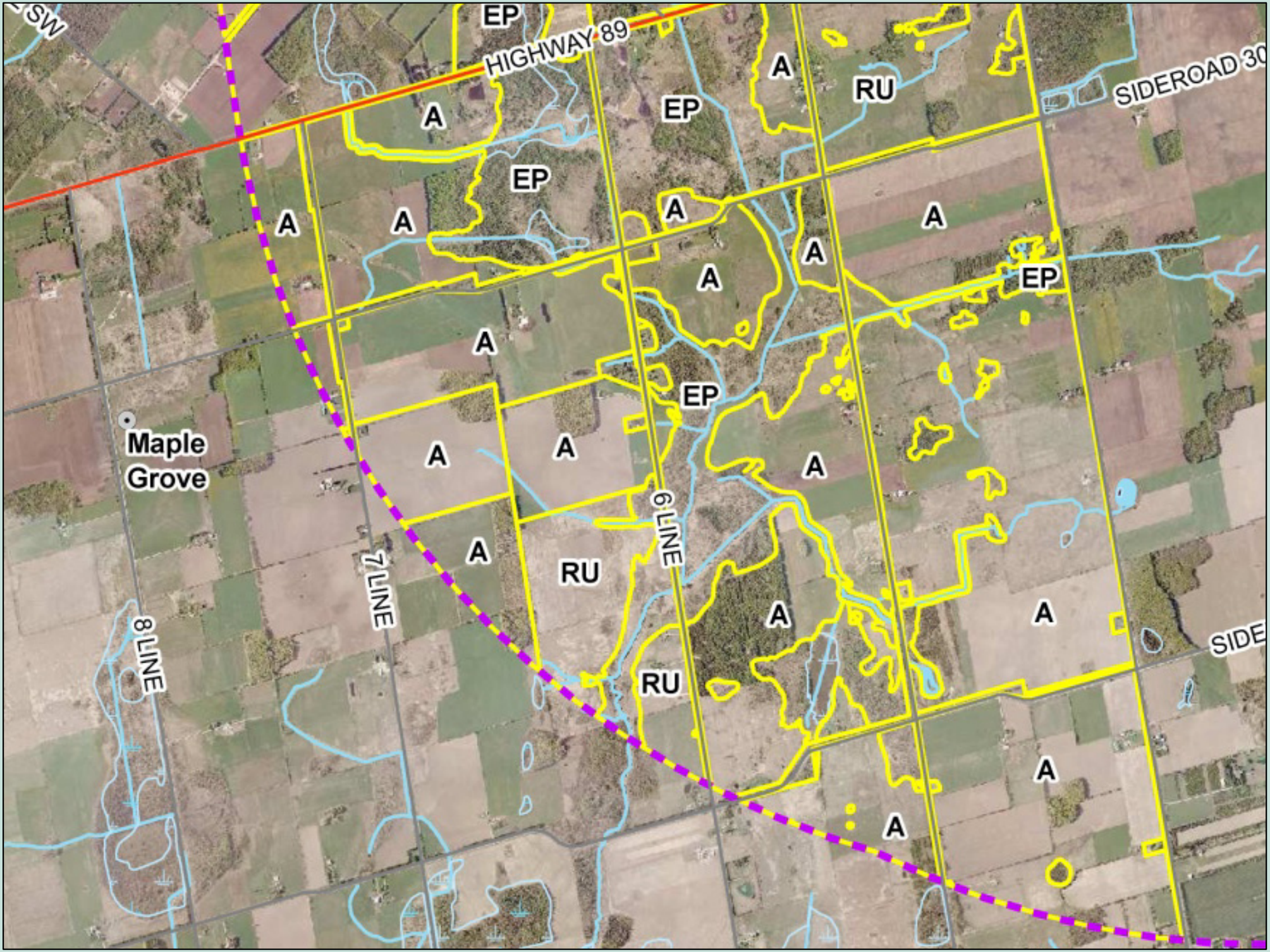
HIGHWAY 89
SIDEROAD 30
Maple Grove
8 LINE
7 LINE
6 LINE
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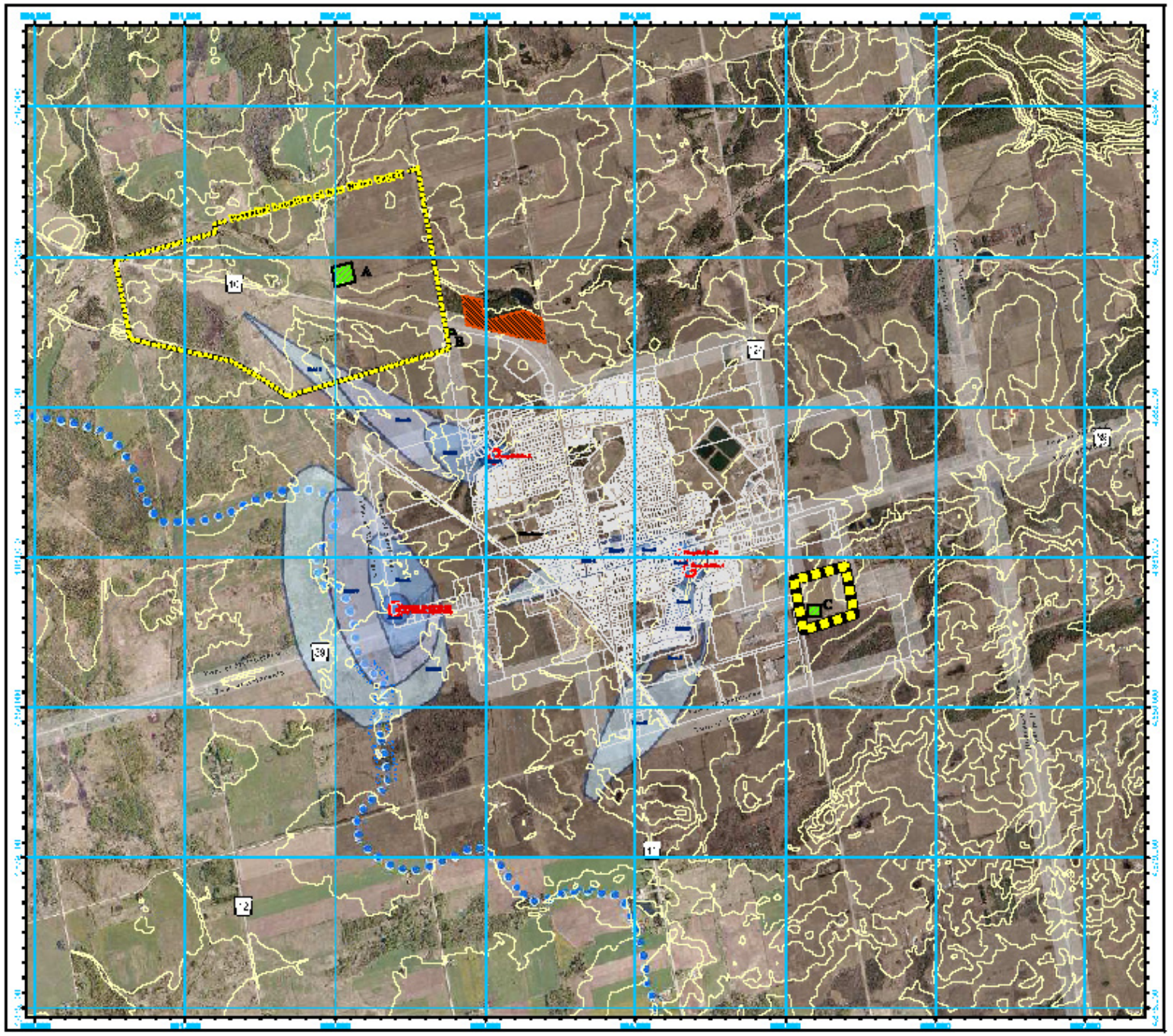
EP
RU

Additional Cost Summary

Option	Cost	Additional Cost
3 Test Wells 200mm x 30m	$ 50,315.	--
1 Test Well 150mm x 76m 1 Production Well 200mm x 76m	$ 77,062.	$ 26,747.
2 Test Wells 150mm x 76m 1 Production Well 200mm x 76m	$ 96,176.	$ 45,861
3 Test Wells 150mm x 76m 1 Production Well 200mm x 76m	$ 115,290.	$ 64,975.



Orthophoto Map

Town of Shelburne

Groundwater Protection Wells and Protection Zones

- Production Well Location
- Wellhead Protection Zones
- Elevation Contour: Index
- Elevation Contour: Approximate
- Elevation Contour: Interpolated
- Elevation Contour: Depression
- Political Boundary: Municipal
- Conservation Authority Jurisdiction Boundary
- Potential Location for New Water Supply
- Possible Sites Within Identified Area
- Cemetery

NOTES

1. Orthophotos on east side of map (green) imaged in 2008.
2. Orthophotos on west side of map (brown) imaged in 2009.

SOURCES

1. Natural Resources Canada © Her Majesty the Queen in Right of Canada
2. Ministry of Natural Resources © Her Majesty the Queen in Right of Ontario
3. Ministry of Municipal Affairs and Housing © Her Majesty the Queen in Right of Canada
4. Town of Shelburne
5. Dufferin County
6. Tremont Inc.

DISCLAIMER

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

N

0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 2,000

Metres

Scale: 1:20000
Date: June, 2009

Projection: UTM Zone 17
Datum: NAD 83

Project: MBO17009

BURNSIDE

Chippewas of RAMA First Nation

5884 Rama Road, Suite 200
Rama, Ontario L0K 1T0
T 705.325.3611 F 705.325.0879

A Proud Progressive First Nation Community

RECEIVED
JUN 13 2011
TOWN OF SHELBURNE

June 6, 2011

The Town of Shelburne
203 Main Street
Shelburne, ON L0N 1S0

Attention: Roseann Rutledge, Project Coordinator

Re: Town of Shelburne Hydrological Study and Class Environmental Assessment

Dear Ms. Rutledge:

As a member of the Williams Treaties First Nations, Rama First Nation acknowledges receipt of your letter of May 26, 2011, which was received on May 31, 2011.

A copy of your letter has been forwarded to Karry Sandy-McKenzie, Barrister & Solicitor, Coordinator for Williams Treaties First Nations for further review and response directly to you. Please direct all future correspondence and inquiries, with a copy to Rama First Nation, to Ms. Sandy-McKenzie at 8 Creswick Court, Barrie, ON L4M 2J7 or her e-mail address at k.a.sandy-mckenzie@rogers.com. Her telephone number is (705) 792-5087.

We appreciate your taking the time to share this important information with us.

Sincerely,

Chief Sharon Stinson Henry

c: Council, Rama First Nation
Jeff Hewitt, General Counsel
Karry Sandy-McKenzie, Coordinator Williams Treaties First Nations
Chief Roland Monague Portfolio Chief for Williams Treaties Nations

Agenda and Draft Notes

Project Name:	Town of Shelburne Long Term Water Well Project	**CEAR #:**	63955
Meeting Type:	Consultation with the Six Nations of the Grand River Territory	**Meeting Date:**	February 9, 2012
Meeting Location:	Ohsweken, Tourism boardroom (2498 Chiefswood Road and Highway 54)	**Time:**	13:30pm to 15:00pmEST
Participants:	Stephanie Davis – CEAA Corey Dekker- CEAA Bill Bunker (FEDDEV) Joanne Thomas -SNGRT Caron Smith - SNGRT Paul General - SNGRT Lonny Bomberry – SNGRT		
CEAA – Canadian Environmental Assessment Agency FEDDEV – Federal Economic Development Agency of Ontario SNGRT – Six Nations of the Grand River Territory			

Purpose: To discuss the Town of Shelburne Long-Term Water Well Project, the associated environmental assessment process and proposed Aboriginal consultation activities

Outcome: To better understand the Project and the environmental assessment (EA) process; to list and document any environmental concerns expressed by Six Nations of the Grand River Territory with respect to the proposed Town of Shelburne Long -Term Water Well project; to discuss consultation preferences.

Documents for Review and Discussion:
Agency presentation
Draft EIS Guidelines for the Town of Shelburne Long-Term Water Well project, Dec 2011

Discussion Items

1	Introductions	All
2	Explanation of the of proposed project: • proponent • proposal • location • main components • potential environmental effects	CEAA
3	Overview of the Federal environmental assessment process : • what is environmental assessment? • when does it apply federally? • current status	CEAA
4	Aboriginal consultation • duty to consult • key stages/documents where consultation is focused	CEAA
5	Request for Feedback from Six Nations of the Grand River	CEAA/SNGRT

DRAFT

	Territory on: • concerns with respect to the proposed project consultation approach • traditional knowledge with respect to environmental effects of project • use of land for traditional purposes	

Discussions

General points

S. Davis (CEAA) chaired the meeting, with a good level of discussion happening throughout the presentation.

The following questions were raised by Six Nations representatives:

- What is the depth of the well?
- What is the width of the water main?
- Is the well within the headwaters of the Grand River?
- What sort of archaeological studies have been done?
- Are the technical studies associated with the provincial environmental assessment available for review?

Six Nations representatives stated they were interested in ensuring that water quality and availability were protected. They also expressed concerns about cumulative effects from other projects in the area e.g. the proposed quarry in Melancthon.

S.Davis (CEAA) responded that cumulative effects will be addressed within the federal environmental assessment.

L.Bomberry informed the Agency that community members undertake traditional activities (hunting) in the Luther Marsh area.

S. Davis (CEAA) requested feedback on whether the community wished to participate in the environmental assessment. She suggested the Agency keep the community informed via notification at key stages.

S.Davis proposed providing a draft consultation work plan for discussion. This document would set out the Agency's proposed consultation approach. It would be sent in draft form to Six Nations representatives with a request for feedback. Once finalized it would form the basis for the consultation activities during the federal environmental assessment.

The Agency and Six Nations representatives discussed the possibility of a meeting or call with the Town's consultants (Golder) once the Environmental Impact Statement (EIS) report was released. The purpose would be to discuss the technical components within the document.

Commitments

S.Davis (CEAA) committed to providing responses to the project questions raised in this meeting.

J.Thomas (SNGRT) agreed to send out the SNGRT Consultation Protocol.

S.Davis (CEAA) committed to providing a draft consultation work plan to Six Nations for review and comment.

SIX NATIONS COUNCIL

RECEIVED
FEB 13 2012
TOWN OF SHELBURNE

Wednesday, January 25, 2012

Town of Shelburne
203 Main Street East
Shelburne, ON
L0N 1S0

Dear: Kelly McDowell, Project Coordinator

RE: **Town of Shelburne, Hydrological Study and Class Environmental Assessment for Additional Water Supply**

The Six Nations of the Grand River (Six Nations) has received a notice of Study Commencement for the Town of Shelburne Hydrological and Class Environmental Assessment for Additional Water Supply.

The above noted lands are in the 1701 Fort Albany Treaty area of the Six Nations, which lands assure Six Nations' economic, cultural, sustenance and other rights are affirmed and protected in Canada's Constitution. Six Nations is concerned about any development relating to land, water and resources which occur throughout this territory. Thus we have an interest in the above noted study and the law requires that we be consulted accordingly.

The legal duty for the Crown to consult with First Nations arises from the protection of Aboriginal and treaty rights set out in *Section 35(1) of the Constitution Act, 1982.* The purpose of such protection has been interpreted by the Supreme Court of Canada as *"the reconciliation of the pre-existence of Aboriginal societies with the sovereignty of the Crown"*. Accordingly, the duty to consult is an aspect of the reconciliation process, which flows from the historical relationship between the Crown and Aboriginal people and is *"grounded in the honour of the Crown"*.

The duty *"arises when the Crown has knowledge, real or constructive, of the potential existence of the Aboriginal right or title and contemplates conduct that might adversely affect it"*. The Crown's duty to consult is proportionate to the strength of the Aboriginal claim that has been asserted and requires *"good faith on both sides"* and requires the Crown to make a *bona fide* commitment to the principle of reconciliation over litigation. Unfortunately, the Crown's ambition is to delegate this legal consultation and accommodation process to municipalities and proponents such as yourself.

We must further advise that the Crown(s) Canada and Ontario are fully aware of Six Nations' interests throughout the 1701 Fort Albany Treaty lands. In our efforts to seek justice, litigation was commenced by Six Nations in 1995 against The Attorney General of Canada and Her Majesty the Queen in Right of Ontario (Ontario Court of Justice General Division Court File No. 406/95). The 1701 Fort Albany Treaty lands forms a part of this litigation.

In view of the foregoing, I trust we can rely on your cooperation and look forward to the opportunity for Six Nations to review, meet and discuss your proposed water taking plans for the Town of Shelburne.

Should you have any questions or require clarification on the contents of the foregoing please feel free to contact me at (519)-753-0665. More details on Six Nations lands and interests can be found at www.sixnations.ca/LandsResDept.htm

Respectfully Yours,

Lonny Bomberry, Director
Six Nations Lands and Resources
SIX NATIONS OF THE GRAND RIVER

CC: Mr. Leroy Hill, Secretary: Confederacy Council of the Grand River
Minister Kathleen Wynne, Ontario Ministry of Aboriginal Affairs
Minister John Duncan, Aboriginal Affairs and Northern Development Canada
Ms. Stephanie Davis, Project Manager, Canadian Environmental Assessment Agency

This letter is without prejudice to the positions that Six Nations has and may take in respect to its claims and litigation in relation to the Six Nations Tract/ Haldimand Proclamation Lands.

Knell, Mark

From: Davis,Stephanie [CEAA] [Stephanie.Davis@ceaa-acee.gc.ca]
Sent: Tuesday, February 14, 2012 11:01 AM
To: Knell, Mark
Subject: FW: proposed reporting structure for VECs
Attachments: VECs 14022012.doc

Hi Mark,

Further to our call. Here are the restructured VECs. The FRT is still reviewing the document but I don't expect these to change. The names for the environmental components have changed and vegetation was kept as a VEC. Otherwise I think they are the same as what you proposed below.

Best wishes,
Stephanie

From: Knell, Mark [mailto:Mark_Knell@golder.com]
Sent: January 12, 2012 9:36 AM
To: Davis,Stephanie [CEAA]
Subject: proposed reporting structure for VECs

Hi Stephanie,

In advance of the conference call this morning, here is the proposed structure of components and VECs, which we think is in keeping with the EIS guidelines.

Let us know if you have any concerns.

Thanks,

Mark

Environmental Component	VECs
Hydrology and Hydrogeology	■ Groundwater quality and quantity ■ Surface water quality and quantity
Biology	■ Fish and fish habitat, aquatic ecosystems ■ Vegetation ■ Wildlife and wildlife habitat including avifauna
Atmospheric Environment	■ Noise and/or vibration levels ■ Air quality
Socio-Economic Environment	■ Human health ■ Aboriginal land and resource use ■ Physical and cultural heritage (archaeological

Environmental Component	VECs
	resources)

Shelburne - Key Milestones and Service Standards for the Environmental Assessment and Aboriginal Consultation

	Milestone	Lead	Support As Needed	Service Standard/ Completion Date
1	Post the Notice of Commencement (NoC) on the CEARIS	CEA Agency	RAs	December 15, 2011
2	Post public participation notice (PP#1) and notify Aboriginal groups that a comprehensive study has commenced	CEA Agency		Within 10 calendar days of posting of the NoC
3	Provide the draft EIS Guidelines to the Proponent	CEA Agency	RAs, expert FAs	Within 10 calendar days of posting of the NoC
4	Public comment period on the draft EIS Guidelines			Within 6 weeks of posting PP#1 on the CEARIS
5	Aboriginal consultation on the draft EIS Guidelines			Within 6 weeks of posting the NoC on the CEARIS
6	Submit draft EIS	Proponent	CEA Agency, RAs, expert FAs	To be determined by the Proponent
7	Review draft EIS for conformity	CEA Agency		Within 4 weeks from submission of draft EIS
8	Public comment period on the draft EIS	CEA Agency	RAs, expert FAs	Within 7 weeks from the review of draft EIS for conformity
9	Aboriginal consultation on the draft EIS	CEA Agency	RAs, expert FAs	Within 7 weeks from the review of draft EIS for conformity
10	Review and provide comments on the draft EIS to the Proponent	CEA Agency, RAs, expert FAs		Within 11 weeks from the review of draft EIS for conformity
11	Submit revised EIS or additional information, as appropriate	Proponent	CEA Agency, RAs, expert FAs	To be determined by the Proponent
12	Review and provide comments on revised EIS to the Proponent, If necessary	RAs, expert, FAs		Within 4 weeks from the submission of revised EIS or additional information
13	Prepare draft Comprehensive Study Report (CSR)	CEA Agency	RAs, expert	Within 9 weeks from the submission of the

	Milestone	Lead	Support As Needed	Service Standard/ Completion Date
			FAs	revised EIS or additional information
14	Review and provide comments on the draft CSR to the CEA Agency	RAs, expert FAs		Within 4 weeks from the circulation of the draft CSR
15	Aboriginal consultation on the draft CSR	CEA Agency	RAs, Expert FAs	Concurrent with federal review of the draft CSR
16	Prepare the revised CSR	CEA Agency	RAs, expert FAs	Within 2 weeks from the receipt of comments on the draft CSR
17	Review and provide comments on the revised CSR to the CEA Agency	RAs, expert FAs		Within 3 weeks from the circulation of the revised CSR
18	Submit the final CSR to the Minister of the Environment	CEA Agency		Within 12 weeks from the provision of federal comments on the revised CSR
19	Post the final CSR for public and Aboriginal comment on the CEARIS	CEA Agency		Within 1 weeks from the submission of the final CSR to the Minister of the Environment
20	Public comment period on the final CSR	CEA Agency	RAs,	Within 4 weeks from the posting of the final CSR
21	Aboriginal consultation on the final CSR	CEA Agency	RAs, expert FAs	Within 4 weeks from the posting of the final CSR
22	Post the Notice of the Minister of the Environment's EA Decision Statement on the CEARIS	CEA Agency		Within 12 weeks from the close of the comment period on the final CSR
23	Post the EA course of action decisions on the CEARIS	RAs	CEA Agency	Within 3 weeks from the Minister's EA Decision Statement being posted on the CEARIS

TECHNICAL MEMORANDUM

DATE December 7, 2010 **PROJECT No.** 09-1112-6007

TO Bill Banks
Banks Groundwater Engineering

CC John Petrie, Alex Ivanoff

FROM Ian Callum **EMAIL** ian_callum@golder.com

MEETING MINUTES FOR TOWN OF SHELBURNE WATER SUPPLY COMPREHENSIVE STUDY PRELIMINARY DISCUSSIONS

The following is a summary of the meeting and action items resulting from the Shelburne Water Supply Project meeting to discuss the federal comprehensive study process. The meeting was held at Golder Associates Ltd's Mississauga office, on December 3, 2010.

There was no formal agenda prepared in advance of the meeting. Main topics of discussion were:

- Outlining the steps in a comprehensive study and discussing changes resulting from the July 2010 amendment to the *Canadian Environmental Assessment Act.*
- Discussing opportunities to further tailoring of the process to the Shelburne Project.

Present were:

- Bill Bunker, Federal Economic Development Agency for Southern Ontario;
- Dave Bell, Canadian Environmental Assessment Agency (CEAA); and
- Ian Callum, Golder Associates Ltd.

The overall outcome of the meeting was agreement that there were opportunities to tailor the Comprehensive Study process, which would take approximately one year. The main steps in the process that were discussed are as follows:

- Submission of Project Description (Municipal EA project file could be submitted to fulfill this requirement);
- 90-day Agency review of Project Description (may be opportunities to shorten this timeframe);
- Notice of Commencement (posting to registry) Public consultation session number 1;
- Aboriginal Consultation (CEAA would attend any in-person meetings with Aboriginal groups);
- Draft Comprehensive Study Report circulation (an open house may be required at this time, but making the report on Town website and in public locations such as libraries and Municipal offices might be sufficient);

Golder Associates Ltd.
2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
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(Follow-up Public Consultation session number 2 can occur any time between Number 1 and final Comprehensive study report. To be discussed at follow-up meeting --Dave Bell).

- Final Consultation (Consultation #3) (including translation of report); and
- Issuing of decision memo.

An additional meeting was proposed for early in the New Year, once action items from this initial meeting had been completed. After this meeting, the Town of Shelburne would be advised of the Comprehensive Study process in a meeting that could be attended by Dave Bell and Bill Bunker.

Specific action items are listed in the table below.

Action Item #	Description	Person(s) Responsible
1	Provide Dave and Bill with any background material available that describes the project. Ian to speak with Bill Banks.	Ian
2	Draft a memo of this meeting and circulate to Dave and Bill for input, prior to distribution to the Town and project team.	Ian
3	Provide Golder with a good example of a comprehensive study report for a water well project.	Dave and Bill
4	Confirmation of Agency attendance of Aboriginal group meetings.	Dave
5	Provide Golder with a template for an Project Environment interaction matrix.	Dave
6	Develop a draft comprehensive study timeline in MS Project based on this meeting. Timeline would be discussed further at our next meeting in the new year.	Dave

Ian Callum
EA Manager

IC/am

n:\active\2009\1112\09-1112-6007 town of shelburne - hydrogeological assessment\6000 comp study ea\correspondence\from ceaa\pre-ea planning feedback\shelburne comp study mtg 7dec10 (draft) db.doc

Knell, Mark

From: Davis,Stephanie [CEAA] [Stephanie.Davis@ceaa-acee.gc.ca]
Sent: Friday, October 14, 2011 5:26 PM
To: Knell, Mark
Cc: Bill.Bunker@feddevontario.gc.ca; Bell,Dave [CEAA]
Subject: Shelburne
Attachments: Pipeline Crossings.pdf; NWPA APPLICATION GUIDE.pdf; Shelburne service standard.doc

Hi Mark,

Apologies I missed your call this week. I was away in our Ottawa office. I've updated the project schedule and I am waiting on internal review. Feel free to call me on Monday and I can discuss the key dates, in particular with respect to public consultation.

I've attached a list of key milestones for your info. They are not mandatory for this project but are service standards we aim to adhere to. I've based a lot of the dates in the project schedule on this sheet.

We have also circulated the project description to other federal departments to determine if they had an interest in this proposed project. I'm still chasing responses from a number of departments but Transport Canada has provided the following response:

Transport Canada is responsible for the administration of the *Navigable Waters Protection Act* (NWPA), which prohibits the construction or placement of any "works" in navigable waters without first obtaining approval. If any of the related project undertakings cross or affect a potentially navigable waterway, the proponent should prepare and submit an application in accordance with the requirements as outlined in the attached Application Guide. Any questions about the NWPA application process should be directed to the Navigable Waters Protection Program at 1-866-821-6631 or NWPontario-PENontario@tc.gc.ca.

The proponent should review the Minor Works and Waters (Navigable Waters Protection Act) Order, established to outline the specific standards and criteria under which Transport Canada considers work / water as a minor and does not require an application under the Navigable Waters Protection Act. It is the responsibility of the applicant, prior to submitting an application to the Navigable Waters Protection Program for review, to assess whether their work meets the criteria, as described, and, therefore, falls within one of the excluded classes. An application will only be required should you determine that your work cannot meet the criteria established for that particular "class" of excluded work.

<<Pipeline Crossings.pdf>> <<NWPA APPLICATION GUIDE.pdf>>
I note from the text in the project description it is anticipated the works fall under the category of a 'minor work' and 'minor waterway'. Please review Transport Canada's response and contact the NWPA office should you have questions about your (the applicant's) determination.

Best wishes,
Stephanie

<<Shelburne service standard.doc>>

Stephanie Davis, BEng, LEED AP
Project Manager | Gestionnaire de projets
Canadian Environmental Assessment Agency | Agence canadienne d'évaluation environnementale
Ontario Region | Région de l'Ontario
55 St. Clair Avenue East, Suite 907, Toronto, ON M4T 1M2 | 55, avenue St-Clair Est, pièce 907, Toronto, ON M4T 1M2
stephanie.davis@ceaa-acee.gc.ca
http://www.ceaa-acee.gc.ca
Telephone l Téléphone 416-954-7334
Facsimile l Télécopieur 416-952-1573
Government of Canada | Gouvernement du Canada

Knell, Mark

From: Findlay, Graham (MNR) [graham.findlay@ontario.ca]
Sent: Tuesday, December 20, 2011 9:58 AM
To: Evers, Andrew
Subject: RE: Town of Shelburne Additional Water Supply Project
Attachments: A_Digital information requests_July10.pdf

Hello Andrew I have copied the wetland evaluation record for the Willow Brook Swamp and will put it in the mail today. I have included a copy of the original map showing the internal vegetation communities and coding; however for accurate outer wetland boundary mapping that should be obtained through the Land Information Ontario. Attached for your reference is our directive document on how to access our digital thematic layers (e.g. wetland boundaries).

Do call with any questions.

Regards,

Graham Findlay
Management Biologist
Midhurst District
Ministry of Natural Resources
705-725-7530
705-725-7584 FAX
graham.findlay@ontario.ca

From: Evers, Andrew [mailto:Andrew_Evers@golder.com]
Sent: December 7, 2011 10:22 AM
To: Findlay, Graham (MNR)
Subject: Town of Shelburne Additional Water Supply Project

Hi Graham,

I am pulling together baseline information for the Town of Shelburne Additional Water Supply Project. I was hoping you could provide me with the Wetland Evaluation for Willow Brook Swamp. Please let me know if you have any questions. Thanks,

Andrew

Andrew Evers (M.Sc.) | Environmental Assessment Specialist | **Golder Associates Ltd.**
2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
T: +1 (905) 567 4444 | **D:** +1 (905) 567 6100 Ext. 1267 | **F:** +1 (905) 567 6561 | **E:** Andrew_Evers@golder.com | **www.golder.com**

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Ministry of Aboriginal Affairs

160 Bloor St. East, 9th Floor
Toronto, ON M7A 2E6
Tel: (416) 326-4740
Fax: (416) 325-1066
www.aboriginalaffairs.gov.on.ca

Ministère des Affaires Autochtones

160, rue Bloor Est, 9e étage
Toronto ON M7A 2E6
Tél. : (416) 326-4740
Téléc. : (416) 325-1066
www.aboriginalaffairs.gov.on.ca

Ontario

APR 12 2011

RECEIVED
APR 13 2011
TOWN OF SHELBURNE

Reference: 67

Kelly McDowell, Project Coordinator
Town of Shelburne
203 Main Street East
Shelburne, ON L0N 1S0

Re: Town of Shelburne Hydro-geological Study and Class Environmental Assessment For Additional Water Supply – Notice of Study Commencement

Dear Ms. McDowell:

Thank you for your inquiry regarding the above-noted project.

As a member of the government review team, the Ministry of Aboriginal Affairs (MAA) identifies First Nation and Métis communities who may have the following interests in the area of your project:

- reserves;
- land claims or claims in litigation against Ontario;
- existing or asserted Aboriginal or treaty rights, such as harvesting rights; or
- an interest in your project's potential environmental impacts.

MAA is not the approval or regulatory authority for your project, and receives very limited information about projects in the early stages of their development. In circumstances where a Crown-approved project may negatively impact a claimed Aboriginal or treaty right, the Crown may have a duty to consult the Aboriginal community advancing the claim. The Crown often delegates procedural aspects of its duty to consult to proponents. Please note that the information in this letter should not be relied on as advice about whether the Crown owes a duty to consult in respect of your project, or what consultation may be appropriate. Should you have any questions about your consultation obligations, please contact the appropriate ministry.

You should be aware that many First Nations and Métis communities either have or assert rights to hunt and fish in their traditional territories. For First Nations, these territories typically include lands and waters outside of their reserves.

In some instances, project work may impact aboriginal archaeological resources. If any Aboriginal archaeological resources could be impacted by your project, you should contact your regulating or approving Ministry to inquire about whether any additional Aboriginal communities should be contacted. Aboriginal communities with an interest in archaeological resources may include communities who are not presently located in the vicinity of the proposed project.

With respect to your project, and based on the brief materials you have provided, we can advise that the project appears to be located in an area where First Nations may have existing or asserted rights or claims in MAA's land claims process or litigation, that could be impacted by your project. Contact information is below:

Chippewas of Georgina Island R.R. #2, P.O. Box 12 SUTTON WEST, Ontario L0E 1R0	Chief Donna Big Canoe (705) 437-1337 (Fax) 437-4597 dbigcanoe@georginaisland.com
Beausoleil First Nation (Christian Island) 1 O-Gema Street Christian Island, CEDAR POINT, Ontario L0K 1C0	Chief Rodney Monague Jr. (705) 247-2051 (Fax) 247-2239 rodmonaguejr@chimnissing.ca
Chippewas of Rama 5884 Rama Road, Suite 200 RAMA, Ontario L0K 1T0	Chief Sharon Stinson Henry (705) 325-3611 (Fax) 325-0879 chiefofmnjikaningfirstnations@mnjikaning.ca

The Government of Canada sometimes receives claims that Ontario does not receive, or with which Ontario does not become involved. For information about possible claims in the area, MAA recommends you contact the following federal contacts:

Ms. Janet Townson Claims Analyst, Ontario Team Specific Claims Branch Indian and Northern Affairs Canada 1310-10 Wellington St. Gatineau, QC K1A 0H4 Tel: (819) 953-4667 Fax: (819) 997-9873	Mr. Sean Darcy Manager Assessment and Historical Research Indian and Northern Affairs Canada 10 Wellington St. Gatineau, QC K1A 0H4 Tel: (819) 997-8155 Fax: (819) 997-1366

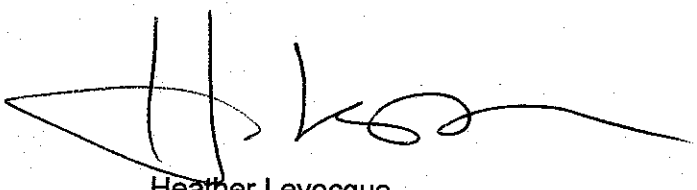
For federal information on litigation contact:

Mr. Marc-André Millaire
Litigation Team Leader for Ontario
Litigation Management and Resolutions Branch
Indian and Northern Affairs Canada
10 Wellington St.
Gatineau, QC K1A 0H4
Tel: (819) 994-1947
Fax: (819) 953-1139

Additional details about your project or changes to it that suggest impacts beyond what you have provided to date may necessitate further consideration of which Aboriginal communities may be affected by or interested in your undertaking. If you think that further consideration may be required, please bring your inquiry to whatever government body oversees the regulatory process for your project.

The information upon which the above comments are based is subject to change. First Nation or Métis communities can make claims at any time, and other developments can occur that could result in additional communities being affected by or interested in your undertaking.

Yours truly,



Heather Levecque
Manager, Consultation Unit
Aboriginal Relations and Ministry Partnerships Division

Knell, Mark

From: CAU-UCA [CAU-UCA@ainc-inac.gc.ca]
Sent: Tuesday, February 22, 2011 4:05 PM
To: Moffett, Cathryn
Subject: Re: Shelburne Hydrogeological Study

Follow Up Flag: Follow up
Flag Status: Flagged

Greetings,

Thank you for your email. INAC is in the process of rolling out a new service for responding to requests from other federal departments, other levels of government, and third parties on Aboriginal rights, claims, and assertions. We are calling this the Consultation Information Service (or CIS for short). At present, we have not fully staffed nor launched the service; however, in the interim we are doing our best to respond to queries in a timely fashion. Below are the communities I've identified, using an electronic mapping system we are developing called ATRIS, which may potentially have an interest in taking part in the consultation exercise you are planning. Attendant information on claims and assertions can also be accessed, by query to this general email address, however until we are fully staffed the response time is roughly 3-4 weeks.

The six communities identified by ATRIS are:

1. Beausoliel
GENERAL DELIVERY
CEDAR POINT, ON, L0K1C0
Phone Number:(705) 247-2051
Fax Number:(705) 247-2239
Contact:ROLAND MONAGUE - Chief

2.Chippewas of Kettle and Stoney
RR 2
FOREST, ON, N0N1J0
Phone Number:(519) 786-2125
Fax Number:(519) 786-2108
Contact:ELIZABETH J. CLOUD - Chief

3. Chippewas of Georgina Island
RR 2 PO BOX 13
SUTTON WEST, ON, L0E1R0
Phone Number:(705) 437-1337
Fax Number:(705) 437-4597
Contact:DONNA L. BIGCANOE - Chief

4. Saugeen
RR 1
SOUTHAMPTON, ON, N0H2L0
Phone Number:(519) 797-2781
Fax Number:(519) 797-2978
Contact:RANDALL KAHGEE - Chief

5. Six Nations of the Grand River
PO BOX 5000
OHSWEKEN, ON, N0A1M0
Phone Number:(519) 445-2201
Fax Number:(519) 445-4208
Contact:WILLIAM K. MONTOUR - Chief

6. Mississaugas of the Credit

RR 6
HAGERSVILLE, ON, N0A1H0
Phone Number:(905) 768-1133
Fax Number:(905) 768-1225
Contact:M. BRYAN LAFORME - Chief

In developing consultation plans, some have found it useful to also engage (or sometimes only engage) umbrella organizations. Two with a potential interest in this project are:

OGEMAWAHJ TRIBAL COUNCIL
5984 RAMA ROAD P.O. BOX 46
RAMA,ON, L0K1T0
Website: http://www.ogemawahj.on.ca/

UNION OF ONTARIO INDIANS
1 Miigizi Mikan
North Bay, Ontario P1B 8G5
Email: resjas@anishinabek.ca
Website: http://www.anishinabek.ca

If you have any questions about the information contained in this email you can contact me at my coordinates below.

Corey Dekker
Consultation & Accommodation Unit
1-613-944-9324

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>>> "Moffett, Cathryn" <Cathryn_Moffett@golder.com> 2/3/2011 9:46 AM >>>
Hi,
I am writing with regards to the Shelburne Hydrogeological Study and Class Environmental Assessment (see Notice attached). I would like to request a list of potentially affected Aboriginal communities who should be engaged as part of this project.
Thanks for your time,
Cathryn

_____
Cathryn Moffett (BSc.) | Public Participation and Aboriginal Engagement | Golder Associates Ltd.
2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
T: +1 (905) 567 4444 | D: +1 (905) 567-6100 ext 1339 | M: +1 (416) 418-3706 |
E: Cathryn_Moffett@golder.com<mailto:Cathryn_Moffett@golder.com> | www.golder.com<http://www.golder.com/>

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Knell, Mark

From: Liz Yerex [lyerex@grandriver.ca]
Sent: Wednesday, October 26, 2011 9:36 AM
To: Evers, Andrew
Cc: Weeks, Gwendolyn; Crystal Allan
Subject: RE: Town of Shelburne - Water Supply Project

Hi Andrew/Gwendolyn,
November 2 is good with Crystal and me. I may be working in Dufferin County (weather pending) on November 2. Please ask for Crystal when you get to the front desk.
See you next Wednesday.

Liz

From: Evers, Andrew [mailto:Andrew_Evers@golder.com]
Sent: October-25-11 9:24 AM
To: Liz Yerex
Cc: Weeks, Gwendolyn
Subject: RE: Town of Shelburne - Water Supply Project

Hi Liz,

I have found someone from our Cambridge office that can go to GRCA on November 2nd at 9:00 am. Does that work for you?

Andrew

Andrew Evers (M.Sc.) | Environmental Assessment Specialist | **Golder Associates Ltd.**
2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
T: +1 (905) 567 4444 | **D:** +1 (905) 567 6100 Ext. 1267 | **F:** +1 (905) 567 6561 | **E:** Andrew_Evers@golder.com | **www.golder.com**

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From: Liz Yerex [mailto:lyerex@grandriver.ca]
Sent: Monday, October 24, 2011 9:32 AM
To: Evers, Andrew
Cc: Crystal Allan
Subject: RE: Town of Shelburne - Water Supply Project

Hi Andrew,

This week may not work. Would it be possible to arrange something either November 1-3 (9:00am –noon) or November 4 (1-4pm).
Regards,

From: Evers, Andrew [mailto:Andrew_Evers@golder.com]
Sent: October-21-11 2:31 PM
To: Liz Yerex
Cc: Crystal Allan
Subject: RE: Town of Shelburne - Water Supply Project

Thanks for getting back to me, Liz.

Can we schedule someone from our Cambridge Office to go to the GRCA one morning next week to photocopy the fisheries records and drain information? Just let me know what day is convenient and I will arrange someone to go to your office. Thanks,

Andrew

Andrew Evers (M.Sc.) | Environmental Assessment Specialist | **Golder Associates Ltd.**
2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
T: +1 (905) 567 4444 | **D:** +1 (905) 567 6100 Ext. 1267 | **F:** +1 (905) 567 6561 | **E:** Andrew_Evers@golder.com | **www.golder.com**

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From: Liz Yerex [mailto:lyerex@grandriver.ca]
Sent: Wednesday, October 19, 2011 2:40 PM
To: Evers, Andrew
Cc: Crystal Allan
Subject: RE: Town of Shelburne - Water Supply Project

Hi Andrew,
You may be able to obtain some of the Fisheries Data directly from the MNR, Midhurst District. MNR is also the keeper of the Wetland Evaluation Records.

You are welcome to come to this office and photo copy fisheries records from the Drain Classification project. Other GRCA historical fisheries data is available however is stored in another building. Arrangements will have to be made to bring the historical files back to head office if you would like access to this information

We are not aware of the Willow Brook Report (Lennox and Strus, 1975)

If you are interested in coming to the office to photo copy or scan information, please let myself or Crystal Allan (Aquatic Resources Supervisor) know so that appropriate arrangements can be made.

Regards,

From: Evers, Andrew [mailto:Andrew_Evers@golder.com]
Sent: October-18-11 12:11 PM
To: Liz Yerex
Subject: Town of Shelburne - Water Supply Project

Hi Liz,

I am putting together a Municipal Class EA report for the Town of Shelburne Water Supply Project. For this report I was hoping to acquire some fisheries information. I was hoping you could provide me with:

- Grand River File - Field Collection Record (Ethier, Cunningham and Wright, 2001).
- The Willow Brook Report (Lennox and Strus, 1975).

Could you also please provide me with any other fish records for Willow Brook Swamp (see attached map) and if there is a Willow Brook Swamp evaluation record.

Please don't hesitate to contact me if you have any questions. Thanks for your help.

Andrew

Andrew Evers (M.Sc.) | Environmental Assessment Specialist | **Golder Associates Ltd.**
2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
T: +1 (905) 567 4444 | **D:** +1 (905) 567 6100 Ext. 1267 | **F:** +1 (905) 567 6561 | **E:** Andrew_Evers@golder.com | **www.golder.com**

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Please consider the environment before printing this email.

Knell, Mark

From: Liz Yerex [lyerex@grandriver.ca]
Sent: Tuesday, December 06, 2011 4:23 PM
To: Evers, Andrew
Cc: Crystal Allan
Subject: RE: Town of Shelburne - Water Supply Project

Hi Andrew,
Please go to our website www.grandriver.ca. Go to Online Services – GRIN for how to access digital information. If you have any problems with this please contact Zoe Green at this office.

The GRCA has not undertaken any ELC exercise in this area. Any ELC work that may have been done would have been through the works associated with wind farm projects. GRCA does not have this information digitally and we are not permitted to give out third party information. I believe Stantec was involved in most of the Wind Farm projects in Amaranth.

Regards,
Liz

From: Evers, Andrew [mailto:Andrew_Evers@golder.com]
Sent: December-06-11 12:07 PM
To: Liz Yerex
Cc: Crystal Allan
Subject: RE: Town of Shelburne - Water Supply Project

Hi Liz and Crystal,

I was wondering if it would be possible to get the GIS shapefiles for the attached map to help us with characterizing the baseline conditions for the Shelburne Additional Water Supply Project.

In addition, has there been an ELC exercise undertaken in the GRCA jurisdiction of the project (West of the Town of Shelburne including Willow Brook Swamp)? If so, are we able to obtain any information or ELC shapefiles?

Thanks for your help,

Andrew

Andrew Evers (M.Sc.) | Environmental Assessment Specialist | **Golder Associates Ltd.**
2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
T: +1 (905) 567 4444 | **D:** +1 (905) 567 6100 Ext. 1267 | **F:** +1 (905) 567 6561 | **E:** Andrew_Evers@golder.com | **www.golder.com**

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Please consider the environment before printing this email.

From: Liz Yerex [mailto:lyerex@grandriver.ca]
Sent: Wednesday, October 26, 2011 9:36 AM
To: Evers, Andrew
Cc: Weeks, Gwendolyn; Crystal Allan
Subject: RE: Town of Shelburne - Water Supply Project

Hi Andrew/Gwendolyn,
November 2 is good with Crystal and me. I may be working in Dufferin County (weather pending) on November 2. Please ask for Crystal when you get to the front desk.
See you next Wednesday.

Liz

From: Evers, Andrew [mailto:Andrew_Evers@golder.com]
Sent: October-25-11 9:24 AM
To: Liz Yerex
Cc: Weeks, Gwendolyn
Subject: RE: Town of Shelburne - Water Supply Project

Hi Liz,

I have found someone from our Cambridge office that can go to GRCA on November 2nd at 9:00 am. Does that work for you?

Andrew

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Please consider the environment before printing this email.

From: Liz Yerex [mailto:lyerex@grandriver.ca]
Sent: Monday, October 24, 2011 9:32 AM
To: Evers, Andrew
Cc: Crystal Allan
Subject: RE: Town of Shelburne - Water Supply Project

Hi Andrew,
This week may not work. Would it be possible to arrange something either November 1-3 (9:00am –noon) or November 4 (1-4pm).
Regards,

From: Evers, Andrew [mailto:Andrew_Evers@golder.com]
Sent: October-21-11 2:31 PM
To: Liz Yerex
Cc: Crystal Allan
Subject: RE: Town of Shelburne - Water Supply Project

Thanks for getting back to me, Liz.

Can we schedule someone from our Cambridge Office to go to the GRCA one morning next week to photocopy the fisheries records and drain information? Just let me know what day is convenient and I will arrange someone to go to your office. Thanks,

Andrew

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From: Liz Yerex [mailto:lyerex@grandriver.ca]
Sent: Wednesday, October 19, 2011 2:40 PM
To: Evers, Andrew
Cc: Crystal Allan
Subject: RE: Town of Shelburne - Water Supply Project

Hi Andrew,
You may be able to obtain some of the Fisheries Data directly from the MNR, Midhurst District. MNR is also the keeper of the Wetland Evaluation Records.

You are welcome to come to this office and photo copy fisheries records from the Drain Classification project. Other GRCA historical fisheries data is available however is stored in another building. Arrangements will have to be made to bring the historical files back to head office if you would like access to this information

We are not aware of the Willow Brook Report (Lennox and Strus, 1975)

If you are interested in coming to the office to photo copy or scan information, please let myself or Crystal Allan (Aquatic Resources Supervisor) know so that appropriate arrangements can be made.

Regards,

From: Evers, Andrew [mailto:Andrew_Evers@golder.com]
Sent: October-18-11 12:11 PM

To: Liz Yerex
Subject: Town of Shelburne - Water Supply Project

Hi Liz,

I am putting together a Municipal Class EA report for the Town of Shelburne Water Supply Project. For this report I was hoping to acquire some fisheries information. I was hoping you could provide me with:

- Grand River File - Field Collection Record (Ethier, Cunningham and Wright, 2001).
- The Willow Brook Report (Lennox and Strus, 1975).

Could you also please provide me with any other fish records for Willow Brook Swamp (see attached map) and if there is a Willow Brook Swamp evaluation record.

Please don't hesitate to contact me if you have any questions. Thanks for your help.

Andrew

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Knell, Mark

From: Bill Banks [Bill.Banks@banksgroundwater.ca]
Sent: Monday, February 22, 2010 11:01 AM
To: Theo Gerrits; Chris Gerrits; Petrie, John; Ivanoff, Alex; Di Biase, Stephen
Subject: FW: Shelburne Drilling

Gents,
Here is a summary of the OGS program and other information from Frank Brunton for reference.

Regards,
Bill

From: Brunton, Frank (MNDMF) [mailto:frank.brunton@ontario.ca]
Sent: Mon February 22, 2010 10:44 AM
To: jtelfer@townofshelburne.on.ca; Lee, Victoria (MNDMF); Rowell, Dave (MNDMF); Mark Williams
Cc: Bill.Banks@banksgroundwater.ca; kmcdowell@townofshelburne.on.ca; swheeldon@townofshelburne.on.ca; jtelfer@townofshelburne.on.ca
Subject: Shelburne Drilling

Hello John, Victoria, Dave, Mark and others

Below is an outline/summary of the upcoming drilling program. Please find attached letter of understanding between the Town of Shelburne and OGS to undertaken the drilling of two bedrock cored holes within the Town – scheduled to begin on February 22nd, 2010.

I received a phone call Friday afternoon from Bill Banks and a few things have come up that will influence our drilling program in Shelburne. The MOE will be in Shelburne Tuesday through Thursday (Feb. 23rd-25th) sampling the towns production wells, so we drill the 2nd line SW hole first. This will eliminate any potential issues with our drilling interfering with well sampling by the MOE at PW5&6.

Bill explained to me that Jim Baxter was concerned about how we will be drilling the overburden portion of the hole at PW5 & 6 site -- concerns regard the fact that these production wells are essentially interface aquifer wells and Jim and Bill wish the overburden portion of this hole to be drilled and casing set with minimal impact to the aquifer zone. Therefore, Bill informed me that the town wishes Gerrits to set casing at this site -- most likely next Friday -- following the MOE sampling. Gerrits will drill a 10" hole and then set a casing within upper solid bedrock so that Lantech can set up on following Monday to drill the bedrock HQ-cored hole to the Cabot Head. Bill -- please clarify if this is inaccurate and please have Theo contact Mark so that the hole will be prepared for Lantech to start drilling on Monday. I do not foresee casing being set deeper than about 100-ft below ground surface at this hole. We wish the upper bedrock cuttings and any cored pieces of bedrock drilled by Gerrits to be retained for study.

This change in drilling program is ok with us -- we wish to cooperate with the town as much as possible to help the town find safe drinking water. However, our tender is with Lantech to drill two bedrock holes in Shelburne area for regional groundwater aquifer mapping purposes and to acquire data that will be useful to the town in their search for safe and new municipal water supply wells. This work is independent of the contract between Golder & Bill Banks (BanksGroundwater) and Gerrits Drilling and the Town of Shelburne to search for a new municipal supply well. Therefore all costs associated with Gerrits drilling the overburden portion of hole at PW 5 & 6 and setting casing to enable Lantech to begin drilling the bedrock portion of hole will be covered by the Town of Shelburne. Our tendering process does not allow us to take money and pay other subcontractors on jobs.

We are drilling the hole at PW 5 & 6 because the town requested this. There are always concerns regarding possible negative impacts on an aquifer when drilling a monitoring well near a production well. Any concerns associated with this work should be discussed prior to beginning of drilling next Friday.

Bill also mentioned that he wishes to visit the two drill sites. Although our drilling program is independent of the Town's municipal water supply exploration program between the Town of Shelburne and Bill, Golder and Gerrits, we have no problem with Bill visiting the work site and encourage the town staff to visit the site while drilling is taking place -- all visitors must have proper health and safety gear (hard hat, safety glasses, vest, CSA approved boots).

Purpose of the OGS Boreholes & Data Sharing between the OGS and Town of Shelburne
The main purpose of our drilling program in Shelburne is to collect rock core to develop a regional 3D geologic model and tie that into a regional aquifer map for Niagara Escarpment. Collaboration with the town of Shelburne involves the OGS paying for two cored boreholes in sites favourable to the town in order to provide stratigraphic logs, analyze the rock chemistry, mineralogy and SEM analyses of rock thin sections, in order to confirm the source of the Arsenic is in the production wells of town of Shelburne.

The long-term utility of the holes will be as regional monitoring wells, with one next to the PW 5&6 production wells. I remain optimistic we will find water in the Gasport regional aquifer zone, but as stated earlier, my preferred locations are further west and NW of town -- so if we do not find sufficient volumes to meet your 200gpm needs, all is not lost because the Town will have data from two locations that will assist in finding a favourable location.

The town will have their consultants utilize a down hole camera (with a flow indicator in front of camera -- ribbon or fan), televiewer log, downhole geophysics (gamma, caliper, resistivity), spinner log and packer testing (should the holes warrant this level of study) on the two boreholes drilled by the OGS to characterize the hydrogeologic characteristics of the holes. This data will be combined with the geologic/geochemical investigations to characterize the water production capability of the key aquifer formations in each hole.

Once this work is completed the OGS wishes the Town of Shelburne to have these wells as long-term monitoring wells to assist in their understanding of groundwater conditions in the town.

Cheers,

Frank

Frank R. Brunton, P.Geo.
Geoscientist
Sedimentary Geoscience Section
Ontario Geological Survey,
Ministry of Northern Development,
Mines and Forestry
B7012 Willet Green Miller Bldg,
933 Ramsey Lake Rd., Sudbury,
Ontario, Canada, P3E 6B5
Toll: 1-888-415-9845 ext. 5956
Tel: 1-705-670-5956
Cell: 1-705-920-3775
Fax: 1-705-670-5905
frank.brunton@ontario.ca

From: Ian Ockenden [iockenden@nvca.on.ca]
Sent: Tuesday, August 18, 2009 8:06 AM
To: Dave Featherstone; Greenaway, Erin; Pengelly, Paul
Cc: Barrios, Abraham
Subject: RE: natural heritage data-Town of Shelburne water supply Class EA
Attachments: Shelburne Area Data Request.zip

Hello all,

I've attached the available benthic macroinvertebrate data that we have for the Shelburne area. If you happen to collect any "bug" data I'd love to have it to enter into our soon-to-be and ever growing benthic database.

Thanks,
Ian

Ian Ockenden
Watershed Monitoring Specialist
Nottawasaga Valley Conservation Authority
8195 Concession 8
Utopia, ON L0M 1T0
Phone: (705) 424-1479 x 234
Fax: (705) 424-2115

From: Dave Featherstone
Sent: Monday, August 17, 2009 8:37 AM
To: Greenaway, Erin; Pengelly, Paul
Cc: Barrios, Abraham; Ian Ockenden
Subject: RE: natural heritage data-Town of Shelburne water supply Class EA

Hi Erin and Paul. We'll start working on data in anticipation that the disclaimer for will be arriving shortly.

Best regards,

David Featherstone, B.Sc.
Manager, Watershed Monitoring Program
Nottawasaga Valley Conservation Authority
8195 Concession Line 8
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From: Greenaway, Erin [mailto:Erin_Greenaway@golder.com]
Sent: August 14, 2009 11:41 AM
To: Dave Featherstone
Cc: Barrios, Abraham; Pengelly, Paul
Subject: natural heritage data-Town of Shelburne water supply Class EA

Hi Dave,

Golder has just started work on the Class EA for the Town of Shelburne additional water supply. I'm responsible for the ecological aspects of the EA. I was wondering if I could get natural environment data for the area surrounding the Town

of Shelburne (see attached map-study area will be full extent of that map).

I have done a preliminary wed-based search (NHIC, GRIN) and came up with a few wetlands in the vicinity of the town. I was wondering if you have the digital layers for the wetlands and other designated areas in the study area. Additionally, fisheries/aquatic habitat related data for the watercourses in the area depicted on the attached map would be useful.

We have a meeting with the Town next Thursday, during which we will present background ecological data and mapping. Sorry about the short notice. Anything you can provide is greatly appreciated.

Copied on this message is Abraham Barrios, water resource engineer, who will also be contacting the NVCA regarding hydrological data for this project.

Also copied is Paul Pengelly, our GIS person as I will be away next week (Monday-Wednesday). Hopefully I'll be able to check my email where I will be, but please include Paul in all email.

Any questions, please give me a call/email to discuss.

Thanks,
Erin

Erin Greenaway (B Sc.) | Biologist | **Golder Associates Ltd.**
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T: [+1] (905) 567 4444 | **D:** [+1] (905) 567 6100 ext 1469 | **F:** [+1] (905) 567 6561 | **E:** Erin_Greenaway@golder.com | **www.golder.com**

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Knell, Mark

From: Dave Featherstone [dfeatherstone@nvca.on.ca]
Sent: Wednesday, August 19, 2009 11:57 AM
To: Greenaway, Erin
Subject: RE: natural heritage data-Town of Shelburne water supply Class EA
Attachments: shelburne_watercourses.jpg; A3_v2Coldwater_Coolwater_Habitats.pdf; 11 _v2Warmwater_Predator_8X11.pdf; 12_v2Municipal Drains_8X11.pdf

Hi Erin. I've attached a .jpg with watercourse names. I've also attached some other fisheries maps that may be useful. I'm still waiting on GIS for the NVCA wetland .shp file. I'll send ASAP.

David Featherstone, B.Sc.
Manager, Watershed Monitoring Program
Nottawasaga Valley Conservation Authority
8195 Concession Line 8
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From: Greenaway, Erin [mailto:Erin_Greenaway@golder.com]
Sent: August 19, 2009 9:39 AM
To: Dave Featherstone; Pengelly, Paul
Cc: Ian Ockenden
Subject: RE: natural heritage data-Town of Shelburne water supply Class EA

Sorry Dave. I didn't look close enough at the excel file to realize that the UTMs for the fish stations are included. However, if you have the digital layer with watercourse names, this would still be useful.

Thanks,
Erin

From: Greenaway, Erin
Sent: Wednesday, August 19, 2009 9:08 AM
To: 'Dave Featherstone'; Pengelly, Paul
Cc: Ian Ockenden
Subject: RE: natural heritage data-Town of Shelburne water supply Class EA

Hi Dave,

Thanks for the data. I was wondering if you have a map showing the fish stations to accompany the fisheries data. If this includes drain names and watercourse names that would be great. If not do you have any other maps or digital layers we could use for naming watercourses?

Thanks,
Erin

From: Dave Featherstone [mailto:dfeatherstone@nvca.on.ca]
Sent: Tuesday, August 18, 2009 8:27 AM
To: Greenaway, Erin; Pengelly, Paul
Cc: Ian Ockenden
Subject: RE: natural heritage data-Town of Shelburne water supply Class EA

Good morning. I've attached available fisheries data (.xls file), deer wintering and wetland mapping for the area around Shelburne. Wetlands map – blue features are MNR evaluated wetlands (west complex is Willow Brook-LSW; southeast complex is Elba-Camilla – PSW). Beige wetlands are those identified in our regulations mapping (unevaluated-subject to field verification). The green wetlands to the east have been recently refined.

Please let us know if we can be of further assistance.

Best regards,

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From: Ian Ockenden
Sent: August 18, 2009 8:06 AM
To: Dave Featherstone; 'Greenaway, Erin'; 'Pengelly, Paul'
Cc: 'Barrios, Abraham'
Subject: RE: natural heritage data-Town of Shelburne water supply Class EA

Hello all,

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Thanks,
Ian

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Sent: August 14, 2009 11:41 AM
To: Dave Featherstone
Cc: Barrios, Abraham; Pengelly, Paul
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Hi Dave,

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Knell, Mark

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Sent: Tuesday, August 18, 2009 8:27 AM
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Attachments: shelburne_area_deerwintering.jpg; boyne_shelburne.xls; shelburne_area_wetlands.jpg

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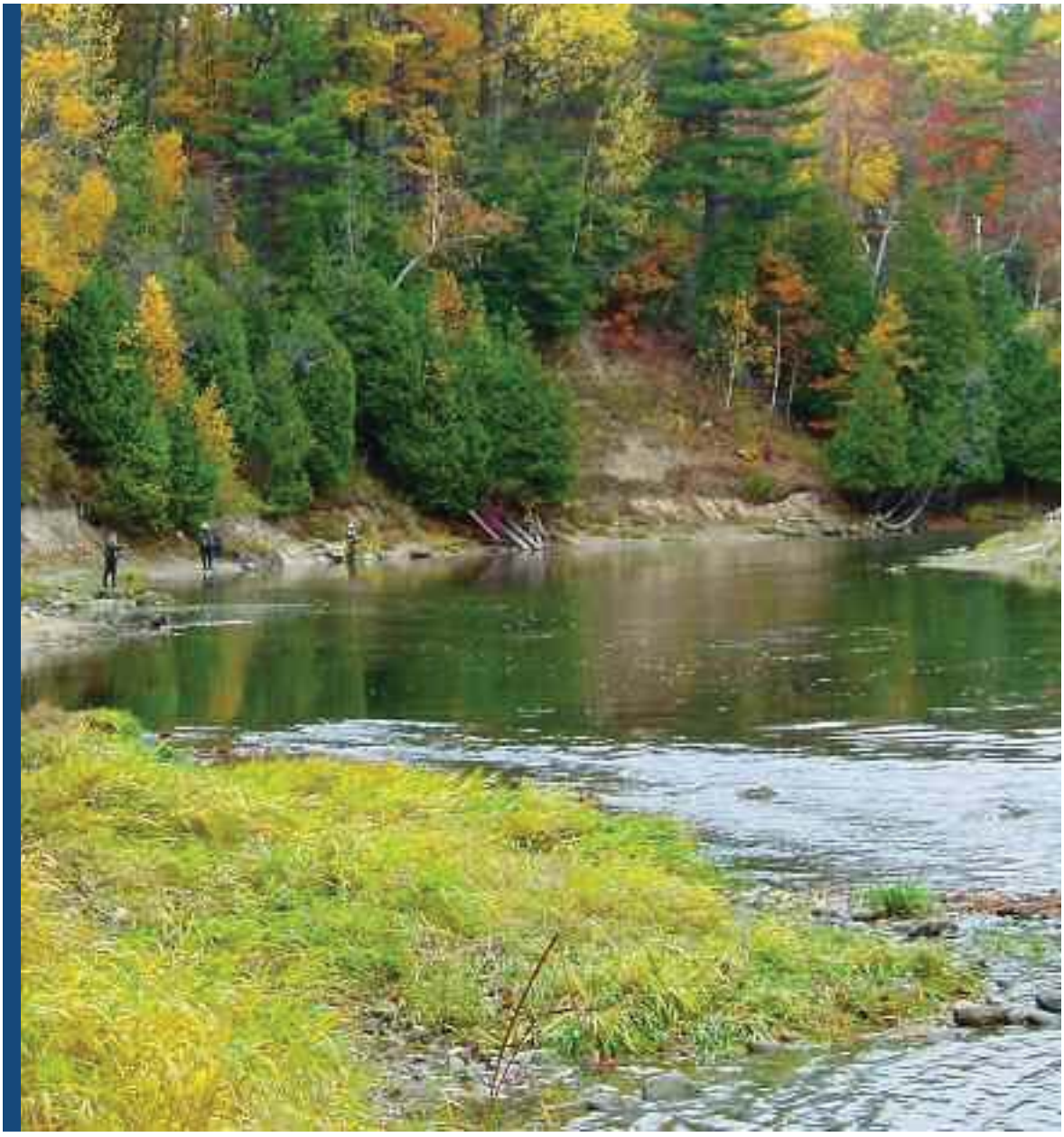
FISHERIES HABITAT MANAGEMENT PLAN

Nottawasaga Valley Conservation Authority Area of Jurisdiction

Prepared by Nottawasaga Valley Conservation Authority
in partnership with

Fisheries and Oceans Canada | Pêches et Océans Canada

March 2009



EXECUTIVE SUMMARY

The Nottawasaga Valley Conservation Authority (NVCA), including its 18 member municipalities, is involved in the management of fisheries habitat as part of its broad mandate for environmental and aquatic resource management documented in the Conservation Authorities Act. Fisheries habitats in the NVCA area of jurisdiction generate significant economic revenues by supporting productive sport and commercial baitfish fisheries. Healthy aquatic environments and the fish populations they support, also provide recreational and cultural values to society. Fisheries habitat management also forms a critical component of any water quality improvement strategy designed to promote human health and provide for the future growth of our urban and rural communities.

The NVCA in partnership with Fisheries and Oceans Canada, the Ontario Ministry of Natural Resources and local environmental interest and stakeholder groups, has developed the Fisheries Habitat Management Plan (which will be referred to as "the plan"), to act as a strategic document designed to support aquatic resource protection, watershed stewardship, fisheries habitat compensation and land use planning. The plan represents an extension of the NVCA Watershed Management Plan, 1996 to 2015, and the 2006 update. The plan documents habitat protection and restoration priorities at the whole area of jurisdiction level. It is intended to provide a basis for the development of a future implementation plan which will specify detailed fisheries habitat management strategies, tactics and project sites in specific catchments, river reaches and tributaries. This current Fisheries Habitat Management Plan would also provide a valuable tool to use in the development of an integrated multi-disciplinary aquatic resource management plan for the NVCA area of jurisdiction.

The plan includes an introduction (Chapter 1) followed by 7 background information chapters. Chapter 2 documents a vision and goals for healthy fisheries habitats. Chapter 3 describes the physical, biological and cultural setting of the NVCA area of jurisdiction including major watercourses, physiography, soil permeability, terrain, forest cover, wetlands, land use and barriers to fish migration. Chapter 4 provides a classification framework for fisheries habitats including 7 types, their locations in the area of jurisdiction and management strategies for each. Chapter 5 documents an overview of typical fisheries habitat impacts and contributing activities. Chapter 6 provides a summary of current legislative mechanisms for fisheries habitat protection and associated government agency roles. Chapters 7 and 8 provide background information on fisheries habitat restoration and assessment respectively.

The plan is based on the philosophy that a detailed understanding of the relationships between watershed features and aquatic habitats, must be developed first before defensible management priorities can be determined. This philosophy provides for the development of perspectives on the historical and potential restored status of fisheries habitats, rather than just focusing on the current condition. An important goal therefore was to develop a fisheries habitat zone framework for the NVCA area of jurisdiction, in which each zone encompassed areas exhibiting similar current habitat types, future restored

habitat types and management issues. The framework was developed in order to provide a geographical information system (GIS) based analytical tool that would support predictions about fisheries habitat potentials, management issues, land use impacts, current habitat status and appropriate management objectives, for any watercourse in the NVCA area of jurisdiction.

Chapter 9 documents the methodology which was used to determine fisheries habitat zones in the framework. Zone boundaries were determined by reviewing a wide range of fisheries habitat background data within each of the 11 fisheries habitat management units (FHMUs) in the NVCA area of jurisdiction. Documenting local physiographic and land use based habitat trends within the FHMUs, provided the basis for identifying broad fisheries habitat zones throughout the NVCA area of jurisdiction.

Chapter 10 documents the fisheries habitat zone framework developed for the NVCA area of jurisdiction, using the methodology documented in Chapter 9. The framework includes 13 physiography-based fisheries habitat zones. Chapter 10 also provides detailed descriptions of the characteristics of each zone.

Chapters 11 through 13 document recommendations for habitat protection, restoration and assessment/monitoring, based on the fisheries habitat zone framework and new perspectives in fisheries habitat management. The recommendations reflect the philosophy that all human land use practices, in both urban and rural areas, play a role impacting fisheries habitats. Therefore all watershed residents need to play an active part in developing the plan for a solution. From a practical perspective, protection activities may emphasize managing new urban developments whereas restoration work may be most effective in addressing historical and current rural impacts. Participants in the development of this plan believed that all watershed residents who are stakeholders in improving water quality, can benefit from supporting cost-effective fisheries habitat restoration in rural areas.

Chapter 14 documents fisheries habitat management objectives which were developed based on the principle of promoting the protection, enhancement and restoration of coldwater habitats, wherever the physiographic, soil permeability and groundwater discharge conditions were suitable for supporting this habitat type. This principle was applied even where current land use practices represented a partial constraint to the restoration of coldwater habitat. The fisheries habitat management objectives emphasized the protection, enhancement and restoration of warmwater fisheries habitats wherever the local conditions were not suitable for supporting coldwater habitat.

A summary of plan recommendations includes:

1. **Emphasizing habitat protection activities** within the Escarpment Natural, Oak Ridges Moraine, Oro Moraine and Deep Valley Sand Plain fisheries habitat zones as well as un-developed natural lake shorelines.
2. **Emphasizing fisheries habitat restoration works** within the Shallow Valley Sand Plain, Southern Clay Plain, Northern Clay Plain, Drumlinized Clay Plain, Escarpment Impact, Dundalk Till Plain, Eastern Uplands, Central Uplands and Minesing Wetlands habitat zones, and for developed lake shorelines.
3. **Implementing a "Core Fisheries Habitat Restoration Strategy"** targeting permanently flowing watercourses within the Sand Plain Shallow Valley, Southern Clay Plain, Northern Clay Plain and Drumlinized Clay Plain zones.
4. **Using the fisheries habitat zone framework as a basis for identifying appropriate sampling station locations** for fisheries habitat surveys and biomonitoring. Sample locations should be selected on each watercourse near the downstream limit of each zone, in order to best reflect the cumulative positive and negative impacts to aquatic habitat within the zone. This approach would facilitate defensible fish habitat quality and stream health comparisons between different watercourses in the NVCA area of jurisdiction.
5. **Implementing a study designed to identify stressors contributing to poor summer water clarity** in the main branch of the Nottawasaga River, Innisfil Creek and Marl Creek, and, to determine associated impacts to fisheries habitat productivity.
6. **Generally managing fisheries habitats** in the NVCA area of jurisdiction, consistent with the protection, restoration and enhancement of **coldwater fisheries habitats**, while protecting local features which currently provide warmwater predator fisheries habitat (see following bullets 7 and 8 for exceptions).
7. **Managing** the lower Nottawasaga River reach (with the exception of the Montgomery Rapids section), Jack's Lake, Marl Lake and warmwater tributary streams within the Northern Clay Plain and Minesing Wetlands habitat zones, as a **warmwater predator fisheries habitat ecosystem** attached to Nottawasaga Bay, and as an important migratory route for coldwater fish species (main river only).
8. **Managing** Bass Lake (including the North River), Orr Lake (including the Wye River), Little Lake (including adjacent reaches of Willow Creek) and Tottenham Reservoir as **warmwater predator fisheries habitat ecosystems.**

ACKNOWLEDGEMENTS

The NVCA would like to thank all watershed residents, environmental interest groups, stakeholders and partner agencies which contributed their time and energy to the development of this Fisheries Habitat Management Plan. Given the scope of the document and the size of the area of jurisdiction, it would have been very difficult for any single partner to have compiled the background information or to have represented the interests and values of all watershed residents.

Cover photo provided by
Gary Christie
of the Nottawasaga Steelheaders.

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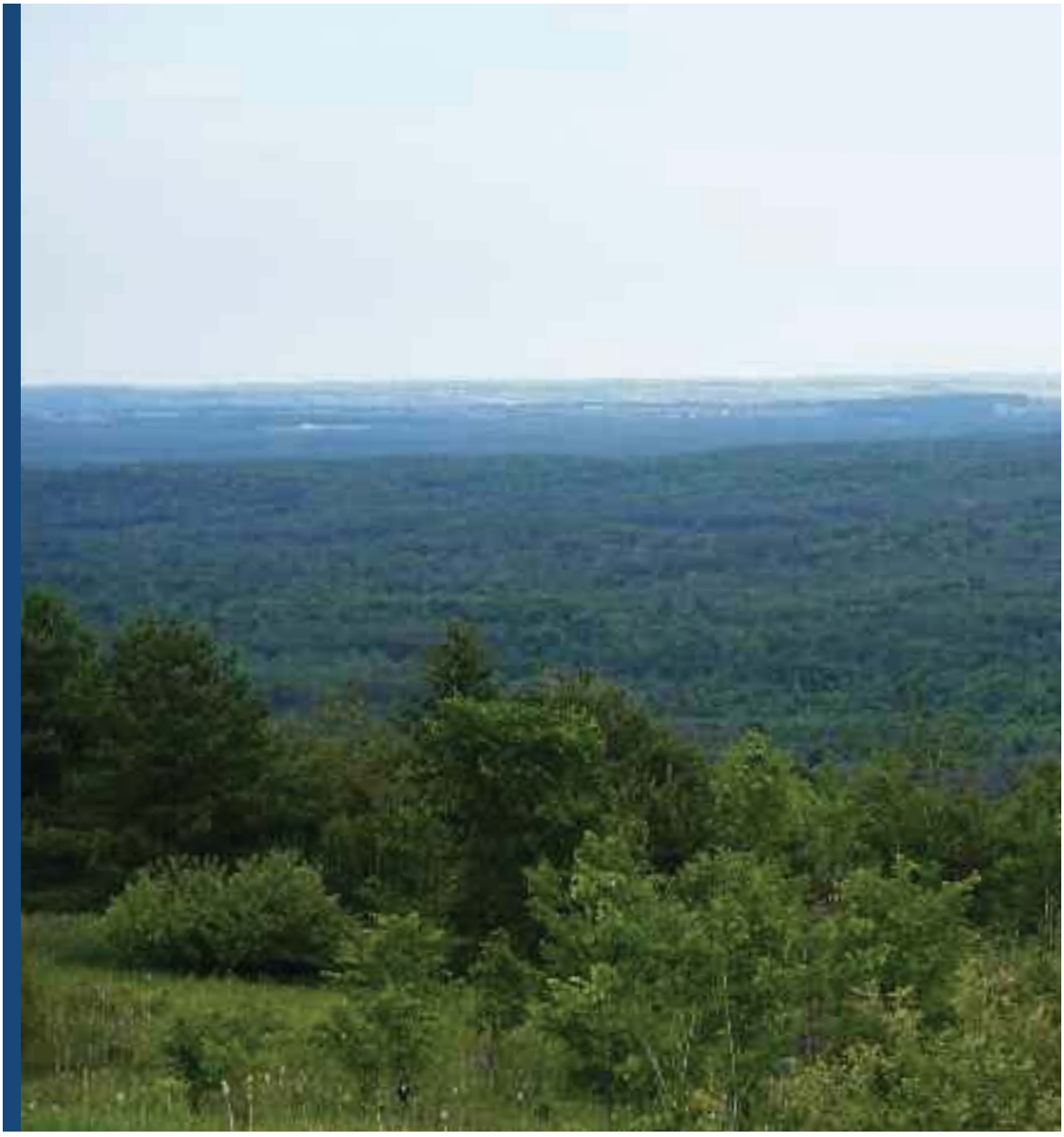

Knell, Mark

From: Dave Featherstone [dfeatherstone@nvca.on.ca]
Sent: Tuesday, December 06, 2011 1:39 PM
To: Evers, Andrew
Cc: Tina Desroches
Subject: RE: Shelburne Additional Water Supply Project

Hi Andrew. We have not completed any ELC work in the NVCA portion of Shelburne. The Grand River CA may have done this type of work in their jurisdiction. Azimuth Environmental Consulting prepared a natural heritage study for the Town and surrounding area back in 2004/2005 (if I recall correctly) and they used coarse community series-type approach to map natural heritage features (limitations associated with winter work if I recall but it was reasonably good, considering). Unfortunately, we do not have digital mapping from this exercise – I'm not sure if the Town has digital files from this effort. We do have updated wetland mapping for the Town of Shelburne area – we could send that your way if it's helpful.

Best regards,

David Featherstone, B.Sc.
Manager, Watershed Monitoring Program
Nottawasaga Valley Conservation Authority
8195 Concession Line 8
Utopia, Ontario
L0M 1T0
P: (705) 424-1479 Ext. 242
F: (705) 424-2115
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From: Evers, Andrew [mailto:Andrew_Evers@golder.com]
Sent: December-06-11 12:03 PM
To: Dave Featherstone
Subject: Shelburne Additional Water Supply Project

Hi Dave,

I understand that an ELC exercise has been completed within the vicinity of the Town of Shelburne, including Willow Brook Swamp. Is it possible to obtain the GIS shapefiles from this exercise to help us with characterizing the baseline conditions of the area for the Shelburne Additional Water Supply Project? Thanks,

Andrew

Andrew Evers (M.Sc.) | Environmental Assessment Specialist | **Golder Associates Ltd.**
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Knell, Mark

From: Small, John (MTO) [John.Small@ontario.ca]
Sent: Tuesday, May 31, 2011 7:32 AM
To: Knell, Mark
Cc: Hood, Steve (MTO); Dixon, Chris (MTO); Nantais, Valerie (MTO); Smyth, Ian (MTO); Gignac, Phil (MTO); Olender, Theresa (MTO); Bill.Banks@banksgroundwater.ca; Callum, Ian; Evers, Andrew; Ward, Roger (MTO); McGuire, Amy (MTO); Callum, Ian; kmcdowell@townofshelburne.on.ca; Giesbrecht, Cathy (MTO); Teasdale, Ken (MTO)
Subject: RE: Request for assistance - Proposed Pipeline - Hwy 89 - West of Shelburne

Mark,

I have checked a few matters and can now advise you of a few requirements. To run the new pipeline within the MTO right-of-way will require an Encroachment Permit from our Owen Sound office, where you will need to correspond with Steve Hood and Chris Dixon, whom I've copied above.

I have checked the limits of the Hwy. 89 construction project under which we plan to repair/replace bridges and culverts between Mount Forest and Sheldon in 2013, and your pipeline proposal is well east of the limits of that project. I am aware of two other MTO projects in the Shelburne area, and I'm copying our Project Managers for those projects(Roger Ward and Amy McGuire) so they can advise you of any conflicts/complications they foresee.

Thank you for the information about the Class EA process you are following. With federal funding involved to trigger the federal CEAA process I expect your EA work will be done to the higher federal standards which include the consideration of matters such as cumulative effects and health impacts not assessed in any detail in the provincial EA's which we complete for MTO projects. Although your proposed pipeline route does not cross any rivers, I expect you will require some fisheries approvals for crossings of any fish-bearing watercourses. I am not aware of any particular environmental sensitivities in your project area, though extensive wetlands appear to cover large areas north of Hwy. 89. and I'm sure they have some environmental significance.

Thank you for advising us of your study. We would appreciate being kept informed of the EA progress, and we wish you and the Town of Shelburne success in completing the new well and pipeline.

John Small

From: Knell, Mark [mailto:Mark_Knell@golder.com]
Sent: May 30, 2011 2:42 PM
To: Small, John (MTO); Teasdale, Ken (MTO)
Cc: Hood, Steve (MTO); Dixon, Chris (MTO); Nantais, Valerie (MTO); Smyth, Ian (MTO); Gignac, Phil (MTO); Olender, Theresa (MTO); Bill.Banks@banksgroundwater.ca; Callum, Ian; Evers, Andrew
Subject: RE: Request for assistance - Proposed Pipeline - Hwy 89 - West of Shelburne

Good afternoon,

Thank you for the feedback provided regarding the Town of Shelburne's Additional Water Supply Project. The Town is currently carrying out a Schedule B Class EA for the construction and operation of a new drinking water production well for the Town's water supply system. A notice of commencement for the proposed project is attached. As part of the proposed project, a hydrogeological study is being completed that has involved pump tests at four target areas for the new production well near the Town of Shelburne. Based on results to-date, the Town has identified a preferred location for a new production well (Well "T4"), approximately 3 km west of the Town (see Figure 1 attached).

Since the proposed project is currently in the EA phase, designs for the watermain route have not been initiated; however, the least costly and least disruptive watermain route, shown on Figure 1, would follow the north side of Highway 89 from 2nd Line SW to 4th Line. The new watermain would connect with the existing water supply system at Wells 5 and 6.

Federal funding is being administered by the Federal Economic Development Agency for Southern Ontario; therefore, the proposed project also requires an EA be successfully completed under the *Canadian Environmental Assessment Act*. Once the federal EA process is initiated, a copy of the project description will be circulated to MTO.

In an effort to consult with MTO early in the development process, the Town would like to request feedback from MTO on the proposed watermain route for the undertaking. If you require any further details, please direct inquiries to myself or Ian Callum, the project manager for the Municipal Class EA.

Regards,

Mark Knell

Mark Knell (Ph.D.) | Environmental Assessment Specialist | **Golder Associates Ltd.**
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From: Small, John (MTO) [mailto:John.Small@ontario.ca]
Sent: Monday, May 30, 2011 8:53 AM
To: Teasdale, Ken (MTO)
Cc: Hood, Steve (MTO); Dixon, Chris (MTO); Nantais, Valerie (MTO); Smyth, Ian (MTO); Gignac, Phil (MTO); Knell, Mark; Olender, Theresa (MTO)
Subject: RE: Request for assistance - Proposed Pipeline - Hwy 89 - West of Shelburne

Ken,
Thanks for the information. I am copying the inquirer from Golders so he will know what our requirements may be. Thanks,
John Small

From: Teasdale, Ken (MTO)
Sent: May 27, 2011 11:02 AM
To: Small, John (MTO)

Cc: Hood, Steve (MTO); Dixon, Chris (MTO); Nantais, Valerie (MTO); Smyth, Ian (MTO); Gignac, Phil (MTO)
Subject: RE: Request for assistance - Proposed Pipeline - Hwy 89 - West of Shelburne

Hi John…

Should Golder's be proposing a pipeline that will be within the Hwy 89 ROW, the Operations Office in Owen Sound would be responsible for the review/approval of the proposal, including issuance of the required Encroachment Permit. Should the pipeline be within an easement adjacent to the ROW, our section would deal with it. I would suggest that Golder's provide MTO with some preliminary plans at this point in time. In addition, they should circulate MTO with their EA Notice for the project.

Any questions give me a shout.

Ken Teasdale
Senior Project Manager
Corridor Management Section

From: Small, John (MTO)
Sent: May 26, 2011 4:33 PM
To: 'mknell@golder.com'
Cc: Giesbrecht, Cathy (MTO); Olender, Theresa (MTO); Nantais, Valerie (MTO); Teasdale, Ken (MTO)
Subject: RE: Request for assistance

Mark,
I am responding as Theresa has requested below to advise:

1. MTO has initiated a highway reconstruction/upgrading project from Conn to Shelburne which could have some bearing on a pipeline installation(will it be within this section?)...I'm copying our Project Engineer for that project(Valerie Nantais) to see if she can advise us of potential complications/timing issues etc.

2. I do expect there would be permit requirements for any installation on or near the MTO right-of-way. On this issue, I'm copying our Regional Corridor Management staff to advise us when permit requirements would apply, and what might be involved in accessing the construction area to install a water line.

Naturally we would expect that some Environmental Assessment be completed, especially for any water crossings involved. Can you advise what EA process you expect to follow for such an undertaking?

John Small
(519) 873-4601

From: Olender, Theresa (MTO)
Sent: May 26, 2011 11:32 AM
To: Small, John (MTO)
Cc: Giesbrecht, Cathy (MTO)
Subject: Request for assistance

Hi John.

Mark Knell from Golder contacted me looking for advice. Golder is putting together possible options to install a new pipe (sounds like drinking water distribution line) and is carrying out a Class EA project. They are formulating options for possible placement of the line and are contemplating adjacent to MTO's ROW on Hwy 89

approximately 30 kms west of Shelburne. It's apparently a federally funded infrastructure improvement project so it's likely to be expedited.

I told Mark that there may be two issues:

1. MTO's plans to expand so there may be a need to avoid; and if that is not a problem,

2. An MTO corridor entrance? Permit may be required if they are within the offset limits.

I have no idea of what I'm talking about but I did promise to get him better contacts. Could you please respond by email or call Mark at: +1 (905) 567 4444

Ext. 1479? mknell@golder.com or Mark_Knell@golder.com

Thanks for your help

Theresa Olender

Sr. Policy Analyst
Environmental Policy Office
Tel.: 905-704-2209
Fax: 905-704-2007
email: Theresa.Olender@Ontario.ca

Town of Shelburne/MOE/MNR Meeting to review issues related to Arsenic in the Municipal Drinking Water Supply

1 Stone Road West, Guelph – November 09, 2011 13:30

Chair/Minutes: Don Hamilton, MOE

Present: John Telfer, Scott Weeldon, Steve Wever, Town of Shelburne, Jeff Graham, Genivar, Carl Slater, Barb Slattery, Angela Homewood, Amy Shaw, Gary Tomlinson, MOE

Regrets: Paula Thompson MNR

Item	Agenda Items	Presenters
1.	**Project Overview and Update**	**John Telfer**
	Discussion • Proposed new well west of Town is a "gusher" with acceptable quantity and quality to meet current and future needs • Arsenic levels in well very low; • Town is currently engaged in both Federal and Municipal EAs. • Public consultation will commence in February; • Would like the new well to be the major source with wells 5 and 6 to be used as backups; • This will resolve arsenic concentrations in the drinking water; • Two year project with directional boring to follow service corridor along Hwy 89 to existing water tower; • Concern with Intra-basin transfer regulation changes and how this will affect the Town moving forward	
2.	**Proposed Drinking Water Standard for Arsenic**	**Satish Deshpande**
	• Satish is a member of the Federal committee which develops new guidelines; • All provinces and territories tend to adopt new guidelines over time; • Traditionally there is a phase in period for new guidelines; • The 2006 Federal guideline is still under review in Ontario and has not been adopted; • The work that the Town of Shelburne is engaged in is excellent and needs to continue; • Shelburne is the largest municipality in Ontario affected by the change in the guideline and has the highest cost to eliminate arsenic from their supply; • John Telfer wanted to know if the Federal committee was considering a further reduction in the arsenic standard;	

	• Satish doesn't foresee a change because there is no certified treatment technology currently available to achieve a lower guideline ***Action:*** ***MOE will work with Shelburne during the phase in period provided the Town continues to implement their current plan.***	
3.	**GIS Mapping & Intra Basin Transfer Concerns**	**Angela Homewood**
	• Jeff Graham confirmed that MNR has ruled the well location is slightly over the drainage divide in the Grand River Watershed; • Legislation on Intra-Basin Transfers is not likely to be posted until June; • The Town of Shelburne is to follow the Technical Bulletin which was prepared for municipal use for water and wastewater proposed projects; • The proposed water project does not trigger the 19 mL/d consumptive use for Prior Notice and Consultation (PNC) but does trigger intra-basin transfer criteria of an increase of 379,000 L/d.; • In accordance with Great Lakes Agreement, there must be PNC with all Great Lake States to provide an understanding of the nature of the project; • While this is a provincial responsibility, the information comes from the proponent; the information is normally part of the EA process; • This is not meant to be an approval process. The Province must consider input received through PNC in any decisions made (e.g. PTTW, CofA); • Shelburne has chosen to conduct a Schedule C EA in order to address future needs ***Action:*** • ***Angela is to provide the Town of Shelburne with a list of items that need to be addressed in the EA process which will help satisfy the Intra Basin Transfer directions and notification requirements***	

4.	**Wastewater Transfer**	**Jeff Graham**
	• John Telfer indicated that the lack of waste water assimilative capacity in the Boyne River (NVCA) has hindered growth and current expansion of the WWTP doesn't address future needs; • Municipality is exploring the possibility of discharging their effluent to Willow Brook as a means to avoid the capacity issue; • The preference is to continue discharging to the Boyne River which is a policy 2 receiver; • Shelburne has a discharge limit of 0.86 k/d of phosphorous; • Shelburne would be willing to consider a lower phosphorous discharge limit provided it is prorated; • Currently they are considering upgrades to the sludge digestion, sand filtration and want to pilot new tertiary treatment of the effluent; • Carl Slater stated the MOE would be willing to engage in pre-consultation ***Action:*** ***Barb Slattery and Carl Slater would arrange a teleconference with the Surface Water representatives, the Town of Shelburne and Golder & Associates to discuss effluent criteria and loading criteria in the Boyne River.***	
5.	**Utility Corridor - MTO**	**All**
	• It is Shelburne's intention to use the MTO utility service corridor to transmit the water via pipeline from the new well along Hwy 89 to the existing water tower. • Shelburne is proposing to use directional drilling practices and fused pipe; Shelburne is currently entering into discussion with MTO on this proposal ***Action:*** ***MOE to provide support to Shelburne, if required, in their discussions with MTO.***	

Meeting adjourned at 15:00.

M I N U T E S

Shelburne Drinking Water System – Potential Intra-basin Transfer

Friday, April 08, 2011
9:00 a.m. – 10:30 a.m.

Attendees:	Don Hamilton *(Minutes)*	MOE WCR	**Regrets:**	Tim Little
	John Telfer	Shelburne		
	Scott Wheeldon	Shelburne		
	Roseann Rutledge	Shelburne		
	Bill Banks	Banks Groundwater		
	John Petrie	Golder Assoc		
	Ian Callum	Golder Assoc		
	Andrew Osyany	Sheppard & Osyany		
	Jeff Graham	Genivar		
	Barb Slattery	MOE WCR		
	Angela Homewood	MOE SWR		
	Rick Neubrand	MOE SDWB		

---

1) Introduction

Bill Banks provided a historic review and summary of the development of a new drinking water source to augment future and existing water demand within the Town of Shelburne.

- Shelburne is serviced by 4 municipal wells (1,3,5,6)
- Looking for an additional groundwater source to augment existing capacity and fulfill future demand
- In order to meet this demand an additional 1,346 m3/day is required
- Existing shallow bedrock wells are influenced by naturally occurring arsenic
- Health Canada Drinking Water Quality Objective for arsenic is 0.010 mg/L
- Ontario considering adopting the lower limit for arsenic (currently 0.025 mg/L)
- Blending of sources to meet a new lower limit was deemed to be a preferred option for Shelburne
- An initial search for suitable shallow bedrock groundwater source within a 5 km radius was conducted, but did not proceed to the test drilling stage
- Steering committee was encouraged by representatives of the Ontario Geological Survey (MNDM&F) to consider drilling a deeper well in the limestone formation known as the Gasport Formation (formerly known as the Amabel Formation) to the west of the town
- Naturally occurring arsenic was not anticipated in this geologic formation
- Two test holes were drilled west of town by the OGS

- One of the wells 3.3 kms west of town indicated the deep aquifer has the potential to be developed as a municipal supply
- A test well was then drilled by the project team for testing purposes
- A pump test in 2010 demonstrated a suitable sustainable yield (250 g/min) with excellent water quality
- the municipality/consultants advised that the amount of water taken and or transferred would be at least 1.3 million litres/day
- Shelburne is in the process of conducting both Provincial and Federal Environmental Assessments to expand the capacity of the Drinking Water System
- During the mapping of the location of the well it was determined that the well has the potential to be in the Grand River watershed
- The Town of Shelburne is located in the Nottawasaga watershed

2) Issue for Discussion

Does the development of this new municipal drinking water source well have the potential to be considered Intra Basin transfer and if it does what are resulting ramifications?

3) Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement

Angela Homewood led a discussion on Intra Basin transfer of water and the relationship to municipal responsibilities under the Municipal Engineers Association Municipal Class Environmental Assessment.

- Great Lakes Charter, 1985 remains in place
- Ministries of Natural Resources and Environment will work closely with municipalities on proposed water or wastewater servicing projects
- Projects exceeding 379,000 litres per day will trigger the Agreement
- A Technical Bulletin has been developed to provide direction to municipalities on how to manage projects prior to regulations being implemented
- Concern is that this project involves transfer of water from the Lake Erie Basin to the Lake Huron Basin
- Great Lakes mapping of watersheds is available on MNR LIO web site
- Need to confirm the location of the well which may will trigger the Agreement
- Confirmed the project will be greater than 379,000 litres per day but less than 19 million litres per day
- “Under the Agreement, there are two triggers with respect to new or increased intra basin water transfers, amounts equal to or greater than 379,000 litres per day and amounts equal to or greater than 19 million litres per day (consumptive use) will trigger the Agreement.
- Municipality is currently in the process of completing the hydrogeological study in support of a Class B Environmental Assessment
- In accordance with the Technical Bulletin a Class C EA should be undertaken
- A Municipal EA and comprehensive Federal EA are being done concurrently

- There is a willingness to streamline the process where possible
- The regulation is close to being posted in the Environmental Bill of Rights (possibly within next six months)
- EA has to consider all feasible alternatives and has to demonstrate how the Ontario Water Resources Act requirements has been met
- Not meant to stop servicing projects but manage Intra Basin diversions
- Shelburne is concerned that changes to the proposed regulation could result in added responsibilities or burdens such as having to revise and redo portions of the EA
- Upon verification of the location of the well on the LIO watershed map a follow up teleconference is to be arranged
- Ministry is committed to providing additional guidance at that time and may call upon guidance from Paula Thompson (MNR) and possibly Stephanie Davis (CEEA)

ACTION:

Consultants are to provide an updated location map to the ministry of Environment with the UTM coordinates to assist in the determination of whether the proposed well will trigger the Agreement. (Included in Tech. Memo. issued by Golder Associates on April 11, 2011)

Consultants are to provide the potential intra-basin transfer amount to the ministry, to assist in the determination of whether the proposed well will triggers the Agreement. (Included in Tech. Memo. issued by Golder Associates on April 11, 2011)

Ministry of Environment to review mapping and additional information provided by the consultants and set a date for second teleconference.

4) Ontario Drinking Water Quality Standard

- Shelburne has requested that the ministry consider harmonizing the revised standard for arsenic with the completion of the EA process if possible.

ACTION:

Update: Satish Deshpande (EMRB) has agreed to meet with John Telfer in May to review the status of the proposed change to the DWQS. Don Hamilton to arrange.

5) Next Meeting: April 18?

APPENDIX B

Hydrogeology Report

October 2012

TOWN OF SHELBURNE GROUNDWATER SUPPLY CLASS ENVIRONMENTAL ASSESSMENT

Final Hydrogeological Report

Submitted to:
Town of Shelburne
203 Main Street East
Shelburne, Ontario
L0N 1S0

REPORT

Report Number: 09-1112-6007

Distribution:

2 copies - Town of Shelburne

2 copies - Golder Associates Ltd.

Golder Associates

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1.0 INTRODUCTION

The Town of Shelburne (the Town) is undertaking Municipal and Federal Environmental Assessments (EAs) to identify the preferred alternative for developing additional municipal groundwater supply. The Town is located in the County of Dufferin, as shown on Figure 1, and bounded by the Townships of Amaranth (to the south) and Melancthon (to the north). Golder Associates Ltd. (Golder) in association with Banks Groundwater Engineering Limited and Gerrits Drilling & Engineering Ltd. were retained by the Town to carry out the field studies and consultation process in support of the EAs.

This Hydrogeological Report presents a characterization of local water resources, interpretation of the EA field study results and an evaluation of potential water related effects from long term operation of a new municipal groundwater supply source (Test Production Well TW7-10). This report is organized as follows:

Section 1: Provides background to the project, as well as the scope and objectives of the EA field studies.

Section 2: Characterization of water resources (groundwater and surface water) in the vicinity of the Town and Hydrogeological Study Area.

Section 3: Presents the methodology and results of field studies supporting the EA.

Section 4: Evaluates the effect of long term operation of TW7-10 (at 1,635 m^3/day) on local water resources.

Section 5: Lists the conclusions developed from the Class EA field studies regarding the quantity and quality of groundwater available for municipal water supply.

Section 6: Provides recommendations supporting the commissioning of the new test production well.

This report is supported by the following technical appendices:

Appendix A: Water Quality and Water Well Surveys

Appendix B: Hydrological Characterization of Willow Brook

Appendix C: Well Construction and Borehole Logs

Appendix D: Performance Assessment of TW7-10

Appendix E: GUDI Assessment of TW7-10

1.1 Project Objective

The Town currently operates four municipal production wells (Well 1, Well 3, Well 5 and Well 6) to support its municipal water distribution system. The location of existing production wells are shown on Figure 1. It is noted that Well 2 was recently decommissioned due to declining performance. Groundwater pumping from the existing sources is carried out in accordance with Ontario Ministry of the Environment (MOE) Permit to Take Water (PTTW) Number 1814-7QVK7S, which expires December 31, 2014. It is estimated that by 2032, the Town's water supply requirements of 5,983 m^3/d (J. Graham, P.Eng., Genivar-Town Engineer, personal communication, September 2012) will exceed the current capacity of 4,916 m^3/day, resulting in a shortfall of 1,067 m^3/day. Additionally, groundwater quality monitoring of the five municipal wells, from 2004 to 2010, indicated that the highest concentration of naturally-occurring arsenic observed in raw water withdrawn from existing production wells ranged approximately from 14 to 22 µg/L. The current Ontario Drinking Water Quality Standard (ODWQS) for arsenic is 25 µg/L and the MOE has indicated this standard may be reduced to 10 µg/L. This proposed reduction in the regulatory standard could potentially require the Town to treat groundwater withdrawn from the four municipal wells. As such, the Town has placed an emphasis on identifying additional groundwater sources with low concentrations of arsenic. Any additional supply realised from a new production well and backup well, above the projected shortfall, could result in a greater overall water supply security for the Town of Shelburne by reducing demand from existing production wells.

In order to accommodate future growth and provide security for the Town's water supply, the Town initiated a Municipal Class EA to develop a new groundwater supply source. This study received funding from the Federal Government and is therefore also subject to the requirements of the Federal Environmental Assessment Process (FEAP). The objective of this study is to identify, evaluate and document a recommended solution for a new supply source(s) in a defined study area with consideration for environmental, social, technical and economic factors.

2.0 OVERVIEW OF STUDY AREA

For the purpose of developing additional groundwater supply, the Town initially considered lands within a 5 km radial distance of its boundaries. As will be discussed in Section 3, a selection process was undertaken to constrain the Class EA field studies (i.e., groundwater exploration) to a specific "Study Area". In order to meet the objectives of the Class EA, a Study Area was identified approximately 3 km west of the Town (Figure 1).

The study area was identified, in part, on the basis of the results of previous groundwater investigations. Table 1 presents a summary of selected background reports that provide the results of various groundwater supply studies completed for the Town of Shelburne. This is not a comprehensive list of background reports, as there were several other reports included in various reference lists. However, the reports summarized represent the key stages in the development of the existing municipal water supply system and also serve to demonstrate the extensive test well drilling that has been conducted within the current Town limits. The outcome of each study is summarized, but only the elements that are relevant to this current project are included.

2.1 Land Use, Physiography and Drainage

Figure 2 shows aerial photography of lands in the vicinity of the Town and Study Area. Lands within the Study Area are predominantly rural-agricultural that are actively farmed.

Topographic relief and drainage in the vicinity of the Town is shown on Figure 3. Local physiography has previously been characterized as Escarpment Uplands (Sibul et al, 1971), where elevated table lands form a regional watershed divide that separate the Grand River and Nottawasaga River basins. In general, local terrain is gently rolling, with subdued ridges separating poorly drained depressions (i.e., swamps and bogs). As a result, several engineered drains have been established to control surface drainage locally.

The Town proper is located within the Boyne River catchment area of the Nottawasaga River basin. As shown on Figure 3, two watercourses (Walters Creek and Besley Drain) flow in a north-easterly direction through the Town and outflow into the Boyne River. Walters Creek flows from the southwest to the northeast, originating near Wells 5/6 and across the northern edge of the Town. The Besley Drain also originates in the southwestern portion of the Town, however, flowing east and northeast (flowing by Well 1).

West of Town, several drains have been engineered within wetland areas to manage overland drainage towards tributaries of Willow Brook. Willow Brook flows in a south-westerly direction, out-flowing into the Grand River near the community of Waldemar (located approximately 20 km southwest of the Town). A water budget assessment of Willow Brook (up-stream of the culvert crossing at Highway 89) is provided in Appendix B. The water surplus of this catchment area varies significantly throughout the year, ranging from 11,318 m^3/day during the spring to no available surplus during the summer. This interpretation is reasonably comparable to the 9,677 m^3/day spot flow measurement taken at Willow Brook (at the Highway 89 culvert crossing) on January 18, 2012.

2.2 Geology

Local overburden and bedrock stratigraphy is discussed comprehensively within the Town of Shelburne Groundwater Management and Protection Study (Burnside, 2002). Since the Protection Study, the Ontario Geological Survey (OGS) has recently revised the nomenclature of Silurian dolostones in Southern Ontario. This section briefly reviews the local overburden and bedrock stratigraphy characterization (as reported within the Protection Study), with correlation of the historical and recently revised stratigraphic nomenclature described by the OGS (Brunton, 2009) provided in Table 2.

Figure 4 shows the locations of boreholes or water wells (where an MOE water well record is available) in the vicinity of the Study Area. The geological records from these locations form the basis for a geological cross-section (Cross-Section A – A') that has been prepared along 2nd Line between Regional Road 17 and Highway 89. Cross-section A – A', as shown on Figure 5, provides a summary of the stratigraphic sequence within the Study Area.

2.2.1 Overburden

Local overburden thickness generally ranges from approximately 30 m in the central portion of the Town, to less than 10 m in the vicinity of the Study Area. Quaternary geology deposits, as mapped by the OGS (OGS, 2003), are shown on Figure 6. Based on this mapping, near surface soils can generally be separated into three types from ground surface down:

1) Organic deposits, Type 20 soils shown as grey on Figure 6;

2) Glacio-fluvial and ice-contact stratified deposits (sand to silty sand), Type 6 and 7 soils shown as orange on Figure 6; and

3) Glaciolacustrine-derived silty to clayey till, Type 5 soils shown as green on Figure 6.

Organic deposits generally reflect the accumulation of peat in low-lying, poorly drained areas. These deposits are predominantly observed in wetlands located in the eastern and southern portions of the Study Area.

Ice-contact stratified soils represent silty-sand to sand and gravel deposition in glacial melt water channels. These soils are predominantly encountered east of the Study Area. Minor pockets of granular soils are noted along the fringe of the Study Area.

As shown on Figure 6, glacial till is encountered near ground surface throughout most of the Study Area and broader region. This regionally extensive glacial till deposit is generally referred to as Tavistock Till, a brown silty to clayey till. Along 2nd Line, overburden is predominantly comprised of glacial till, which ranges in thickness from approximately 5 to 15 m (Figure 5).

2.2.2 Palaeozoic Bedrock Geology

The Silurian bedrock formations underlying the Town comprise one of the most extensive bedrock aquifers in Ontario and represent the source of drinking water for the Town. The bedrock formations are composed of dolostone and shale sequences that reflect an active groundwater flow system generally ranging from 20 to 40 m in thickness. Figure 5 shows bedrock stratigraphy within the Study Area (along 2nd Line). Local bedrock stratigraphy, beginning with the youngest bedrock formation, is summarized as follows:

Guelph Formation: The Guelph Formation consists of medium to thickly bedded crinoidal grainstones and wackestones and reefal complexes (Brunton, 2008). It is the uppermost bedrock unit in the vicinity of the Town, with an observed thickness of 35 m near TW7-10 (encountered from approximately 489 to 454 metres above sea level (masl)). Due to its reefal structure, Guelph Formation is generally recognized as moderately permeable, water bearing bedrock aquifer.

Eramosa Formation: The Eramosa Formation consists of three members including, from youngest to oldest, the Stone Road Member, the Reformatory Quarry Member and the Vinemount Member. Approximately 5 m of Eramosa Formation (either Stone Road or Reformatory Quarry Members) was encountered near TW7-10 (from approximately 454 to 449 masl). This bedrock formation is generally recognized as cream coloured, coarsely crystalline dolostone. It often contains mud-rich and microbial mat-bearing lithofacies that may act as aquitard materials, resulting in a low vertical permeability (Brunton, 2008).

Goat Island Formation: The Goat Island Formation consists of two members; the lower Niagara Falls Member and the upper Ancaster Member. The Niagara Falls Member is a finely crystalline and cross laminated crinoidal grainstone with small reef mounds. The Ancaster Member is a chert rich, finely crystalline dolostone that is medium to ash grey in colour. Approximately 14 m of Goat Island Formation was encountered near TW7-10 (from approximately 449 to 436 masl). Due to its crystalline structure, the Goat Island Formation is generally regarded to have low vertical hydraulic conductivity and not significantly water bearing.

Gasport Formation: The Gasport Formation is a bluish grey to white cross-bedded crinoidal grainstone-packstone with sequences of reef mound and coquina (shell bed) lithofacies. This unit has been referred to as the Amabel Formation in previous hydrogeological investigations. Near TW7-10, the thickness of the Gasport Formation is approximately 28 m (from approximately 436 to 408 masl). The Gasport Formation is generally recognized as a highly permeable, water bearing aquifer. This deposit represents the groundwater supply source for many communities in southern Ontario, particularly along the Niagara Escarpment (e.g., Cambridge, Guelph, and Acton)

Bedrock Underlying Gasport Formation: Beneath the Gasport Formation are a series of bedrock deposits (Irondequoit, Rockway Formations) with marginal thicknesses (i.e., approximately 1 m or less). These bedrock deposits are underlain by the Fossil Hill Formation, which represents fine-grained non-calcareous shale with thin interbeds of sandstone and limestone. Due to its characteristically low hydraulic conductivity, the Fossil Hill Formation represents the base of the active groundwater flow system in the vicinity of the Town.

2.3 Hydrogeological Conceptual Model

Groundwater flow in the Guelph Formation, as interpreted within the Town's Groundwater Management and Protection Study (Burnside, 2002), is shown on Figure 7. The groundwater elevation in the bedrock, which has been inferred from MOE water well records, generally represents a subdued reflection of topography. Groundwater levels are highest in the vicinity of the watershed divides and slope toward perennial watercourses.

Due to the limited number of wells completed in the Gasport Formation, groundwater flow patterns within the Gasport Formation have not been well established. Recognizing the Study Area is located along a regional groundwater and watershed divide (i.e., separating two major watersheds of southern Ontario), it is reasonable to assume that the groundwater flow directions in the Gasport Formation are generally consistent relative to the overlying Guelph Formation.

Figure 8 shows the hydrogeological conceptual model developed for the Study Area, which is based on the results of previous hydrogeological investigations (see Table 1) and the EA field study results (discussed in Section 3 below). The conceptual model represents a multi-layer system conceptual model where:

- The Guelph Formation represents a shallow aquifer that receives groundwater recharge from local infiltration of precipitation through the glacial till overburden. Most of the groundwater recharge to the Guelph Formation flows horizontally towards the headwaters of the Boyne River and Willow Brook (in the vicinity of the Study Area). Some of the groundwater recharge to the Guelph Formation continues to drain vertically into the underlying bedrock deposits.

- Collectively, the Eramosa and Goat Island Formations are recognized as an aquitard, limiting downward seepage of water from the overlying Guelph Formation to the underlying Gasport Formation. As will be discussed in Section 3 below, the aquitard function of these deposits is evident from the groundwater response to TW7-10 pumping and the lower groundwater elevation observed in the Gasport Formation relative to that of the Guelph Formation.
- The Gasport Formation represents a regionally extensive deep aquifer, which is recharged from vertical seepage through the overlying aquitard. Groundwater in the Gasport Formation flows horizontally towards principal water courses (i.e., Grand River, Boyne River) located well beyond the Study Area.

2.3.1 Groundwater Use

The principal user of local groundwater is the Town, which is currently permitted for a maximum daily taking of 4,916 m^3/day from their four production wells (Wells 1, 3, 5 and 6). No other known water taking permits have been issued in the vicinity of the Study Area.

The remainder of groundwater use locally reflects private well use to service residential and agricultural needs.

3.0 ENVIRONMENTAL ASSESSMENT FIELD STUDIES

The Terms of Reference (ToR) for the EA required that target areas be identified for the purpose of exploration, and selection of one location for test well installation and performance testing to confirm availability and quality of a sustainable groundwater supply. Previous test drilling programs within the Town have been successful in the development of the municipal water supply system; however, not all test wells yielded an adequate supply. Based on the results of previous test drilling it was concluded that the investigation of potential additional groundwater supply sources should be conducted beyond the Town's current boundaries. The Project Steering Committee received direction from Town Council to expand the search area to within a radius of 5 km around the Town.

The logical sequence of tasks developed for the EA field studies are outlined as follows:

- Compilation and review of all available background hydrogeological information.
- Mapping and analysis of an updated MOE water well record database for wells located within the 5 km radius of the Town, to identify target test well areas potentially suitable for developing higher capacity test wells.
- Conduct a water well sampling program in the target areas to assess natural groundwater quality characteristics. Consider results relative to available research of natural source(s) of arsenic in groundwater supplies.
- Develop and recommend a test well drilling program, including potential test well areas.
- Obtain agreement with land owners for test well drilling and testing.

- Conduct test well drilling and a testing program at selected available site(s), to assess the potential for developing additional municipal groundwater supply of suitable quantity and quality.
- Prepare a technical report to present the findings of the EA field studies in support for the Municipal and Federal EAs.

Each of the above tasks was completed in support of the Class EA. This section describes the results of the desktop studies, preliminary field studies and site selection process for the test production well (TW7-10).

3.1 Preliminary Desktop and Field Studies

To determine potential test well exploration target areas, the following criteria were considered:

- Target areas need to be within a 5 km radius of the Town, which was considered to be a feasible distance for installing a watermain that could connect to the Town's distribution system;
- Minimize potential overlap with existing municipal well capture areas;
- The hydrogeologic conditions should exhibit the potential to develop a well that yields at least 1,346 m^3/day;
- A potable water supply source, preferably with negligible arsenic concentrations;
- Minimize interference with existing private wells; and
- Minimize potential effects on ecological and/or surface water features.

A review of available background hydrogeological information (as listed in Table 1) and MOE water well records were undertaken to support the selection of target areas within the 5 km of the Town. Initially three potential test well target areas were identified based on the criteria listed above. As shown on Figure 9, these target areas are located on the west side of Town, where:

1) Deep, water-bearing bedrock aquifers could be sourced to distribute the effects of groundwater pumping over broad areas (i.e., minimizing potential water resources impacts on any single watershed); and
2) A greater probability of higher well yields is generally observed west of Town.

3.1.1 Groundwater Quality Survey and Results

To assess groundwater quality in each target area, a well survey and sampling program was carried out. Well survey notices were distributed to well owners within the three initial target areas. Approvals were received from nine well owners, herein referred to as private well sampling locations (PWSL-1 through PWSL-9). The locations of the PWSLs are shown on Figure 9. It is noted that no well owners in Target Area 2 were willing to participate in the sampling program, but one well owner located just north of the area agreed.

As part of the well survey at PWSLs, Golder requested any available well construction details (e.g., type, depth, location) from the owners. A groundwater sample was collected from each of the PWSLs, and submitted to an accredited laboratory to perform the required analyses. Certificates of water quality analyses for the PWSLs are provided in Attachment A2 in Appendix A. The analytical results are summarized in Table A1 in Appendix A.

The individual results of the chemical analyses were distributed to the respective well owners and, where necessary, comments and recommendations were made with respect to the results. In all cases total hardness was above the operational guideline of 100 mg/L. In some samples, the concentration of iron and manganese were detected above the aesthetic objectives of the ODWQS. At PWSL No. 2, the concentration of arsenic was found to be above the ODWS of 25 μg/L. Golder provided detailed information to the well owner, indicating that arsenic is a known carcinogen and must therefore be removed by treatment where present at levels over this concentration. An arsenic fact sheet from Health Canada was included for reference, which also provided contact information should they wish to obtain more information. The well owner was also advised that another source of information related to arsenic in drinking water is the local Medical Officer of Health.

It is noted that all PWSLs were completed in bedrock, with the exception of PWSL No. 3 which represents a dug well completed within the shallow overburden. The arsenic levels in the samples collected from bedrock wells are summarized on Figure 9. The concentration of arsenic generally ranged from 0.5 to 5 μg/L. Lowest concentrations were encountered near PWSL Nos. 1 and 8.

3.1.2 Ontario Geological Survey Test Coring

Following consideration of the water quality data obtained from groundwater quality survey, combined with the desktop study results, it was apparent that target areas located on the west side of the Town could be capable of supporting the development of higher capacity production wells. However, in the interest of determining the natural source of arsenic in existing municipal and private wells in this area, additional information was sought.

The OGS, a Unit of the Ontario Ministry of Northern Development, Mines and Forestry, has a mandate to research and provide information on the geology of Ontario and how geology controls and influences groundwater flow, availability and quality. Information was provided by geoscience staff from the OGS, based on the results of current research being conducted in southern Ontario. This information indicated that arsenic occurs naturally in some areas in the shallow bedrock formation (i.e., Guelph Formation) that underlies the Town of Shelburne, among other locations. They explained that the arsenic levels in existing shallow bedrock municipal wells serving the Town were likely a result of the microbial degradation of pyrite under aerobic conditions. The presence of pyrite in some areas, while not present in others would account for some of the variability in arsenic levels.

Another factor that was important to the Town, the OGS research had determined that deeper bedrock formations did not exhibit the same characteristics as the shallow formation in terms of arsenic-producing conditions. Deeper bedrock formations have been developed in other communities for municipal wells, with negligible levels of arsenic. These deeper formations occur in areas west of the Town. Based on this work, they considered it was possible that a well completed in a deeper bedrock formation located up to 5 km west of the Town may meet the quantity and quality requirements of the Town. Subsequently, the OGS advised the Town that research funding was available to drill two cored test holes west of the Town, at locations to be established with assistance from Town Staff and the Project Team.

An area west of the Town was identified based on several factors, including geology, land use designation, proximity to surface water features, and distance to the municipal water supply system. Land owners in this area were approached by Town staff to determine willingness to enter into an agreement to permit test drilling. Based on the responses received, one test coring location (OGS 10A) was selected on 2nd Line southwest in

Melancthon Township, about 3 km west of Town, and the second test coring location (OGS 10B) adjacent to existing Municipal Wells PW5 and PW6.

OGS 10A and OGS 10B are 100-mm diameter holes, cored into the Cabot Head Formation. Installation of the cored holes was carried out under the supervision of the OGS in February and March 2010. Bedrock cores were retrieved for subsequent logging and geochemical analyses. Borehole logs for OGS 10A are provided in Appendix C. Various downhole investigative methods were utilized by the Project Team to evaluate the potential of developing a groundwater supply source from deeper bedrock formations. These methods included borehole geophysics and test pumping.

The test results indicated that the Gasport Formation at OGS 10A (located on 2nd Line) was moderately transmissive (i.e., water bearing fractures apparent) and likely capable of supporting the development of a municipal supply well. Water bearing fractures were not encountered within the bedrock deposits at OGS 10B, (located in proximity to Wells 5/6), therefore this location did not appear suitable for further groundwater supply development.

Based on the preliminary field study results, it was then decided that EA field studies should continue with a larger-diameter (i.e., 200 mm) test well located in proximity to OGS 10A. Performance testing of the test well could then be undertaken to confirm the groundwater quality and sustainability of pumping from deep bedrock deposits in proximity to OGS 10A. The test well drilling program and subsequent pumping tests are described in the sections below.

3.2 Test Well Drilling Program and Performance Assessment

Drilling and construction of the test well (TW7-10) was completed in July 2010 by Gerrits Drilling & Engineering. A borehole log and MOE water well record (in draft) for TW7-10 are provided in Appendix C. The primary goal of the test well was to evaluate the quantity and quality of groundwater available from the deeper bedrock formations (i.e., the Gasport Formation). The well was temporarily constructed with a 200-mm diameter steel casing set at about 11 m below grade, about 1 m below bedrock surface. A nominal 200-mm open hole was then drilled in the bedrock to a depth of 86.5 m. In order to isolate groundwater pumping from the Gasport Formation, an inflatable packer was seated at the bottom of the Eramosa Formation (i.e., 47 m below grade), with the pump set at a depth below the packer. The discharge line from the pump passed through the centre of the packer.

3.2.1 Conclusions of TW7-10 Performance Testing

A 72-hour groundwater pumping test was carried out at TW7-10 from November 29 through to December 2, 2010, in compliance with MOE PTTW No. 4820-895KBC. The purpose of the performance test was to assess the sustainable yield of the well and evaluate potential environmental effects of long term operation of TW7-10 (at 1,635 m^3/day). The methodology and results of the TW7-10 performance test are discussed comprehensively in Appendix D. Based on the interpretation of these data (as provided in Appendix D), conclusions developed from the results of the TW7-10 performance test are as follows:

1) Hydraulic parameters interpreted for the hydrostratigraphic layers in the vicinity of the Study Area are as summarized follows:

	Hydraulic Conductivity (m/s)	**Specific Storage** (m^{-1})	**Thickness** (m)
Unpumped Aquifer (Guelph Formation)	5 x10^{-5}	6 x10^{-5}	35
Aquitard (Eramosa and Goat Island)	5 x10^{-7}	1 x10^{-10}	18
Pumped Aquifer (Gasport Formation)	2 x10^{-5}	8 x10^{-5}	28

2) Steady-state groundwater pumping conditions had been observed at the conclusion of the 72-hour performance test. As a result, the groundwater level drawdown expected within the Guelph and Gasport Formations from long term pumping of TW7-10 (at 1,635 m^3/day) should be consistent with the observations at the conclusion of the test. These groundwater level drawdowns are expressed graphically on Figure 10. At distances greater than 450 m from TW7-10, groundwater level drawdown in both the Gasport and Guelph Formations are interpreted to be less than 0.5 m. In proximity to TW7-10, groundwater level drawdown should range from approximately 18 m in the Gasport Formation to 2 m in the Guelph Formation. Collectively, these results indicate a radius of influence of approximately 1 km from TW7-10. Recognizing the low horizontal hydraulic gradient in the Guelph Formation (approximately 0.004 m/m in the vicinity of the Study Area, as identified by the groundwater elevation contours shown on Figure 7), the zone of influence is likely to be skewed slightly towards the northwest.

3) The water source contributing to TW7-10 pumping (at 1,635 m^3/day) is summarized as follows:

Source	**Approximate Quantity** (m^3/day)	**Percentage of overall pumping rate**	**Where captured flow would have otherwise reported to**
Horizontal flow within deep aquifer capture area	235	14 %	Principal watercourses located well beyond Study Area (i.e., Boyne River, Grand River)
Drainage from Guelph Formation within Nottawasaga River Basin	~ 700	43 %	Reaches of the Boyne River
Drainage from Guelph Formation within Grand River Basin	~ 700	43 %	Reaches of Willow Brook
Total	1,635		

4) Pumped groundwater from TW7-10 meets all applicable ODWQS criteria, with the exception of Total Hardness (as $CaCO_3$). The ODWQS for Total Hardness is an operational guideline for drinking water supplies and the elevated levels are typical of groundwater in this area of Ontario. The concentration of arsenic in TW7-10 pumped groundwater remained below 4 µg/L. The low levels of arsenic concentrations are expected to reflect dissolution of arsenopyrite during drainage of groundwater through the overlying Guelph Formation.

   The quality of the groundwater pumped from the test well, based on the analyses conducted, is suitable for the development of a municipal drinking water supply. However, it must be emphasized that it is not possible to be certain that arsenic levels observed while testing the well will remain at this concentration. Continued monitoring of arsenic levels is required to establish longer-term trends, if any.

4.0 SUSTAINABLE OPERATION OF TW7-10

The groundwater pumping test results indicate that TW7-10 can sustain a minimum yield of 1,635 m^3/day in the long term. The maximum potential yield of TW7-10 will be constrained by the available drawdown within the well (i.e., primarily a function of well efficiency). The pumping level within the well should not be lowered below the top of the Gasport Formation (approximately 58 metres below ground surface (mbgs) or 438.5 masl). Exposure of Gasport Formation to atmospheric conditions could result in mineral precipitation within the borehole and reduced well efficiency in the long-term.

Following completion of the testing, the well was constructed in accordance with Ontario Regulation 903, with a steel well casing set at a depth of 47.0 mbgs. The 305 mm diameter casing was installed with a concrete annular seal placed from 47.0 m up to ground surface. A nominal 305 mm diameter open hole was drilled to a depth of 86.5 m. A water well record is presented in Appendix C. This well would be suitable for use as a municipal production well.

This section presents an evaluation of the potential environmental effects from long term pumping of TW7-10 at 1,635 m^3/day.

4.1 Effects on Local Groundwater Resources

Expected groundwater level drawdown in the shallow (Guelph Formation) and deep (Gasport Formation) bedrock deposits, from long term pumping of TW7-10 at 1,635 m^3/day, is shown on Figure 10. A 3 km^2 zone of influence is anticipated, where drawdown of groundwater levels are most significant near TW7-10 and insignificant along the fringe.

Less than 1 m of groundwater level drawdown is anticipated within private wells completed within the Guelph Formation. Based on the well depths reported within the MOE water well records (as shown on Figure 5), the operation of private wells should not be affected from long term operation of TW7-10.

4.2 Effects on Local Surface Water Resources

Surface water courses within the TW7-10 zone of influence primarily represent engineered drains in the upper reaches of the Willow Brook and the Boyne River. Due to their limited catchment area (due to proximity to the regional watershed divide), the water surplus within these headwaters vary significantly throughout the year. As noted in Section 2.1 (above) and within Appendix B, the daily water surplus of the Willow Brook catchment area (up-stream of the Highway 89 culvert crossing) ranges from about 11,000 m^3/day during the spring to no available surplus during the summer. The sensitivity of local water surpluses to seasonal weather trends is therefore noted.

In response to long term pumping from TW7-10 (at 1,635 m^3/day), groundwater contribution towards the local surface water features is expected to be reduced by approximately 700 m^3/day. During the spring season, seepage losses could represent approximately 6% of the water surplus. Dry conditions in the headwater areas currently exist during the summer months due to the lack of available water surplus. Relative to this seasonal variability, seepage losses from surface catchments (in response to TW7-10 pumping) should have no discernible effect on the variation of streamflow rate or temperature currently observed within local drainage features.

5.0 CONCLUSIONS

As part of an EA, a hydrogeological field study has been undertaken to determine the potential for developing additional groundwater supply in the vicinity of the Town of Shelburne. Based on the results of the field study, the following conclusions are submitted:

1) The Town of Shelburne has commissioned the installation of a test production well (TW7-10) located on the west side of 2nd Line, approximately 1,100 m north of Highway 89. The well extends to a total depth of 86.5 mbgs. Future operation of this well would draw water from the Gasport Formation, which is encountered from approximately 60.7 to 89.1 mbgs (equivalent to 435.9 to 407.5 masl). Over the long term, TW7-10 can sustain a yield of at least 1,635 m^3/day. It is acknowledged that this yield exceeds the required additional capacity of 1,067 m^3/day, to meet the Town's projected water supply requirements of 5,983 m^3/day in 2032. However, additional supply realised from a new production well and backup well, above the projected shortfall, could result in a greater overall water supply security for the Town of Shelburne by reducing demand from existing production wells.

2) Following completion of the testing program, the well was constructed in accordance with Ontario Regulation 903, with a steel well casing set at a depth of 47.0 mbgs. The 305 mm diameter casing was installed with a concrete annular seal placed from 47.0 m up to ground surface. A nominal 305 mm diameter open hole was drilled to a depth of 86.5 m. This well would be suitable for use as a municipal production well.

3) Steady-state pumping from TW7-10 (at 1,635 m^3/day) is sustained by:

   i) Seepage losses from the surface catchments over the 3 km^2 zone of influence; and

   ii) Horizontal groundwater flow in a deep bedrock aquifer from a 3 km^2 capture area.

4) Groundwater level drawdown in shallow and deep bedrock aquifers should not affect the operation of local private well owners.

5) Due to proximity to the regional watershed divide, surface water courses in the vicinity of TW7-10 have limited catchment areas. As such, the water surpluses of local surface catchments are sensitive to seasonal weather trends. Relative to this seasonal variability, seepage losses from surface catchments (in response to TW7-10 pumping) should have no discernible effect on the variation of streamflow rate or temperature currently observed within local drainage features.

6) Local wetland areas are underlain by glacial till soils and drained by engineered trenches at surface. Water levels in these areas did not respond to groundwater pumping from TW7-10 (over a 72 hour period). Since wetland areas are located towards the edge of TW7-10 zone of influence, seepage losses will be insignificant.

7) Based on water samples collected during performance testing of TW7-10, the quality of the groundwater is suitable for development of municipal supply.

8) Groundwater pumped from TW7-10 is interpreted to be not under the direct influence of surface water (i.e., non-GUDI).

6.0 RECOMMENDATIONS

In consideration of the results of the Class EA field studies, the following recommendations are provided:

1) The well constructed for the purpose of testing and assessment of a long-term sustainable groundwater supply source (i.e., TW7-10), should be considered as a preferred alternative for the purposes of the EAs.

2) To confirm the assessment of potential effects that may be realized from long term pumping of TW7-10 (at a rate of 1,635 m^3/day), an environmental monitoring program should be implemented. The components of the monitoring plan are provided in Table 3.

7.0 REFERENCES

Brunton, F.R., 2009. Update of Revisions to the Early Silurian Stratigraphy of the Niagara Escarpment: Integration of Sequence Stratigraphy, Sedimentology and Hydrogeology to Delineate Hydrogeologic Units. In Summary of Field Work and Other Activities 2009, Ontario Geological Survey, Open File Report 6240, p.25-1 to 25-20.

Brunton, F.R., 2008. Preliminary Revisions to the Early Silurian Stratigraphy of Niagara Escarpment: Integration of Sequence Stratigraphy, Sedimentology and Hydrogeology to Delineate Hydrogeologic Units. In Summary of Field Work and Other Activities 2008, Ontario Geological Survey, Open File Report 6226, p. 31-1 to 31-18.

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R.J. Burnside & Associates Limited (Burnside), 1992b. Town of Shelburne Well Evaluation Study of the Fabrizio and Robinson Wells (Draft Report). April, 1992.

R.J. Burnside & Associates Limited (Burnside), 1992c. Hydrogeological Assessment of Aquifer Potential, Town of Shelburne. July, 1992.

R.J. Burnside & Associates Limited (Burnside), 1989. Water Supply and Distribution Study, Town of Shelburne. January, 1989.

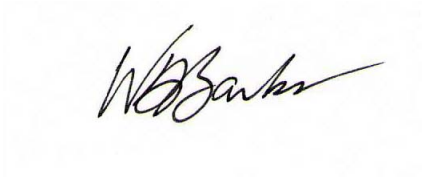
Sibul, V. and Coo-Ying, A.V., 1971. *"Water Resources of the Upper Nottawasaga River Basin"*, Ontario Water Resources Commission (OWRC). Water Resource Report Number 3.

8.0 CLOSURE

We trust that this draft hydrogeological report sufficiently supports the Town of Shelburne Groundwater Supply Class EA study. If you require any further clarification, please contact the undersigned.

Report Signature Page

GOLDER ASSOCIATES LTD.



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WDB/SMD/JLH/wlm/ll/wlm

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TABLES

Summary of Selected Background Reports
Groundwater Supply Studies

Report Title: Assessment of the Maple Heights and Lumber Mill Well Sites, Town of Shelburne
Report By: Hydrology Consultants Limited
Date: July, 1978
Outcome: The Maple Heights wells located in the north-western part of the Town could yield at least 100 Igpm continuously and possibly up to 980 m^3/day (150 Igpm). The Lumber Mill well located in the south-western part of the Town was calculated to have a safe perennial yield of 1,640 m^3/day (250 Igpm), without causing interference with PW3 and other existing wells.

Report Title: Report on the Construction and Testing of Production Well No. 5, Town of Shelburne
Report By: Hydrology Consultants Limited
Date: February, 1979
Outcome: A production well was constructed and tested, which confirmed an available perennial supply of 1,310 m^3/day (200 Igpm). The well was located in the vicinity of the Maple Heights wells. It was recommended that this well be equipped as a municipal supply well to pump up to 1,640 m^3/day (250 Igpm). This well was initially referred to as PW5, but was re-named PW3 sometime before 1992, and continues to be PW3 in 2012.

Report Title: Groundwater Study of the Shelburne Area for the Town of Shelburne
Report By: Hydrology Consultants Limited
Date: May, 1979
Outcome: An evaluation of the four existing municipal wells and the new well (*i.e.,* PW1, PW2, PW3, PW4, and PW5) indicated a combined capacity of 3,760 m^3/day (575 Igpm). Testing of PW1 and PW2 was recommended to confirm their respective maximum safe yield. It was also recommended that a test drilling program be conducted to determine potential additional municipal well sites. The recommended four test drilling sites within the Town's boundaries were located as follows: 1) west of PW5, 2) south of PW5, 3) south of Hwy. 89 and west of the CPR (Lumber Mill well site), and 4) between Victoria St. and the CPR in the south end of Town.

Report Title: Preliminary Report on the Hydrogeologic Assessment of Municipal Test Well TW4/83, Constructed for the Town of Shelburne, County of Dufferin
Report By: Morrison Beatty Limited
Date: March 1984
Outcome: Four deep test wells were drilled, ranging in depth from 248 to 478 feet. Well records indicate each well ended in the shale formation underlying the dolostone formation. Three of the wells were located in the southeast area of Town, while the fourth (TW4/83) was located just west of PW5. A pumping test on TW4/83 determined a safe perennial yield of at least 590 m^3/day (90 Igpm). Construction of a larger diameter well was recommended and it was estimated that it would yield up to 1,310 m^3/day (200 Igpm).

Summary of Selected Background Reports
Groundwater Supply Studies

Report Title: Water Supply and Distribution Study, Town of Shelburne
Report By: R.J. Burnside & Associates Limited
Date: January 1989
Outcome: A summary of the municipal production wells indicated PW2 and PW5 are currently in regular service, with reported capacities of 1,310 and 3,270 m^3/day (200 and 500 Igpm), respectively. PW1 was to be placed back in service during 1989, once the pump had been replaced. PW3 had been abandoned due to high sulphur levels. PW4 is only used for emergencies as it interferes with local private wells. This report indicates that PW5 became a municipal production well in 1979. A hydrogeologic study has also been initiated to identify potential new municipal well locations within Town limits to increase capacity by as much as 2,290 m^3/day (350 Igpm).

Report Title: Town of Shelburne Well Evaluation Study Analysis of PW2
Report By: R.J. Burnside & Associates Limited
Date: January 1992
Outcome: Gas observed in the form of small bubbles in the water from PW2 was determined to be carbon dioxide. To reduce the production of carbon dioxide it was recommended that the pumping rate of PW2 be reduced to 980 m^3/day (150 Igpm). It was recognized that an assessment of the existing municipal wells should be completed in light of the declining static levels and pumping levels and the loss of production from PW2. It was also recommended that a study be completed to identify potential test drilling locations to develop additional municipal wells to meet the long-term needs of the Town. (Note: PW5 has been re-named as PW3.)

Report Title: Town of Shelburne Well Evaluation Study Analyses of the Fabrizio and Robinson Wells
Report By: R.J. Burnside & Associates Limited
Date: April 1992 (Draft Report)
Outcome: The present maximum safe system capacity appears to be 450 Igpm, with each of the present wells yielding an equivalent amount of 980 m^3/day (150 Igpm) (i.e. wells PW1, PW2, and PW3 [previously named PW5]). An immediate requirement for an additional supply of 1,930 m^3/day (295 Igpm) was identified. Testing of the Fabrizio Well (PW1-89) and the Robinson Well confirmed well yields of 1,960 and 1,640 m^3/day (300 and 250 Igpm) respectively. With some exceptions, water quality met all Ontario Drinking Water Objectives. Treatment of iron was anticipated. It was recommended that further drilling and testing be conducted at these two sites to potentially establish additional municipal production wells. An assessment of existing municipal wells remained from the previous report as a recommendation.

Report Title: Hydrogeological Assessment of Aquifer Potential, Town of Shelburne
Report By: R.J. Burnside & Associates Limited
Date: July 1992
Outcome: An additional groundwater supply of 1,640 m^3/day (250 Igpm) is required immediately. Three high yield well field areas were identified as having municipal well potential, one area included the Fabrizio and Robinson test well area. The other two areas were identified east of the Town boundaries, south of Hwy 89. The Fabrizio and Robinson test well area was identified as the preferred area for additional drilling and testing.

Summary of Selected Background Reports
Groundwater Supply Studies

Report Title: Town of Shelburne Water Supply Environmental Study Report
Report By: R.J. Burnside & Associates Limited
Date: February 1993
Outcome: A Municipal Class Environmental Assessment was completed as a Schedule C project. This is the required Environmental Study Report, which identifies alternative planning options and selects the preferred alternative, and identifies alternative design concepts for the preferred solution. The preferred solution presented in this report was development of production wells at both the Fabrizio and Robinson well sites and that if results are adequate a pumphouse should be constructed at the Fabrizio site. A pumphouse at the Robinson site could be constructed at some time in the future.

Report Title: Hydrogeological Report on Two New Municipal Water Supply Wells, Town of Shelburne
Report By: R.J. Burnside & Associates Limited
Date: September 1993
Outcome: Two municipal production wells were constructed and tested as recommended in the ESR. PW1-93 was located adjacent to the Fabrizio Well (PW1-89). PW2-93 was located near the Robinson well. Testing determined that the yield for PW1-93 was 1,960 m^3/day (300 Igpm), which will meet the immediate needs of the Town. The yield for PW2-93 was determined to be 1,050 m^3/day (160 Igpm). It is noted that PW1-93 would become municipal production well PW5 and PW1-89 would become municipal production well PW6.

Report Title: Groundwater Under Direct Influence of Surface Water (GUDI) Study, Shelburne Production Wells PW1, PW2, PW3, PW5 and PW6
Report By: R.J. Burnside & Associates Limited
Date: June 2002
Outcome: Results of the study determined that PW1 is identified as a GUDI well, but PW2, PW3, PW5 and PW6 are identified as not being GUDI.

Report Title: Groundwater Management and Protection Study, Town of Shelburne
Report By: R.J. Burnside & Associates Limited
Date: November 2002
Outcome: A summary of historical well development in the Town and current municipal production wells is included. From 1945 to 2000, a total of 37 private and municipal wells were drilled within the Town's current boundaries. PW1 and PW2 were constructed in the 1950's. PW3 (as reported above) was constructed in 1979 and PW5 and PW6 in 1993 and 1989 respectively. This extensive report includes details related to: groundwater resources assessment, water budget and water use, groundwater flow modelling, contaminant sources assessment, aquifer vulnerability assessment, and groundwater management strategies, all in accordance with the MOE Technical Terms of Reference. Detailed capture zone analyses were recommended to assist with identifying potential future municipal production well sites. It was recommended that areas to the northwest and southwest of Town be considered in this evaluation.

Summary of Selected Background Reports
Groundwater Supply Studies

Report Title: Final Master Servicing Study, Town of Shelburne

Report By: R.J. Burnside & Associates Limited

Date: September 2003

Outcome: The existing water supply system was determined to be sufficient to meet the needs for a population of 6,700 people in the Town. It was recommended that the Town include the development of an additional water supply in the 20 year plan so that the supply would be available prior to being required. The firm well capacity at this time was reported to be 5,490 m^3/day (840 Igpm) and it was concluded that this should be capable of providing the 20 year maximum day demand for the community.

Report Title: 2008 Permit To Take Water Annual Monitoring Report, Town of Shelburne

Report By: R.J. Burnside & Associates Limited

Date: March 2009

Outcome: The total combined Permitted capacity of municipal production wells PW1, PW2, PW3, PW5, and PW6 was 5,890 m^3/day (900 Igpm) and the maximum day flows for each well during 2008 was less than the Permitted amounts. Water supply demand in 2008 was found to be less than the three preceding years. A significant loss in capacity in PW2 was described.

Report Title: Groundwater Vulnerability Analysis, Issues Evaluation and Threats Assessment - Final, Town of Shelburne

Report By: R.J. Burnside & Associates Limited

Date: July 2010

Outcome: Provides delineation of wellhead protection areas for all current municipal production wells based on permitted capacities (same as above in 2008). Also included in accordance with the MOE Source Protection Technical Studies requirements are: a description of the physical setting, aquifer vulnerability analysis, vulnerability scoring, vulnerability uncertainty assessment, issues evaluation, list of drinking water threats, threats inventory, identification of significant drinking water threats, prioritization of threats, and uncertainty of threats assessment.

Table 2
Updated Hydrostratigraphy

<table>
<tr><th colspan="2">Revised Conceputualization Formation / Member</th><th colspan="2">Previous Conceptualization Formation / Member</th></tr>
<tr><td colspan="2">Overburden</td><td colspan="2">Overburden</td></tr>
<tr><td rowspan="2">Guelph Formation</td><td>Hanlon Member</td><td colspan="2" rowspan="2">Guelph Formation</td></tr>
<tr><td>Wellington Member</td></tr>
<tr><td rowspan="3">Eramosa Formation</td><td>Stone Road Member</td><td rowspan="5">Amabel Formation</td><td rowspan="2">Eramosa Member</td></tr>
<tr><td>Reformatory Quarry Member</td></tr>
<tr><td>Vinemount Member</td><td rowspan="3">Wiarton / Colpoy / Lions Head Members</td></tr>
<tr><td>Goat Island Formation</td><td>Ancaster / Niagara Falls Members</td></tr>
<tr><td>Gasport Formation</td><td>Gothic Hill Member</td></tr>
<tr><td colspan="2">Rochester / Irondequoit / Rockway / Merritton Formations</td></tr>
<tr><td colspan="2">Fossil Hill Formation</td><td colspan="2">Cabot Head / Reynales Formation</td></tr>
</table>

SOURCE: Brunton, 2009

Table 3
Recommended Monitoring Program Supporting Long Term Operation of TW7-10

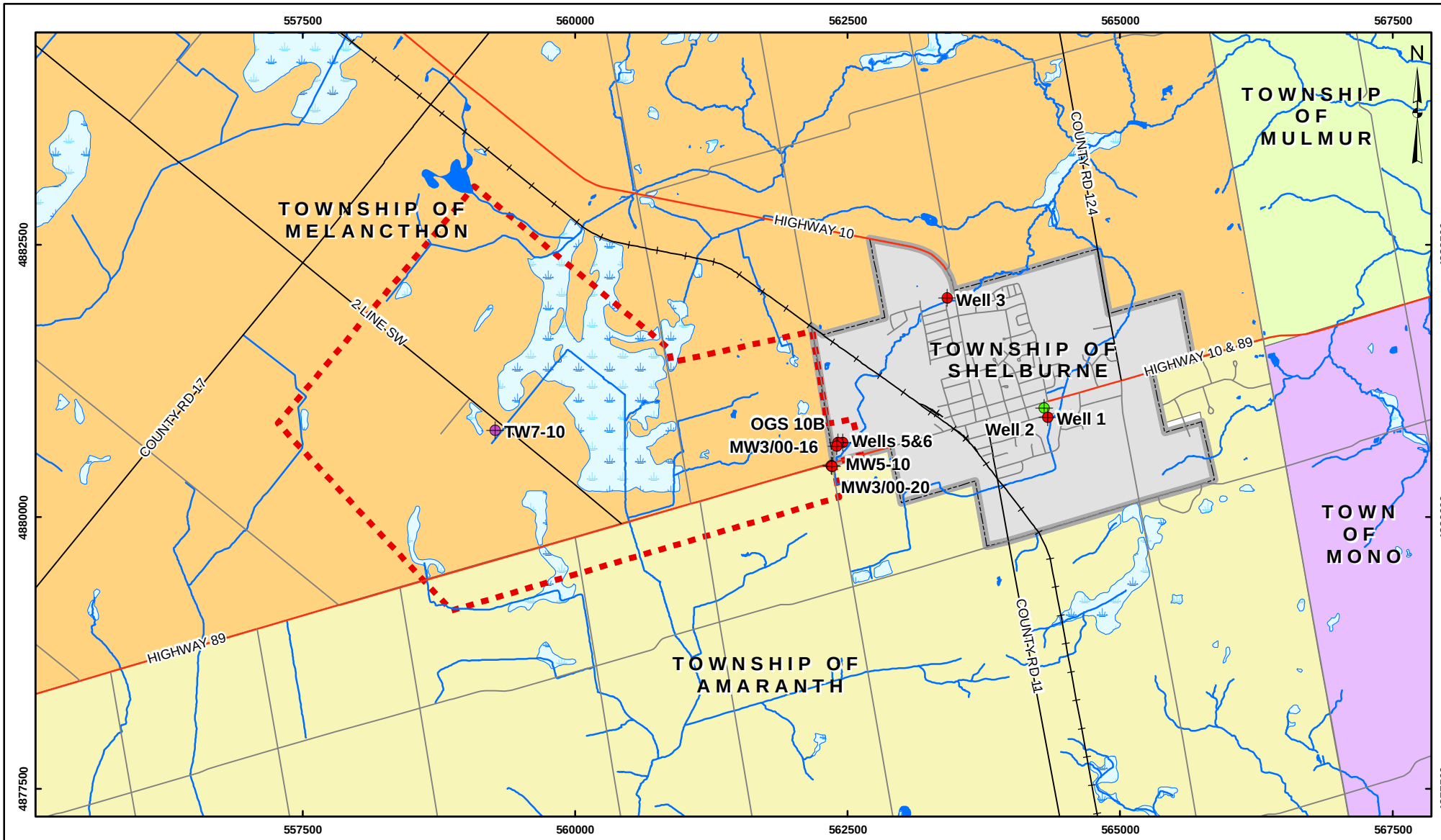
1. Continuous groundwater elevation monitoring at the following locations, with semi-annual (twice per year) manual measurements:

Well	Type	Hydrostratigraphic Layer
MW6/10-9	Municipal Monitoring Well	Overburden
WNOW4ABC-06	OGS Test Well	Guelph to Gasport

2. Development of a rating curve and continuous monitoring of surface water elevation at the Willow Brook crossing of Highway 89.

4. Following 5 years of TW7-10 operation, collected monitoring data should be summarized in a hydrogeological monitoring report. The report should include a discussion of any observed effects with respect to operation of TW7/10.

FIGURES



LEGEND

- Existing Municipal Well
- Former Municipal Well
- Test Production Well
- Highway
- Major Road
- Local Road
- Railway (Abandoned)
- Watercourse
- Waterbody
- Wetland (MNR LIO 2009)
- Town of Shelburne Boundary
- Hydrogeologicial Study Area

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

1 0.5 0 1 2
SCALE 1:50,000 Kilometers

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE
TOWN LOCATION AND STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	14 Nov. 2008		
GIS	PRM	8 Mar. 2012		
CHECK	SMD	8 Mar. 2012		
REVIEW	SMD	Oct. 2012		

FIGURE: 1

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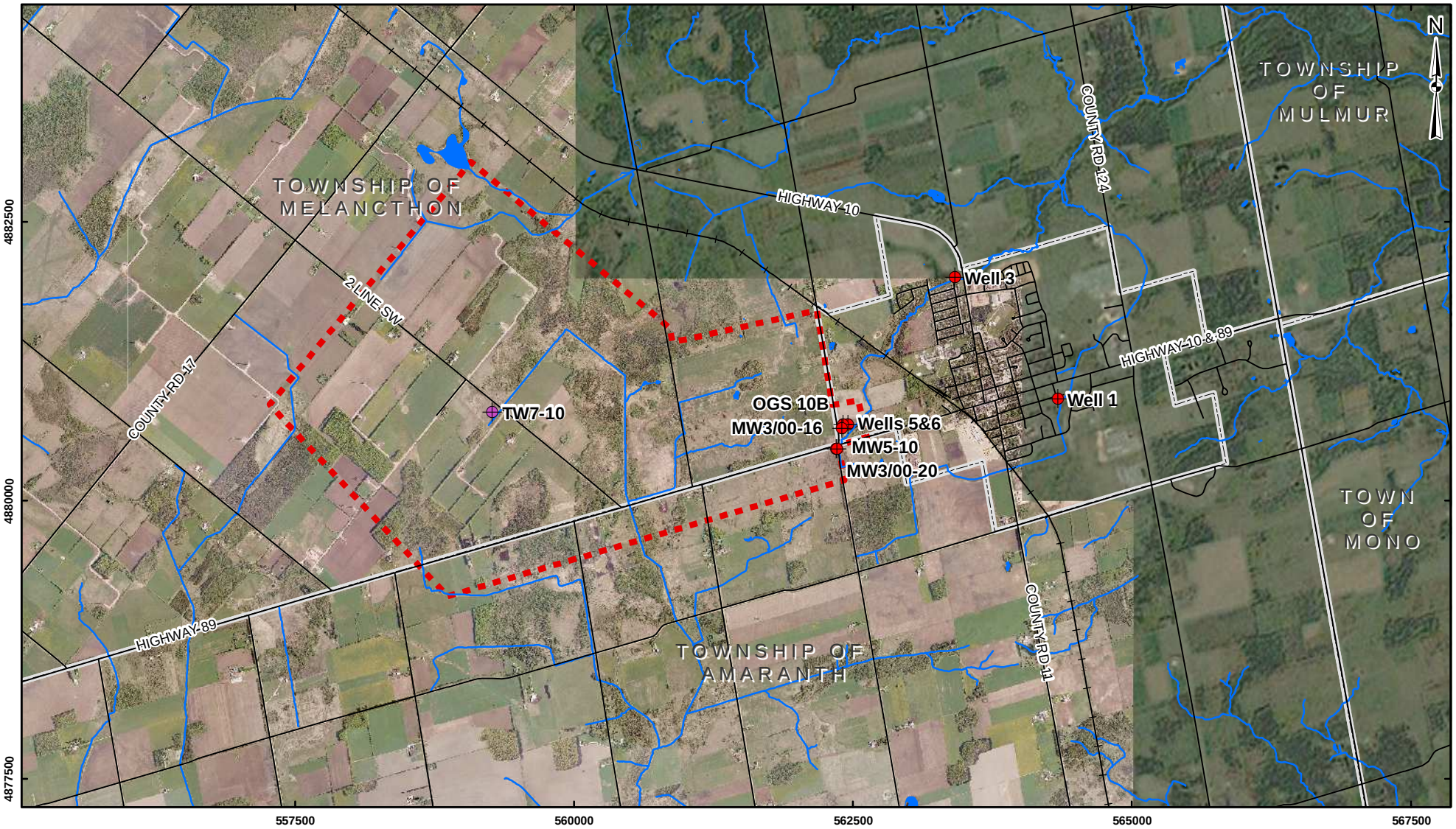

LEGEND

- Existing Municipal Well
- Test Production Well
- Road
- Railway (Abandoned)
- Watercourse
- Waterbody
- Municipal Boundary
- Hydrogeologicial Study Area

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
Imagery: GRCA (2006); ESRI World Imagery dataset
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

1 0.5 0 1 2
SCALE 1:50,000 Kilometers

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE
LAND USE

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	14 Nov. 2008		
GIS	PRM	8 Mar. 2012		
CHECK	SMD	8 Mar. 2012		
REVIEW	SMD	Oct. 2012		

FIGURE: 2

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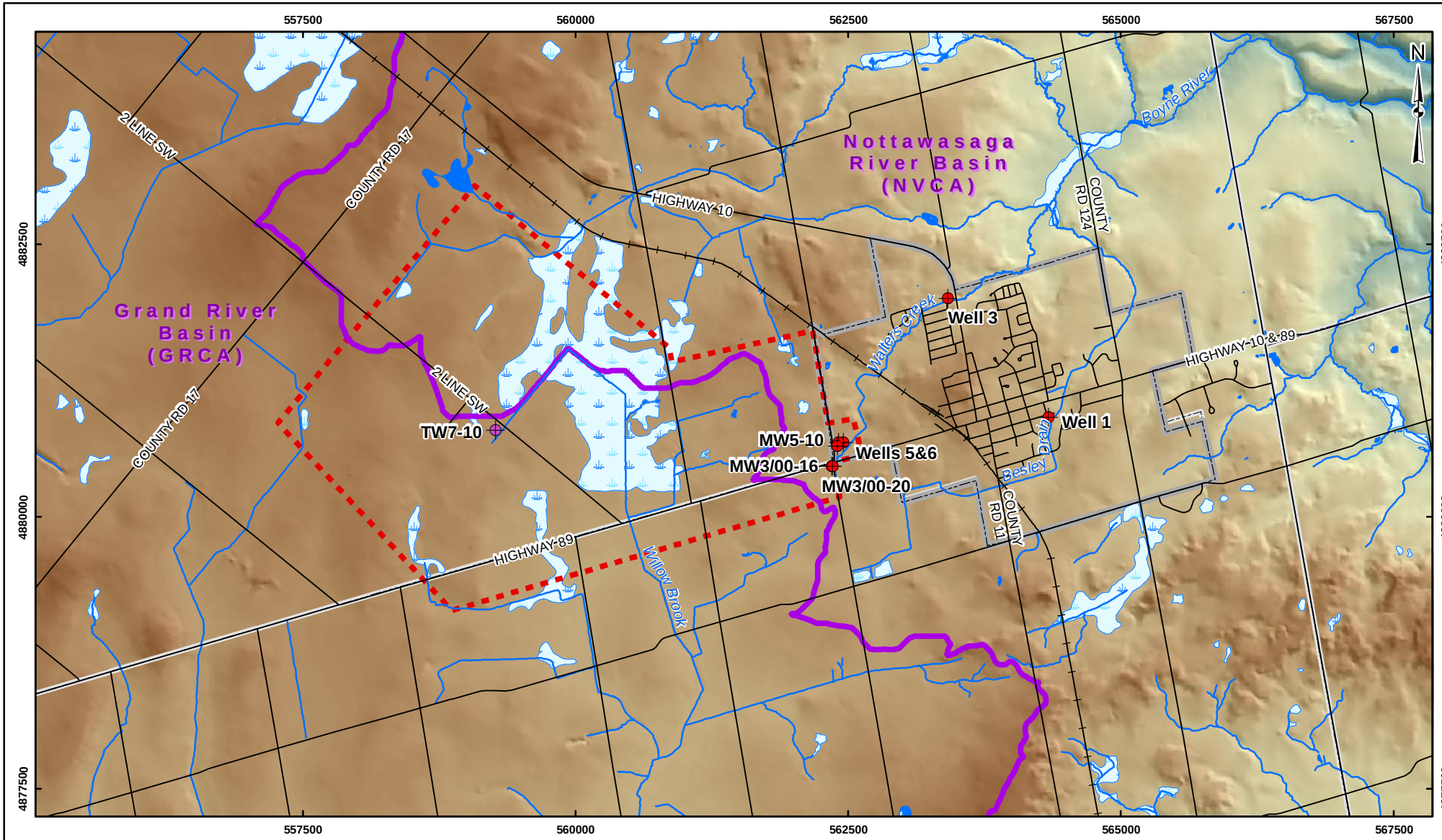

LEGEND

- Existing Municipal Well
- Test Production Well
- Road
- Railway (Abandoned)
- Watercourse
- Waterbody
- Wetland (MNR LIO 2009)
- Watershed Divide
- Municipal Boundary
- Hydrogeologicial Study Area

Elevation (masl)

High : 515

Low : 435

1 0.5 0 1 2

SCALE 1:50,000 Kilometers

PROJECT

TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE

TOPOGRAPHY AND DRAINAGE

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	14 Nov. 2008		
GIS	PRM	24 Jan. 2012		
CHECK	SMD	24 Jan. 2012		
REVIEW	SMD	Oct. 2012		

FIGURE: 3

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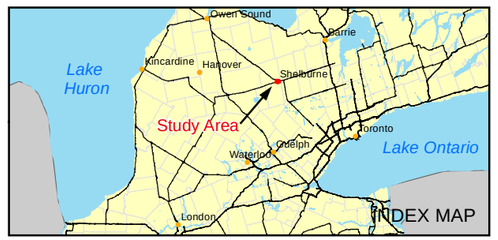
LEGEND

- 1700396 MOE Water Well Record No.
- Domestic Well
- Municipal Monitoring Location
- Test Production Well
- Cross-Section Location (Shown on Figure 5)
- Road
- Railway (Abandoned)
- Watercourse
- Waterbody
- Wetland (MNR LIO 2009)
- Town of Shelburne Boundary
- Municipal Boundary



REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
MOE Well Records - MOE 2009
Imagery: GRCA (2006); ESRI World Imagery dataset
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

250 125 0 250 500 750
SCALE 1:15,000 METRES

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE
LOCAL WATER WELLS

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	7 Mar. 2012		
GIS	PRM	7 Mar. 2012		
CHECK	SMD	7 Mar. 2012		
REVIEW	SMD	Oct. 2012		

FIGURE: 4

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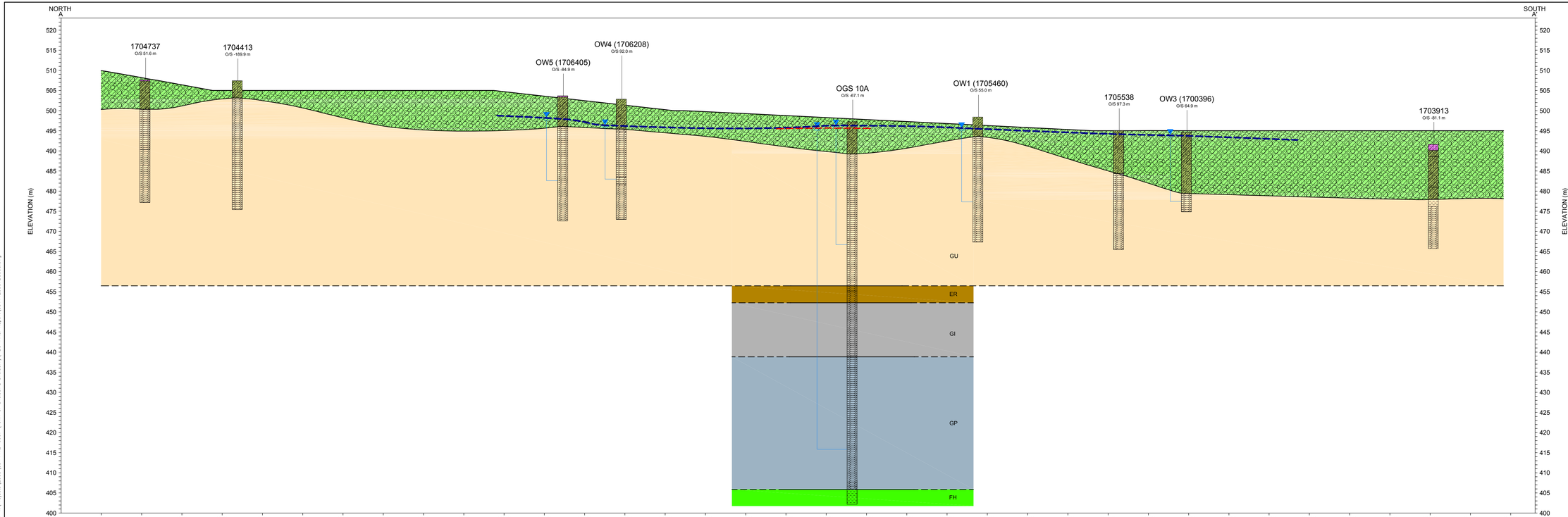


SOIL/LITHOGICAL DESCRIPTIONS:

- TOPSOIL
- CLAYEY SAND
- GLACIAL TILL
- SHALE
- DOLOMITE

INTERPRETED HYDOSTRATAGRAPHIC:

- OVERBURDEN - TILL
- GU — GUELPH FORMATION
- ER — ERAMOSA FORMATION
- GI — GOAT ISLAND FORMATION
- GP — GASPORT FORMATION
- FH — FOSSIL HILL FORMATION

LEDGEND:

- 1703913 — MOE WATER WELL RECORD NUMBER
- WATER LEVEL MEASURED IN NOVEMBER 2010
- INFERRED GROUNDWATER IN GUELPH FORMATION
- INFERRED GROUNDWATER IN GASPORT FORMATION

NOTES:

1. BEDROCK OF THE IRONDEQUOIT AND ROCKWAY FORMATIONS HAVE BEEN INCORPORATED INTO THE GASPORT FORMATION.

SCALE HORIZ. 1:5000 — 100 0 100 200 METRES

SCALE VERT. 1:500 — 10 0 10 20 METRES

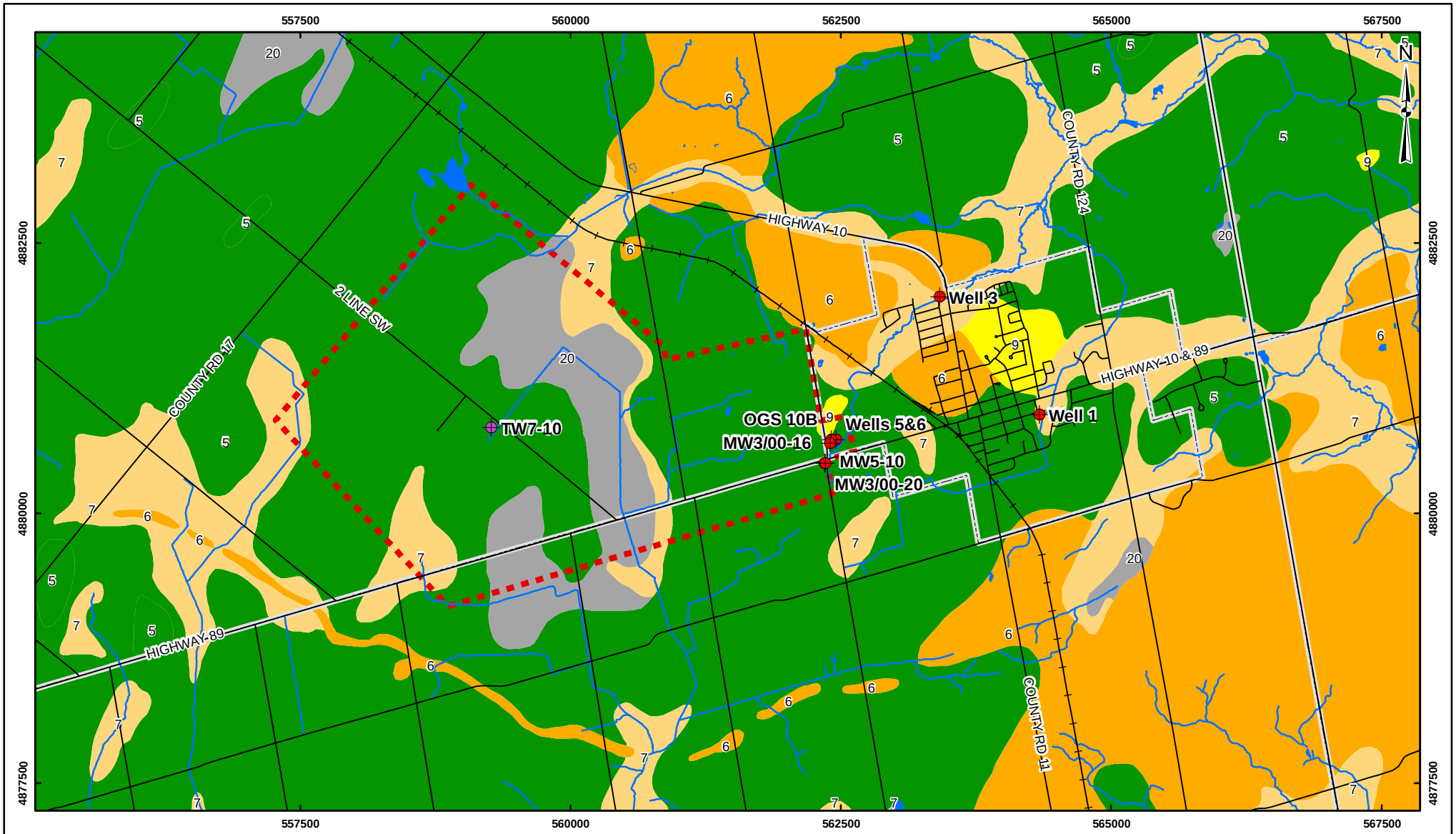
PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE
CROSS-SECTION A-A'

Golder Associates
Mississauga, Ontario, Canada

PROJECT No.	09-1112-6007	FILE No.	09111260078D005.dwg
DESIGN		2/10/2012	SCALE AS SHOWN REV.
CAD	CD	12/6/2012	DRAWING No.
CHECK	JH	12/6/2012	5
REVIEW	SMD	Oct. 2012	

PLOT DATE: December 6, 2012
FILENAME: \\Projects_00-09\09-1112--6007 (Town of Shelburn, Shelburn)_e-BC--Final Report\09111260078D005.dwg



LEGEND

- Existing Municipal Well
- Test Production Well
- Road
- Railway (Abandoned)
- Watercourse
- Waterbody
- Municipal Boundary
- Hydrogeologicial Study Area
- 5: Glacial till
- 6: Ice-contact stratified deposits
- 7: Glaciofluvial deposits
- 9: Coarse-textured glaciolacustrine deposits
- 20: Organic deposits

SCALE 1:50,000

1 0.5 0 1 2 Kilometers

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

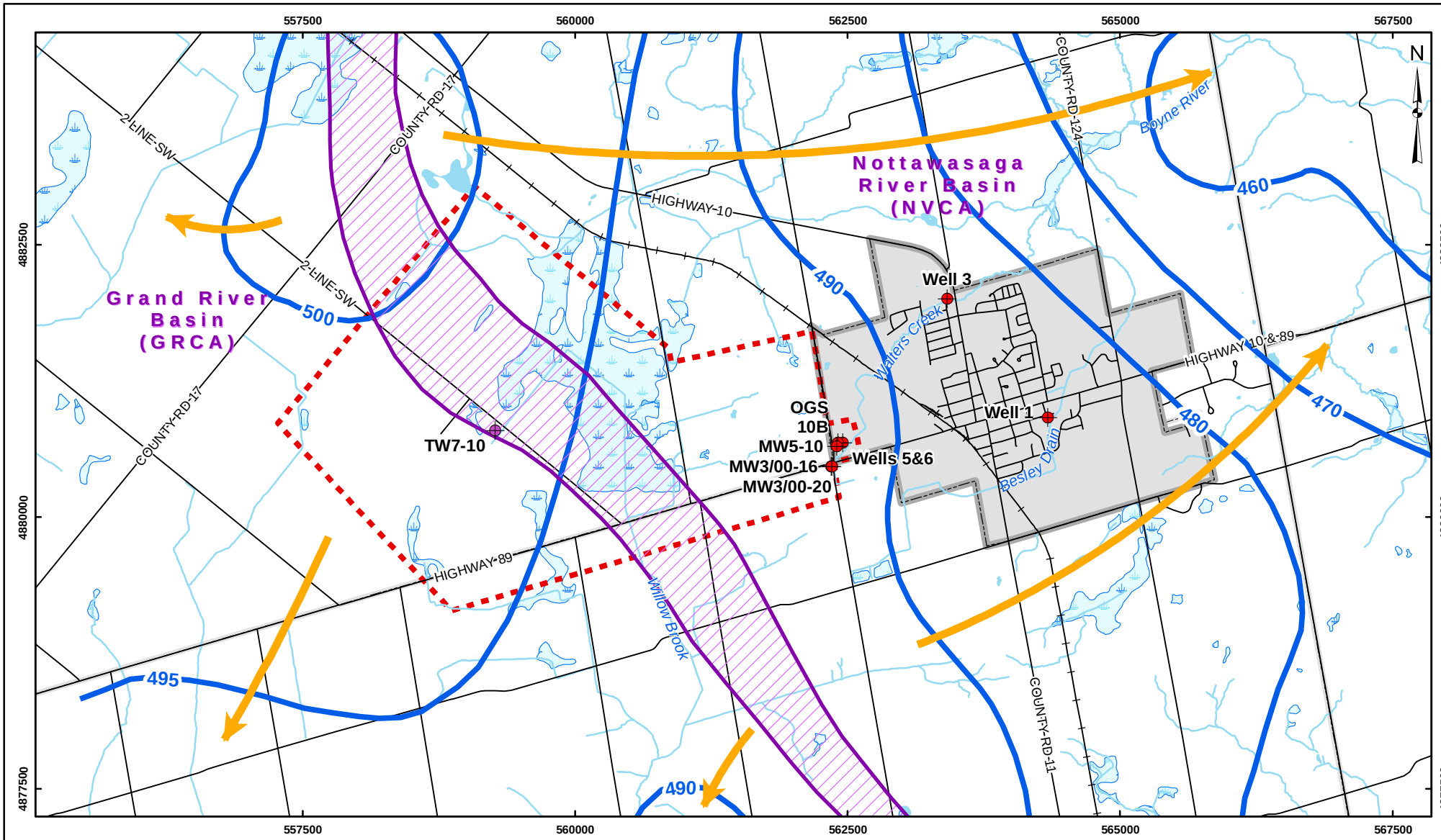
TITLE
QUATERNARY GEOLOGY

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	14 Nov. 2008		
GIS	PRM	8 Mar. 2012		
CHECK	SMD	8 Mar. 2012		
REVIEW	SMD	Oct. 2012		

FIGURE: 6

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\Draft\Hydrogeo_Report\Quat_Geology.mxd



LEGEND

- Existing Municipal Well
- Test Production Well
- Road
- Railway (Abandoned)
- Inferred Groundwater Flow Direction
- Approximation of Groundwater Elevation Contour (Burnside 2002)*
- Watercourse
- Waterbody
- Wetland (MNR LIO 2009)
- Regional Groundwater Divide
- Town of Shelburne Boundary
- Hydrogeologicial Study Area

1 0.5 0 1 2

SCALE 1:50,000 Kilometers

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4

* - Groundwater contours taken from Figure 3.9 of Town of Shelburne Groundwater Management and Protection Study (Burnside, 2002). Contours have been modified along 2nd Line, based on groundwater elevation monitoring undertaken as part of EA Field Studies.

Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2011

Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

PROJECT

TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE

GROUNDWATER FLOW IN GUELPH FORMATION

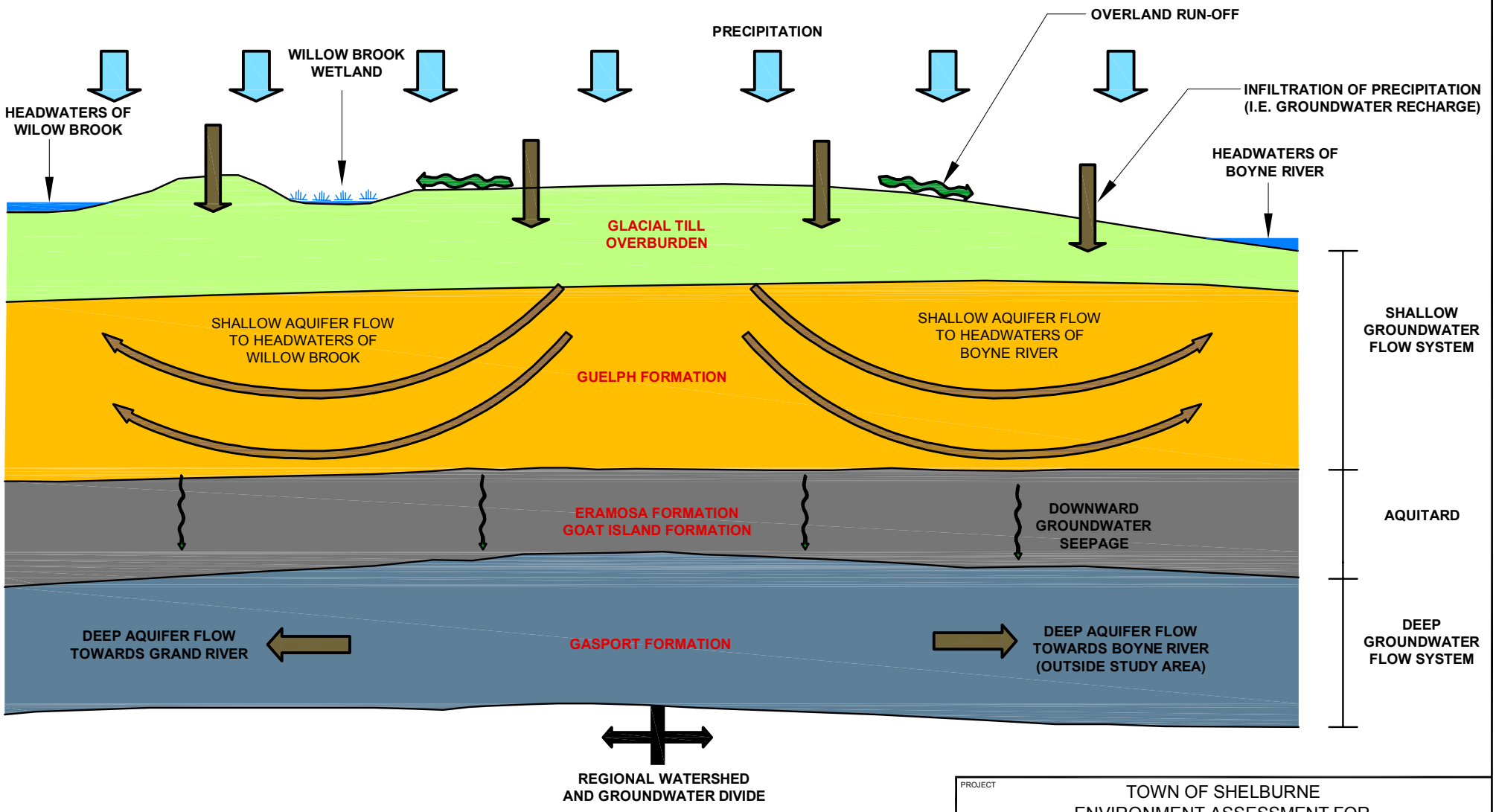
Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	14 Nov. 2008		
GIS	PRM	3 Feb. 2012		
CHECK	SMD	3 Feb. 2012		
REVIEW	SMD	Oct. 2012		

FIGURE: 7

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\Final\EA_for_Additional_Water_Supple\Groundwater_Flow_Guelph_Formation.mxd

PLOT DATE: December 6, 2012
FILENAME: T:\Projects\2009\09-1112-6007 (Town of Shelburn, Shelburn)\-BC-Final Report\0911126007BC008.dwg



PROJECT

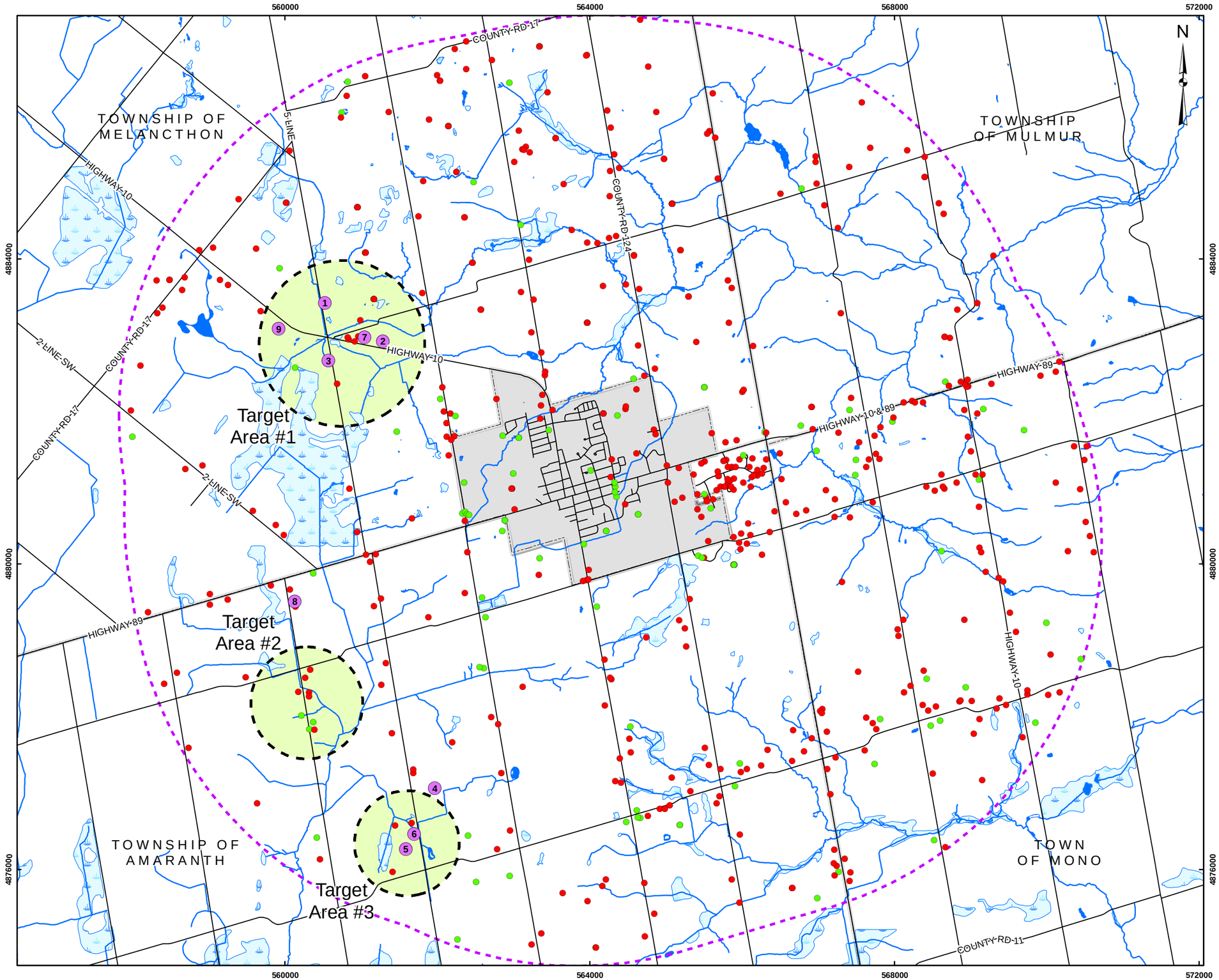
TOWN OF SHELBURNE
ENVIRONMENT ASSESSMENT FOR
ADDITIONAL WATER SUPPLY

TITLE

CONCEPTUAL MODEL OF GROUNDWATER FLOW WITHIN STUDY AREA

Golder Associates
Mississauga, Ontario, Canada

PROJECT No.		09-1112-6007	FILE No.	0911126007BC008.dwg
DESIGN			SCALE AS SHOWN	REV. A
CAD	DD/KD	March 12, 2012	FIGURE No.	
CHECK	SMD	March 12, 2012		8
REVIEW	SMD	Oct. 2012		



LEGEND

- MOE Water Well Record locations where potential yield indicated to be in excess of 160 m³/day
- MOE Water Well Record locations where potential yield indicated to be less than of 160 m³/day
- Private Well Water Quality Sampling Location (PWSL)
- Road
- Watercourse
- Waterbody
- Wetland (MNR LIO 2009)
- Municipal Boundary
- 5 km Buffer around Town Boundary

PWSL	Concentration of Arsenic (mg/L)
1	0.0005
2	0.0262
3	0.0008
4	0.0054
5	0.0026
6	0.0047
7	0.0053
8	0.0005
9	0.0014

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4
MOE Well Records - MOE 2009
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

1 0.5 0 1 2
SCALE 1:50,000 KILOMETERS

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

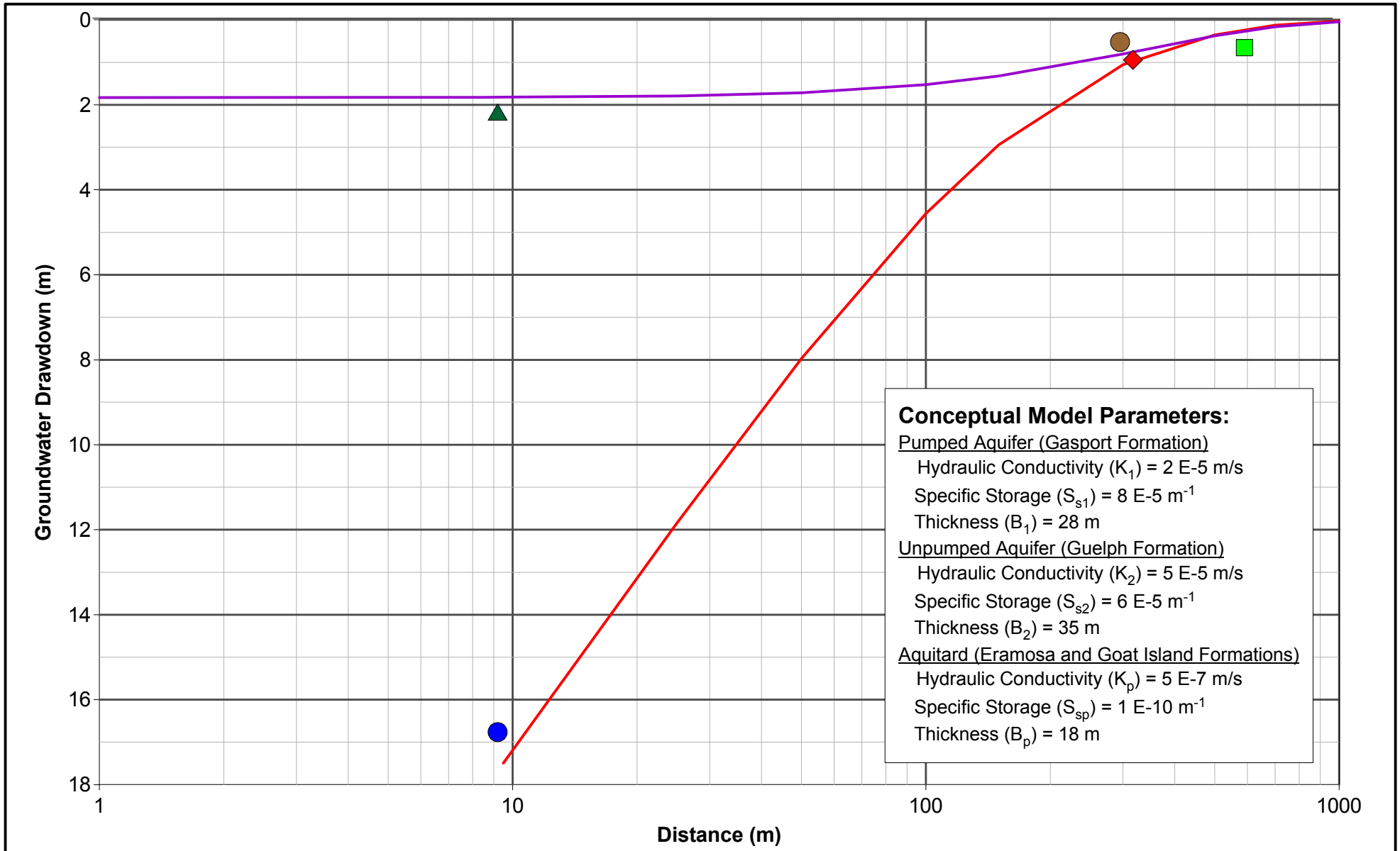
TITLE
PRELIMINARY WATER EXPLORATION TARGET AREAS

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	27 Aug. 2009		
GIS	PRM	8 Mar. 2012		
CHECK	JH	8 Mar. 2012		
REVIEW	SMD	Oct. 2012		

FIGURE: 9

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\FinalEA_for_Additional_Water_Supply\Prelim_Target_Areas.mxd



Town of Shelburne
Environmental Assessment
For Additional Water Supply

Model and Observed Drawdown Versus Distance

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: 10

APPENDIX A

Water Quality and Water Well Surveys

Table of Contents

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2.0 WELL SURVEY AND SAMPLING PROGRAM 2

3.0 WATER QUALITY RESULTS 2

4.0 CONCLUSIONS 3

TABLE

Table A1 Water Quality Results from Private Wells

FIGURE

Figure A1 Locations of Private Water Quality Sampling Areas

ATTACHMENTS

Attachment A1 Well Survey Notice
Attachment A2 Certificates of Analysis
Attachment A3 Sample Letters of Results to Private Well Owner

1.0 INTRODUCTION

The Town of Shelburne (the Town) is undertaking Municipal and Federal Environmental Assessments (EA's) to identify the preferred alternative for developing additional municipal groundwater supply. Part of the field studies supporting the EA's was to assess groundwater quality in each target area, a well survey and sampling program was carried out. The purpose of this assessment was to identify the sustainable yield and evaluate potential environmental effects from the long term operation of TW7-10. This Technical Appendix (Appendix A) of the Hydrogeological Report (HR) presents the factual results of well survey and water well sampling program.

2.0 WELL SURVEY AND SAMPLING PROGRAM

Following a review of available background hydrogeological information and MOE water well records, three potential test well target areas (within 5 km of the Town) were identified to conduct a well survey and water quality sampling program. These three target areas, as shown on Figure A1, are located to the west of Town where:

1) Deep, water-bearing bedrock aquifers could be sourced to distribute the effects of groundwater pumping over broad areas (i.e., minimizing potential water resources impacts on any single watershed); and

2) A greater probability of higher well yields is generally observed west of Town.

To assess groundwater quality in each of the three target areas, a well survey and sampling program was carried out. Staff from the Town of Shelburne distributed well survey notices (Attachment A1) to a total of 34 well owners within the three initial target areas (15 in Target Area 1, 9 in Target Area 2 and 10 in Target Area 3). Nine of the 34 well owners gave permission to collect a water quality sample from their well. Private well sampling locations (PWSL-1 through PWSL-9) are shown on Figure A1. It is noted that no well owners in Target Area 2 were willing to participate in the sampling program, but one well owner located just north of the area agreed.

Well owners wishing to have their wells sampled were contacted by staff from Gerrits Drilling & Engineering (a project team member) who arranged a time to collect a water sample. All water samples were collected between November 4 and November 11, 2009, following standard sample collection protocol. Samples were delivered to the same accredited laboratory retained by the Town for regular analysis of drinking water samples. Certificates of water quality analyses for the PWSL's are provided in Attachment A2.

As part of the well survey, at the time of sampling, Gerrits staff requested any available well construction details (e.g. type, depth, location) from the owners. It is noted that all PWSL's were completed in bedrock, with the exception of PWSL No. 3 which represents a dug well completed within the shallow overburden.

3.0 WATER QUALITY RESULTS

The analytical results are summarized in Table A1, where the results are compared to the Ontario Drinking Water Quality Standard (ODWQS). The hardness of the water ranged from 194 to 388 mg/L, above the ODWQS's operational guideline of 100 mg/L, which is typical of groundwater from bedrock in Southern Ontario. The concentrations of iron in groundwater sampled generally ranged from below detection (<0.01 mg/L) to 0.23

mg/L. Two higher concentrations of iron of 1.09 and 1.16 mg/L, exceeding the ODWQS of 0.05 mg/L, were measured at PWSL 6 and PWSL 2, respectively. A concentration of manganese of 0.053 mg/L, slightly exceeding the ODWQS of 0.05 mg/L, was measured at PWSL 2. The arsenic levels in the samples collected from bedrock wells are summarized on Figure A1. The concentration of arsenic in the groundwater generally ranged from 0.5 to 5 μg/L. The lowest concentrations were encountered near PWSL Nos. 1 and 8. A concentration of 26 μg/L, which slightly exceeds the ODWQS of 25 μg/L, was measured at PWSL No. 2.

The individual results of the chemical analyses were distributed to the respective well owners (see examples in Attachment A3) and, where necessary, comments and recommendations were made with respect to the results. Golder provided detailed information to the well owner, indicating that arsenic is a known carcinogen and must therefore be removed by treatment where present at levels over this concentration. An arsenic fact sheet from Health Canada was included for reference, which also provided contact information should they wish to obtain more information. The well owner was also advised that another source of information related to arsenic in drinking water is the local Medical Officer of Health.

4.0 CONCLUSIONS

The results of the sampling and water quality analysis provided confirmation of the typical quality of groundwater obtained from the shallow bedrock aquifer (i.e. Guelph Formation) in this area. The arsenic levels in the sampled wells were of particular interest at this early stage in the hydrogeological study.

\\golder.gds\gal\mississauga\active\2009\1112\09-1112-6007 town of shelburne - hydrogeological assessment\reports\shelburne draft hydro-g oct 2012\appendix a_water quality and water well surveys\appendix a water quality and water well surveys_2012sep27.docx

TABLE

Table A1
Water Quality Results from Private Wells

Sample ID		ODWQS[1]		PWSL-1	PWSL-2	PWSL-3[4]	PWSL-4	PWSL-5	PWSL-6	PWSL-7	PWSL-8	PWSL-9
Sample Date		MAC[2]	AO/OG[3]	04/Nov/2009	05/Nov/2009	04/Nov/2009	04/Nov/2009	04/Nov/2009	11/Nov/2009	04/Nov/2009	04/Nov/2009	04/Nov/2009
Analysis	Units											
Temperature Upon Receipt	°C			12.0	12.0	12.0	12.0	12.0	9.0	12.0	12.0	12.0
pH	units		6.5-8.5	8.19	8.01	7.40	8.26	8.09	8.18	8.00	8.13	8.19
Conductivity	uS/cm			377	444	1300	380	366	373	439	451	455
Alkalinity	mg/L as $CaCO_3$		30-500	207	232	227	200	191	185	234	228	229
Carbonate	mg/L as $CaCO_3$			< 2	< 2	<2	< 2	< 2	< 2	< 2	< 2	< 2
HCO3	mg/L as $CaCO_3$			207	232	227	200	191	185	234	228	229
OH	mg/L as $CaCO_3$			< 2	< 2	<2	< 2	< 2	< 2	< 2	< 2	< 2
Dissolved Organic Carbon (DOC)	mg/L		5	< 1.0	1.9	1.7	< 1.0	1.3	< 1.0	< 1.0	< 1.0	< 1.0
Ammonia+Ammonium(NH3+NH4)	as N mg/L			< 0.1	0.1	0.1	0.3	< 0.1	< 0.1	0.4	0.2	0.1
Tot.Reactive Phos.	mg/L			< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Sulphate(SO4)	mg/L		500	6.6	13	32	14	11	10	11	12	17
Chloride (Cl)	mg/L		250	1.0	3.9	200	0.8	0.6	0.9	2.2	5.7	7.9
Nitrite(NO2)	as N mg/L	1		< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Nitrate(NO3)	as N mg/L	10		< 0.05	< 0.05	9.10	< 0.05	< 0.05	< 0.05	< 0.05	1.91	< 0.05
Nitrate+Nitrite (NO2+NO3)	as N mg/L	10		< 0.06	< 0.06	9.10	< 0.06	< 0.06	< 0.06	< 0.06	1.91	< 0.06
Hardness	mg/L as $CaCO_3$		80-100	215	253	388	213	194	188	249	256	256
Arsenic(As)	mg/L		0.0250	0.0005	0.0262	0.0008	0.0054	0.0026	0.0047	0.0053	0.0005	0.0014
Calcium(Ca)	mg/L			50.1	66.6	116	50.1	28.6	40.0	54.8	65.2	54.6
Copper (Cu)	mg/L			0.005	0.490	0.059	0.008	0.026	0.002	0.018	0.024	< 0.001
Iron (Fe)	mg/L		0.3	0.21	1.16	< 0.01	0.11	< 0.01	1.09	0.23	< 0.01	0.20
Potassium(K)	mg/L			0.90	0.85	3.05	1.09	1.52	1.06	1.39	0.77	0.96
Magnesium(Mg)	mg/L			21.7	21.1	23.9	21.3	29.8	21.5	27.2	22.7	29.1
Manganese(Mn)	mg/L		0.05	0.032	0.053	0.006	0.010	0.005	0.017	0.004	< 0.001	0.022
Sodium(Na)	mg/L		200	2.82	3.90	127	5.99	10.4	6.52	4.36	2.35	5.99
Cation Sum	meq/L			4.43	5.25	13.36	4.54	4.37	3.93	5.20	5.24	5.40
Anion Sum	meq/L			4.30	5.01	10.99	4.31	4.06	4.38	4.96	4.99	5.15
Anion-Cation Balance	% difference			1.52	2.32	9.73	2.64	3.69	5.43	2.31	2.44	2.42
TDS (calculated)	mg/L			207	249	647	213	197	201	241	247	253
Saturation pH	pHs @ 4°C			7.92	7.76	7.57	7.94	8.20	8.07	7.84	7.77	7.85
Saturation pH	pHs @20°C			7.60	7.44	7.25	7.62	7.88	7.75	7.52	7.45	7.53
Langelier's Index	@4°C			-0.08	-0.08	-0.17	-0.10	-0.37	0.11	-0.12	-0.06	-0.04
Langelier's Index	@20°C			0.24	0.24	0.15	0.22	-0.05	0.43	0.20	0.26	0.28

NOTES:
1) **ODWQS** - Ontario Drinking Water Quality Standards, Objectives and Guidelines dated June 2003
2) **MAC** - Maximum Acceptable Concentration
3) **AO/OG** - Aesthetic Objective and/or Operational Guideline
4) shallow dug well (7 ft deep)
- indicates parameter exceeds AO/OG

FIGURE

556000 560000 564000 568000 572000

4884000 4880000 4876000

N

COUNTY RD 17 COUNTY RD 124 COUNTY RD 17 2 LINE SW COUNTY RD 17 2 LINE SW HIGHWAY 10 HIGHWAY 89 HIGHWAY 10 & 89 HIGHWAY 10 COUNTY RD 11

Melancthon Primrose Granger Elba Maple Grove

Target Area #1 Target Area #2 Target Area #3

1 9 3 8 4 6

LEGEND

- MOE Water Well with Pump Rate (GPM) >25
- MOE Water Well
- City / Town
- Highway
- Major Road
- Local Road
- Watercourse
- Waterbody
- Wetland
- 5 km Buffer
- Town Boundary

Well Label	Name	Arsenic (mg/L)
1	PWSL-1	0.0005
2	PWSL-2	0.0262
3	PWSL-3	0.0008
4	PWSL-4	0.0054
5	PWSL-5	0.0026
6	PWSL-6	0.0047
7	PWSL-7	0.0053
8	PWSL-8	0.0005
9	PWSL-9	0.0014

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

1 0.5 0 1 2
SCALE 1:55,000 KILOMETERS

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE
LOCATIONS OF PRIVATE WELL WATER QUALITY SAMPLING

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	27 Aug. 2009		
GIS	JO	13 Sep. 2012		
CHECK	AI	13 Sep. 2012		
REVIEW	SMD	Oct. 2012		

FIGURE: A1

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\FinalEA_for_Additional_Water_Supply\Locations_of_Private_WQ_Sampling_Areas.mxd

ATTACHMENT A1

Well Survey Notice

The Corporation of
THE TOWN OF SHELBURNE

Date

Attention: Resident

Re: Notice of Well Water Quality Testing
Town of Shelburne Hydrogeological Study and Class Environmental Assessment
for Additional Water Supply

Dear Resident,

The Town of Shelburne has commenced a study to identify additional groundwater supply sources. The enclosed Notice of Study Commencement provides more details about this study. The Town has retained a consulting team lead by Golder Associates to conduct this study. One of the initial tasks is to identify areas in and around the Town where test wells could be developed, with consideration given to locations where water quality and quantity may be suitable as a municipal drinking water supply source. Over the next three weeks, as part of the hydrogeological study, the consulting team will be sampling private water wells for analysis of water quality.

Our purpose in contacting you is to request permission to collect a water sample from your well. The sample will then be submitted for analysis by a water quality testing laboratory. The results of the chemical analysis will be provided to you, free of charge, in exchange for your approval to use the data in support of our study. Therefore, we kindly request that you complete the enclosed approval form. Please mail the completed form to the Town by October 5, 2009, in the enclosed, postage-paid envelope. Once we receive your approval, a member of the Golder consulting team will contact you to arrange a convenient time to collect the water sample. The water sampling by the Golder Associates team should take less than ten minutes to complete.

Should you have any questions regarding this study and/or the well sampling, please call the Town's Project Coordinator, Kelly McDowell (Tel: 519-925-2600 ext. 252), or the consulting team's Project Manager, Bill Banks (Guelph Tel: 519-829-4808).

We appreciate your cooperation and assistance with this study.

Sincerely,

John Telfer, Town Clerk & Acting CAO

Town of Shelburne

Encl.

Approval for Access on Private Land for Well Water Sampling

Town of Shelburne Hydrogeological Study and Class Environmental Assessment for Additional Water Supply

Owner: _____

Telephone: _____

Address: _____

_____

_____

I hereby authorize the Town of Shelburne and/or its consultant to collect a well water sample at the above address. I understand that the water sample is to be collected at a date and time to be arranged in discussion with the Town of Shelburne and/or its consultant, but no later than the end of October, 2009.

Signature: _____

Name (please print): _____

Date: _____

ATTACHMENT A2

Certificates of Analysis

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - K0L 2H0
Phone: 705-652-2000 FAX: 705-652-6365

Golder Associates
Attn : Alex Ivanoff Alex_Ivanoff@golder.com

2390 Argentia Road
Mississauga, Ontario
L5N 5Z7,

Phone: 905-567-4444
Fax:pdf, excel
Copy: cgerrits@waterwelldrilling.ca
bill.banks@banksgroundwater.ca

Wednesday, November 18, 2009

Date Rec. : 06 November 2009
LR Report: **CA10069-NOV09**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	9: PWSL-1
Sample Date & Time			04-Nov-09 19:00
Temperature Upon Receipt [°C]	—	—	12.0
pH [no unit]	18-Nov-09	14:55	8.19
Conductivity [uS/cm]	18-Nov-09	14:55	377
Alkalinity [mg/L as CaCO3]	18-Nov-09	14:56	207
Carbonate [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Bicarbonate [mg/L as CaCO3]	18-Nov-09	14:56	207
OH [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Dissolved Organic Carbon [mg/L]	10-Nov-09	10:01	< 1.0
Ammonia+Ammonium (N) [mg/L]	09-Nov-09	13:49	< 0.1
Tot.Reactive Phos. [mg/L]	09-Nov-09	12:15	< 0.03
Sulphate [mg/L]	13-Nov-09	14:11	6.6
Chloride [mg/L]	13-Nov-09	15:57	1.0
Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Nitrate (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.05
Nitrate + Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Hardness [mg/L as CaCO3]	11-Nov-09	14:25	215
Arsenic [mg/L]	14-Nov-09	15:35	0.0005
Calcium [mg/L]	11-Nov-09	14:26	50.1
Copper [mg/L]	11-Nov-09	14:26	0.005
Iron [mg/L]	11-Nov-09	14:26	0.21
Potassium [mg/L]	11-Nov-09	14:26	0.90
Magnesium [mg/L]	11-Nov-09	14:26	21.7
Manganese [mg/L]	11-Nov-09	14:26	0.032
Sodium [mg/L]	11-Nov-09	14:26	2.82
Cation sum [meq/L]	—	—	4.43
Anion Sum [meq/L]	—	—	4.30
Anion-Cation Balance [% difference]	—	—	1.52
Total Dissolved Solids (calculated) [mg/L]	—	—	207
Saturation pH [pHs @ 4°C]	—	—	7.92
Saturation pH [pHs @20°C]	—	—	7.60
Langelier's Index [@4°C]	—	—	-0.08
Langelier's Index [@20°C]	—	—	0.24

OnLine LIMS

Data reported represents the sample submitted to SGS. Reproduction of this analytical report in full or in part is prohibited without prior written approval. Please refer to SGS General Conditions of Services located at http://www.sgs.com/terms_and_conditions_service.htm. (Printed copies are available upon request.)
Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA10069-NOV09**

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Project Specialist
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Wednesday, November 18, 2009

Date Rec. : 06 November 2009
LR Report: **CA10069-NOV09**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	12: PWSL-2
Sample Date & Time			05-Nov-09 09:30
Temperature Upon Receipt [°C]	—	—	12.0
pH [no unit]	18-Nov-09	14:55	8.01
Conductivity [uS/cm]	18-Nov-09	14:55	444
Alkalinity [mg/L as CaCO3]	18-Nov-09	14:56	232
Carbonate [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Bicarbonate [mg/L as CaCO3]	18-Nov-09	14:56	232
OH [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Dissolved Organic Carbon [mg/L]	10-Nov-09	10:01	1.9
Ammonia+Ammonium (N) [mg/L]	09-Nov-09	13:49	0.1
Tot.Reactive Phos. [mg/L]	09-Nov-09	12:15	< 0.03
Sulphate [mg/L]	13-Nov-09	14:11	13
Chloride [mg/L]	13-Nov-09	15:57	3.9
Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Nitrate (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.05
Nitrate + Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Hardness [mg/L as CaCO3]	11-Nov-09	14:25	253
Arsenic [mg/L]	14-Nov-09	15:35	0.0262
Calcium [mg/L]	11-Nov-09	14:26	66.6
Copper [mg/L]	11-Nov-09	14:26	0.490
Iron [mg/L]	11-Nov-09	14:26	1.16
Potassium [mg/L]	11-Nov-09	14:26	0.85
Magnesium [mg/L]	11-Nov-09	14:26	21.1
Manganese [mg/L]	11-Nov-09	14:26	0.053
Sodium [mg/L]	11-Nov-09	14:26	3.90
Cation sum [meq/L]	—	—	5.25
Anion Sum [meq/L]	—	—	5.01
Anion-Cation Balance [% difference]	—	—	2.32
Total Dissolved Solids (calculated) [mg/L]	—	—	249
Saturation pH [pHs @ 4°C]	—	—	7.76
Saturation pH [pHs @20°C]	—	—	7.44
Langelier's Index [@4°C]	—	—	-0.08
Langelier's Index [@20°C]	—	—	0.24

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LR Report : **CA10069-NOV09**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: PWSL-3
Sample Date & Time			04-Nov-09 19:00
Temperature Upon Receipt [°C]	—	—	12.0
pH [no unit]	18-Nov-09	14:55	7.40
Conductivity [uS/cm]	18-Nov-09	14:55	1300
Alkalinity [mg/L as CaCO3]	18-Nov-09	14:56	227
Carbonate [mg/L as CaCO3]	18-Nov-09	14:56	<2
Bicarbonate [mg/L as CaCO3]	18-Nov-09	14:56	227
OH [mg/L as CaCO3]	18-Nov-09	14:56	<2
Dissolved Organic Carbon [mg/L]	10-Nov-09	10:01	1.7
Ammonia+Ammonium (N) [mg/L]	09-Nov-09	13:49	0.1
Tot.Reactive Phos. [mg/L]	09-Nov-09	12:15	< 0.03
Sulphate [mg/L]	13-Nov-09	14:11	32
Chloride [mg/L]	13-Nov-09	15:57	200
Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Nitrate (as nitrogen) [mg/L]	12-Nov-09	09:17	9.10
Nitrate + Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	9.10
Hardness [mg/L as CaCO3]	11-Nov-09	14:25	388
Arsenic [mg/L]	14-Nov-09	15:35	0.0008
Calcium [mg/L]	11-Nov-09	14:26	116
Copper [mg/L]	11-Nov-09	14:26	0.059
Iron [mg/L]	11-Nov-09	14:26	< 0.01
Potassium [mg/L]	11-Nov-09	14:26	3.05
Magnesium [mg/L]	11-Nov-09	14:26	23.9
Manganese [mg/L]	11-Nov-09	14:26	0.006
Sodium [mg/L]	11-Nov-09	14:26	127
Cation sum [meq/L]	—	—	13.36
Anion Sum [meq/L]	—	—	10.99
Anion-Cation Balance [% difference]	—	—	9.73
Total Dissolved Solids (calculated) [mg/L]	—	—	647
Saturation pH [pHs @ 4°C]	—	—	7.57
Saturation pH [pHs @20°C]	—	—	7.25
Langelier's Index [@4°C]	—	—	-0.17
Langelier's Index [@20°C]	—	—	0.15

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	7: PWSL - 4
Sample Date & Time			04-Nov-09 16:00
Temperature Upon Receipt [°C]	—	—	12.0
pH [no unit]	18-Nov-09	14:55	8.26
Conductivity [uS/cm]	18-Nov-09	14:55	380
Alkalinity [mg/L as CaCO3]	18-Nov-09	14:56	200
Carbonate [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Bicarbonate [mg/L as CaCO3]	18-Nov-09	14:56	200
OH [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Dissolved Organic Carbon [mg/L]	10-Nov-09	10:01	< 1.0
Ammonia+Ammonium (N) [mg/L]	09-Nov-09	13:49	0.3
Tot.Reactive Phos. [mg/L]	09-Nov-09	12:15	< 0.03
Sulphate [mg/L]	13-Nov-09	14:11	14
Chloride [mg/L]	13-Nov-09	15:57	0.8
Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Nitrate (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.05
Nitrate + Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Hardness [mg/L as CaCO3]	11-Nov-09	14:25	213
Arsenic [mg/L]	14-Nov-09	15:35	0.0054
Calcium [mg/L]	11-Nov-09	14:26	50.1
Copper [mg/L]	11-Nov-09	14:26	0.008
Iron [mg/L]	11-Nov-09	14:26	0.11
Potassium [mg/L]	11-Nov-09	14:26	1.09
Magnesium [mg/L]	11-Nov-09	14:26	21.3
Manganese [mg/L]	11-Nov-09	14:26	0.010
Sodium [mg/L]	11-Nov-09	14:26	5.99
Cation sum [meq/L]	—	—	4.54
Anion Sum [meq/L]	—	—	4.31
Anion-Cation Balance [% difference]	—	—	2.64
Total Dissolved Solids (calculated) [mg/L]	—	—	213
Saturation pH [pHs @ 4°C]	—	—	7.94
Saturation pH [pHs @20°C]	—	—	7.62
Langelier's Index [@4°C]	—	—	-0.10
Langelier's Index [@20°C]	—	—	0.22

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LR Report : **CA10069-NOV09**

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Wednesday, November 18, 2009

Date Rec. : 06 November 2009
LR Report: **CA10069-NOV09**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	R: PWSL-5
Sample Date & Time			04-Nov-09 15:30
Temperature Upon Receipt [°C]	—	—	12.0
pH [no unit]	18-Nov-09	14:55	8.09
Conductivity [uS/cm]	18-Nov-09	14:55	366
Alkalinity [mg/L as CaCO3]	18-Nov-09	14:56	191
Carbonate [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Bicarbonate [mg/L as CaCO3]	18-Nov-09	14:56	191
OH [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Dissolved Organic Carbon [mg/L]	10-Nov-09	10:01	1.3
Ammonia+Ammonium (N) [mg/L]	09-Nov-09	13:49	< 0.1
Tot.Reactive Phos. [mg/L]	09-Nov-09	12:15	< 0.03
Sulphate [mg/L]	13-Nov-09	14:11	11
Chloride [mg/L]	13-Nov-09	15:57	0.6
Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Nitrate (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.05
Nitrate + Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Hardness [mg/L as CaCO3]	11-Nov-09	14:25	194
Arsenic [mg/L]	14-Nov-09	15:35	0.0026
Calcium [mg/L]	11-Nov-09	14:26	28.6
Copper [mg/L]	11-Nov-09	14:26	0.026
Iron [mg/L]	11-Nov-09	14:26	< 0.01
Potassium [mg/L]	11-Nov-09	14:26	1.52
Magnesium [mg/L]	11-Nov-09	14:26	29.8
Manganese [mg/L]	11-Nov-09	14:26	0.005
Sodium [mg/L]	11-Nov-09	14:26	10.4
Cation sum [meq/L]	—	—	4.37
Anion Sum [meq/L]	—	—	4.06
Anion-Cation Balance [% difference]	—	—	3.69
Total Dissolved Solids (calculated) [mg/L]	—	—	197
Saturation pH [pHs @ 4°C]	—	—	8.20
Saturation pH [pHs @20°C]	—	—	7.88
Langelier's Index [@4°C]	—	—	-0.37
Langelier's Index [@20°C]	—	—	-0.05

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Thursday, November 19, 2009

Date Rec. : 12 November 2009
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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: PWSL - 6
Sample Date & Time			11-Nov-09 08:00
Temperature Upon Receipt [°C]	---	---	9.0
pH [no unit]	19-Nov-09	08:18	8.18
Conductivity [uS/cm]	19-Nov-09	08:18	373
Alkalinity [mg/L as CaCO3]	19-Nov-09	08:18	185
Carbonate [mg/L as CaCO3]	19-Nov-09	08:18	< 2
Bicarbonate [mg/L as CaCO3]	19-Nov-09	08:18	185
OH [mg/L as CaCO3]	19-Nov-09	08:18	< 2
Dissolved Organic Carbon [mg/L]	13-Nov-09	10:25	< 1.0
Ammonia+Ammonium (N) [mg/L]	13-Nov-09	14:47	< 0.1
Tot.Reactive Phos. [mg/L]	13-Nov-09	15:40	< 0.03
Sulphate [mg/L]	16-Nov-09	15:50	10
Chloride [mg/L]	19-Nov-09	08:09	0.9
Nitrite (as nitrogen) [mg/L]	16-Nov-09	15:00	< 0.06
Nitrate (as nitrogen) [mg/L]	16-Nov-09	15:00	< 0.05
Nitrate + Nitrite (as nitrogen) [mg/L]	16-Nov-09	15:00	< 0.06
Hardness [mg/L as CaCO3]	18-Nov-09	11:04	188
Arsenic [mg/L]	18-Nov-09	11:04	0.0047
Calcium [mg/L]	18-Nov-09	10:55	40.0
Copper [mg/L]	18-Nov-09	10:55	0.002
Iron [mg/L]	18-Nov-09	10:55	1.09
Potassium [mg/L]	18-Nov-09	10:55	1.06
Magnesium [mg/L]	18-Nov-09	10:55	21.5
Manganese [mg/L]	18-Nov-09	10:55	0.017
Sodium [mg/L]	18-Nov-09	10:55	6.52
Anion Sum [meq/L]	---	---	3.93
Cation sum [meq/L]	---	---	4.38
Anion-Cation Balance [% difference]	---	---	5.43
Total Dissolved Solids (calculated) [mg/L]	---	---	201
Saturation pH [pHs @ 4°C]	---	---	8.07
Saturation pH [pHs @20°C]	---	---	7.75
Langelier's Index [@4°C]	---	---	0.11
Langelier's Index [@20°C]	---	---	0.43

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LR Report : **CA11260-NOV09**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	6: PWSL - 7
Sample Date & Time			04-Nov-09 19:10
Temperature Upon Receipt [°C]	—	—	12.0
pH [no unit]	18-Nov-09	14:55	8.00
Conductivity [uS/cm]	18-Nov-09	14:55	439
Alkalinity [mg/L as CaCO3]	18-Nov-09	14:56	234
Carbonate [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Bicarbonate [mg/L as CaCO3]	18-Nov-09	14:56	234
OH [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Dissolved Organic Carbon [mg/L]	10-Nov-09	10:01	< 1.0
Ammonia+Ammonium (N) [mg/L]	09-Nov-09	13:49	0.4
Tot.Reactive Phos. [mg/L]	09-Nov-09	12:15	< 0.03
Sulphate [mg/L]	13-Nov-09	14:11	11
Chloride [mg/L]	13-Nov-09	15:57	2.2
Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Nitrate (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.05
Nitrate + Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Hardness [mg/L as CaCO3]	11-Nov-09	14:25	249
Arsenic [mg/L]	14-Nov-09	15:35	0.0053
Calcium [mg/L]	11-Nov-09	14:26	54.8
Copper [mg/L]	11-Nov-09	14:26	0.018
Iron [mg/L]	11-Nov-09	14:26	0.23
Potassium [mg/L]	11-Nov-09	14:26	1.39
Magnesium [mg/L]	11-Nov-09	14:26	27.2
Manganese [mg/L]	11-Nov-09	14:26	0.004
Sodium [mg/L]	11-Nov-09	14:26	4.36
Cation sum [meq/L]	—	—	5.20
Anion Sum [meq/L]	—	—	4.96
Anion-Cation Balance [% difference]	—	—	2.31
Total Dissolved Solids (calculated) [mg/L]	—	—	241
Saturation pH [pHs @ 4°C]	—	—	7.84
Saturation pH [pHs @20°C]	—	—	7.52
Langelier's Index [@4°C]	—	—	-0.12
Langelier's Index [@20°C]	—	—	0.20

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Wednesday, November 18, 2009

Date Rec. : 06 November 2009
LR Report: **CA10069-NOV09**

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	11: PWSL - 8
Sample Date & Time			04-Nov-09 16:30
Temperature Upon Receipt [°C]	—	—	12.0
pH [no unit]	18-Nov-09	14:55	8.13
Conductivity [uS/cm]	18-Nov-09	14:55	451
Alkalinity [mg/L as CaCO3]	18-Nov-09	14:56	228
Carbonate [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Bicarbonate [mg/L as CaCO3]	18-Nov-09	14:56	228
OH [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Dissolved Organic Carbon [mg/L]	10-Nov-09	10:01	< 1.0
Ammonia+Ammonium (N) [mg/L]	09-Nov-09	13:49	0.2
Tot.Reactive Phos. [mg/L]	09-Nov-09	12:15	< 0.03
Sulphate [mg/L]	13-Nov-09	14:11	12
Chloride [mg/L]	13-Nov-09	15:57	5.7
Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Nitrate (as nitrogen) [mg/L]	12-Nov-09	09:17	1.91
Nitrate + Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	1.91
Hardness [mg/L as CaCO3]	11-Nov-09	14:25	256
Arsenic [mg/L]	14-Nov-09	15:35	0.0005
Calcium [mg/L]	11-Nov-09	14:26	65.2
Copper [mg/L]	11-Nov-09	14:26	0.024
Iron [mg/L]	11-Nov-09	14:26	< 0.01
Potassium [mg/L]	11-Nov-09	14:26	0.77
Magnesium [mg/L]	11-Nov-09	14:26	22.7
Manganese [mg/L]	11-Nov-09	14:26	< 0.001
Sodium [mg/L]	11-Nov-09	14:26	2.35
Cation sum [meq/L]	—	—	5.24
Anion Sum [meq/L]	—	—	4.99
Anion-Cation Balance [% difference]	—	—	2.44
Total Dissolved Solids (calculated) [mg/L]	—	—	247
Saturation pH [pHs @ 4°C]	—	—	7.77
Saturation pH [pHs @20°C]	—	—	7.45
Langelier's Index [@4°C]	—	—	-0.06
Langelier's Index [@20°C]	—	—	0.26

OnLine LIMS

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

SGS Lakefield Research Limited
P.O. Box 4300 - 185 Concession St.
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LR Report : **CA10069-NOV09**

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Golder Associates
Attn : Alex Ivanoff Alex_Ivanoff@golder.com

2390 Argentia Road
Mississauga, Ontario
L5N 5Z7,

Phone: 905-567-4444
Fax:pdf, excel
Copy: cgerrits@waterwelldrilling.ca
bill.banks@banksgroundwater.ca

Wednesday, November 18, 2009

Date Rec. : 06 November 2009
LR Report: **CA10069-NOV09**

Copy: **#1**

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	10: PWSL - 9
Sample Date & Time			04-Nov-09 16:15
Temperature Upon Receipt [°C]	—	—	12.0
pH [no unit]	18-Nov-09	14:55	8.19
Conductivity [uS/cm]	18-Nov-09	14:55	455
Alkalinity [mg/L as CaCO3]	18-Nov-09	14:56	229
Carbonate [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Bicarbonate [mg/L as CaCO3]	18-Nov-09	14:56	229
OH [mg/L as CaCO3]	18-Nov-09	14:56	< 2
Dissolved Organic Carbon [mg/L]	10-Nov-09	10:01	< 1.0
Ammonia+Ammonium (N) [mg/L]	09-Nov-09	13:49	0.1
Tot.Reactive Phos. [mg/L]	09-Nov-09	12:15	< 0.03
Sulphate [mg/L]	13-Nov-09	14:11	17
Chloride [mg/L]	13-Nov-09	15:57	7.9
Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Nitrate (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.05
Nitrate + Nitrite (as nitrogen) [mg/L]	12-Nov-09	09:17	< 0.06
Hardness [mg/L as CaCO3]	11-Nov-09	14:25	256
Arsenic [mg/L]	14-Nov-09	15:35	0.0014
Calcium [mg/L]	11-Nov-09	14:26	54.6
Copper [mg/L]	11-Nov-09	14:26	< 0.001
Iron [mg/L]	11-Nov-09	14:26	0.20
Potassium [mg/L]	11-Nov-09	14:26	0.96
Magnesium [mg/L]	11-Nov-09	14:26	29.1
Manganese [mg/L]	11-Nov-09	14:26	0.022
Sodium [mg/L]	11-Nov-09	14:26	5.99
Cation sum [meq/L]	—	—	5.40
Anion Sum [meq/L]	—	—	5.15
Anion-Cation Balance [% difference]	—	—	2.42
Total Dissolved Solids (calculated) [mg/L]	—	—	253
Saturation pH [pHs @ 4°C]	—	—	7.85
Saturation pH [pHs @20°C]	—	—	7.53
Langelier's Index [@4°C]	—	—	-0.04
Langelier's Index [@20°C]	—	—	0.28

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

ATTACHMENT A3

Sample Letters of Results to Private Well Owner

March 17, 2010 Project No. 09-1112-6007

PWSL-1
Shelburne, ON

RE: WELL WATER QUALITY TESTING
TOWN OF SHELBURNE HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

Dear PWSL-1:

Thank you again for providing a sample of your well water for analysis. The results of the general chemical analysis are attached for your reference.

The results indicate that all parameters analyzed were below the Ontario Drinking Water Quality Standards, with the exception of hardness. Elevated hardness in groundwater is typical for this area of Ontario. The following excerpt is from the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, published by the Ministry of the Environment:

> ***Hardness:*** *The operational guideline for hardness in drinking water is set at between 80 and 100 mg/L as calcium carbonate. This value is set to aid in water source selection where a choice exists. Hardness is caused by dissolved calcium and magnesium, and is expressed as the equivalent quantity of calcium carbonate. On heating, hard water has a tendency to form scale deposits and can form excessive scum with regular soaps. However, certain detergents are largely unaffected by hardness. Conversely, soft water may result in accelerated corrosion of water pipes. Hardness levels between 80 and 100 mg/L as calcium carbonate (CaCO3) are considered to provide an acceptable balance between corrosion and incrustation. Water supplies with a hardness greater than 200 mg/L are considered poor but tolerable. Hardness in excess of 500 mg/L in drinking water is unacceptable for most domestic purposes.*

2390 Argentia Road, Mississauga, Ontario, Canada L5N 5Z7
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Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

We appreciate your assistance with this project, as the results have been very helpful. Should you have any questions regarding the results, please contact us.

Sincerely,

Alex Ivanoff, P.Geo,
Project Hydrogeologist
(905) 567-4444

William D. Banks, P.Eng.
Project Manager
(519) 829-4808

WB/AI/wlm

CC: Kelly McDowell, Project Coordinator, Town of Shelburne (519) 925-2600

Attachments: Results of Chemical Analysis

March 17, 2010 Project No. 09-1112-6007

PWSL-2
RR#6
Shelburne, ON

RE: WELL WATER QUALITY TESTING
TOWN OF SHELBURNE HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

Dear PWSL-2:

Thank you again for providing a sample of your well water for analysis. The results of the general chemical analysis are attached for your reference.

The results indicate that all parameters analyzed were below the Ontario Drinking Water Quality Standards, with the exception of hardness, iron, manganese and arsenic. Elevated levels of hardness, iron and manganese in groundwater are typical for this area of Ontario. Elevated arsenic levels have also been detected in groundwater in some wells in the local area. The following excerpts are from the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, published by the Ministry of the Environment:

> ***Hardness:*** *The operational guideline for hardness in drinking water is set at between 80 and 100 mg/L as calcium carbonate. This value is set to aid in water source selection where a choice exists. Hardness is caused by dissolved calcium and magnesium, and is expressed as the equivalent quantity of calcium carbonate. On heating, hard water has a tendency to form scale deposits and can form excessive scum with regular soaps. However, certain detergents are largely unaffected by hardness. Conversely, soft water may result in accelerated corrosion of water pipes. Hardness levels between 80 and 100 mg/L as calcium carbonate (CaCO3) are considered to provide an acceptable balance between corrosion and incrustation. Water supplies with a hardness greater than 200 mg/L are considered poor but tolerable. Hardness in excess of 500 mg/L in drinking water is unacceptable for most domestic purposes.*
>
> ***Iron:*** *Iron may be present in groundwater as a result of mineral deposits and chemically reducing underground conditions. It may also be present in surface waters as a result of anaerobic decay in sediments and complex formation. The aesthetic objective for iron, set by appearance effects, in drinking water is 0.3 mg/L. Excessive levels of iron in drinking water supplies may impart a brownish colour to laundered goods, plumbing fixtures and the water itself; it may produce a bitter, astringent taste in water and beverages; and the precipitation of iron can also promote the growth of iron bacteria in water mains*

and service pipes. Iron based coagulants such as ferric sulfate can be highly effective in treatment processes at removing particles from water and leave very little residual iron in the treated water.

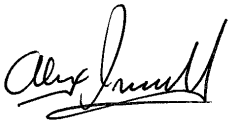
Manganese: *The colour related aesthetic objective for manganese in drinking water is 0.05 mg/L. Like iron, manganese is objectionable in water supplies because it stains laundry and fixtures black, and at excessive concentrations causes undesirable tastes in beverages. Manganese is present in some groundwater because of chemically reducing underground conditions coupled with presence of manganese mineral deposits.*

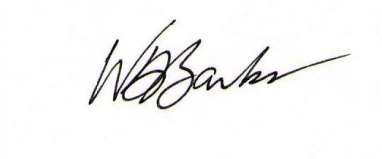
Arsenic: *The interim maximum acceptable concentration for arsenic in drinking water is 0.025 mg/L. Arsenic is a known carcinogen and must therefore be removed by treatment where present at levels over this concentration.*

With respect to arsenic, also attached for your reference is a fact sheet from Health Canada. This summary also provides contact information should you wish to obtain more information. Another source of information related to arsenic in your drinking water is your local Medical Officer of Health.

We appreciate your assistance with this project, as the results have been very helpful. Should you have any questions regarding the results, please contact us.

Sincerely,





Alex Ivanoff, P.Geo.
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Project Manager
(519) 829-4808

WB/AI/wlm

CC: Kelly McDowell, Project Coordinator, Town of Shelburne (519) 925-2600

Attachments: Results of Chemical Analysis
Fact Sheet regarding Arsenic

ARSENIC IN DRINKING WATER

The Issue

Arsenic is a natural element found widely in the earth's crust. It may be found in some drinking water supplies, including wells. Exposure to high levels of arsenic can cause health effects.

Background

There are trace amounts of arsenic in all living matter. For most Canadians, the primary source of exposure to arsenic is food, followed by drinking water, soil and air. Drinking water would only be the major source of exposure for people living near a source of arsenic.

Arsenic may enter lakes, rivers or underground water naturally, when mineral deposits or rocks containing arsenic dissolve. Arsenic may also get into water through the discharge of industrial wastes and by the deposit of arsenic particles in dust, or dissolved in rain or snow. These arsenic particles can enter the environment through:

- the burning of fossil fuels (especially coal);
- metal production (such as gold and base metal mining);
- agricultural use (in pesticides and feed additives); or
- waste burning.

Data collected indicate that the levels of arsenic in Canadian drinking water are generally less than 0.005 milligrams per litre (0.005 parts per million - ppm), although concentrations may be higher in some areas.

Testing For Arsenic

As arsenic is both tasteless and odourless, you won't be able to tell if it is in your drinking water. However, arsenic tends to be found in very specific regions of the country and may not be a drinking water concern in your area. If you live in an area that has natural sources of arsenic or is known to have high levels of arsenic in its groundwater, it is recommended that you have your water tested. To do so, please contact your regional public health office. If you obtain your drinking water from a municipal supply and want to have your water tested, you should contact the local drinking water authorities.

Laboratories with specialized equipment can conduct tests to measure arsenic in your body. Testing for arsenic in urine will indicate recent exposure.

The Health Effects of Arsenic

Arsenic in drinking water is absorbed by the body when you swallow it, and distributed by the blood-stream. It does not enter the body through the skin or by inhalation during bathing or showering. The highest levels of arsenic are found in nails and hair, which accumulate arsenic over time. Your body gets rid of arsenic mostly through urine, with smaller amounts removed through the skin, hair, nails and sweat.

Health Canada and the International Agency for Research on Cancer consider arsenic a human cancer-causing agent. Its effects have been studied in a population in Taiwan where the drinking water contains naturally high levels of arsenic (over 0.35 ppm). The results suggest that consuming drinking water with very high levels of arsenic over a lifetime can increase the risk of cancer in internal organs such as the bladder, liver and lungs.

Long-term exposure (over many years or decades) to high levels of arsenic in drinking water may also cause:

- thickening and discoloration of the skin;
- nausea and diarrhea;
- decreased production of blood cells;
- abnormal heart rhythm and blood vessel damage; or
- numbness in the hands and feet.

Short-term exposure (days/weeks) to very high levels of arsenic in drinking water can result in:

- abdominal pain, vomiting and diarrhea;
- muscular cramping or pain;
- weakness and flushing of skin, skin rash;
- numbness, burning or tingling sensation or pain in hands and feet;
- thickening of the skin on the palms of the hands and soles of the feet; or
- loss of movement and sensory responses.

Studies do not show greater risks of health effects in children, pregnant women or other vulnerable populations.

Minimizing Your Risk

Because arsenic can cause cancer, every effort should be made to keep arsenic levels in drinking water as low as possible.

If you live in an area that has natural sources of arsenic or is known to have high levels of arsenic in its groundwater, you should have your well water tested. To do so, contact your regional public health office. If you find excessive concentrations of arsenic in your drinking water, you may want to:

- Look for an alternate water source with low arsenic concentrations. Where possible, connect to a public water distribution system.
- Buy an in-home water treatment device that can reduce the level of arsenic. Look for treatment devices that have been certified by an accredited certification organization as meeting the appropriate NSF International (NSF)/American National Standards Institute (ANSI) drinking water treatment unit standards for removing arsenic. These standards have been designed to safeguard drinking water. They help to ensure the material safety and performance of products that come into contact with drinking water.

  Make sure you follow the manufacturer's instructions regarding their use and maintenance.

If you are concerned about health risks from the consumption of water containing arsenic, contact your doctor.

Government of Canada's Role

Federal, provincial and territorial governments share responsibility for providing safe drinking water in Canada. Health Canada works with the provinces and territories to establish the Guidelines for Canadian Drinking Water Quality. The guidelines are designed to ensure that Canadians have access to safe drinking water. They are constantly reviewed and revised to reflect new data on contaminants in drinking water. All jurisdictions in Canada use them as the basis for establishing drinking water quality requirements.

Arsenic is one of the many chemicals for which Health Canada has set guidelines. A new guideline has been established at 0.010 milligrams per litre, and will continue to be reviewed to reflect new treatment methods and new information on health risks as they become available. The guideline is based on lifetime exposure to arsenic from drinking water, and takes into consideration the ability to measure arsenic and to remove it from drinking water supplies.

Need More Info?

For information regarding Health Canada's drinking water program, visit our Web site at:
http://www.healthcanada.gc.ca/waterquality

You can also send requests by e-mail to water_eau@hc-sc.gc.ca. or by regular mail to:
Water, Air and Climate Change Bureau
Health Canada
269 Laurier Ave. West, al 4903D
Ottawa, Ont K1A 0K9

Specific information on Health Canada's drinking water guidelines, including links to guideline technical documents, can be found at
http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/index_e.html

The day-to-day responsibility of providing safe drinking water to the public generally rests with the provinces and territories, while municipalities usually oversee the day to day operations of the treatment facilities. In the Yukon, Northwest Territories, Nunavut, British Columbia and New Brunswick water quality is overseen by the provincial health ministries.
For more information go to:
http://chp-pcs.gc.ca/CHP/index_e.jsp?pageid=10042

In all other provinces water quality is overseen by the environment ministries.

For more information on water quality issues go to Health Canada's Water Talk site at:
http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/water_talk-parlons_eau_e.html

For additional articles on health and safety issues go to the It's Your Health Web site at:
www.healthcanada.gc.ca/iyh
You can also call toll free at
1-866-225-0709
or TTY at 1-800-267-1245*

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Original: November 2001 Updated: August 2006

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Canada

March 17, 2010 Project No. 09-1112-6007

PWSL-6
Shelburne, ON

RE: WELL WATER QUALITY TESTING
TOWN OF SHELBURNE HYDROGEOLOGICAL STUDY AND CLASS ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

Dear PWSL-6:

Thank you again for providing a sample of your well water for analysis. The results of the general chemical analysis are attached for your reference.

The results indicate that all parameters analyzed were below the Ontario Drinking Water Quality Standards, with the exception of hardness and iron. Elevated levels of hardness and iron in groundwater are typical for this area of Ontario. The following excerpts are from the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, published by the Ministry of the Environment:

> ***Hardness:*** *The operational guideline for hardness in drinking water is set at between 80 and 100 mg/L as calcium carbonate. This value is set to aid in water source selection where a choice exists. Hardness is caused by dissolved calcium and magnesium, and is expressed as the equivalent quantity of calcium carbonate. On heating, hard water has a tendency to form scale deposits and can form excessive scum with regular soaps. However, certain detergents are largely unaffected by hardness. Conversely, soft water may result in accelerated corrosion of water pipes. Hardness levels between 80 and 100 mg/L as calcium carbonate (CaCO3) are considered to provide an acceptable balance between corrosion and incrustation. Water supplies with a hardness greater than 200 mg/L are considered poor but tolerable. Hardness in excess of 500 mg/L in drinking water is unacceptable for most domestic purposes.*
>
> ***Iron:*** *Iron may be present in groundwater as a result of mineral deposits and chemically reducing underground conditions. It may also be present in surface waters as a result of anaerobic decay in sediments and complex formation. The aesthetic objective for iron, set by appearance effects, in drinking water is 0.3 mg/L. Excessive levels of iron in drinking water supplies may impart a brownish colour to laundered goods, plumbing fixtures and the water itself; it may produce a bitter, astringent taste in water and beverages; and the precipitation of iron can also promote the growth of iron bacteria in water mains*

and service pipes. Iron based coagulants such as ferric sulfate can be highly effective in treatment processes at removing particles from water and leave very little residual iron in the treated water.

We appreciate your assistance with this project, as the results have been very helpful. Should you have any questions regarding the results, please contact us.

Sincerely,

Alex Ivanoff, P.Geo.
Project Hydrogeologist
(905) 567-4444

William D. Banks, P.Eng.
Project Manager
(519) 829-4808

WB/AI/wlm

CC: Kelly McDowell, Project Coordinator, Town of Shelburne (519) 925-2600

Attachments: Results of Chemical Analysis

APPENDIX B

Hydrological Characterization of Willow Brook Creek

October 2012
Report No. 09-1112-6007

Golder Associates

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Table B1: Water Balance Summary – Willow Brook at Highway 89 4

FIGURES

Figure B1: Willow Brook Water Budget Assessment and Flow Monitoring

ATTACHMENTS

Attachment B1: Detailed Water Balance – Willow Brook at Highway 89

1.0 INTRODUCTION

The Town of Shelburne (the Town) is undertaking municipal and federal Environmental Assessments (EA's) to identify the preferred alternative for developing additional municipal groundwater supply. Hydrological studies carried out in support of the EA's included:

- A spot flow measurement of Willow Brook at the Highway 89 crossing; and
- A water budget assessment of the Willow Brook catchment area, up-stream of Highway 89.

This Technical Appendix (Appendix B) of the Hydrogeological Report (HR) presents the factual results of the Willow Brook spot flow measurements and water budget assessment.

2.0 WILLOW BROOK STREAMFLOW MEASUREMENT

Instantaneous streamflow measurements were conducted in the vicinity of the Willow Brook crossing of Highway 89 on January 18, 2012. Streamflow measurements were estimated using the velocity-area method. A tape measure was extended the length of a representative cross-section during the measurement event. Streamflow velocities and corresponding water depths were collected at various intervals along the cross-section (0.2 m to 0.4 m). Current velocities were recorded with a Valeport Electromagnetic Flow Meter Model 801 (EM Flow Meter) at 60% of the total water depth (for water depths less than 0.50 m) or at both 20% and 80% and then averaged (for water depths greater than 0.50 m).

Streamflow measurements were carried out in three locations, as shown on Figure B1. These locations include:

1) Willow Brook (west branch), approximately 25 m up-stream from Highway 89;
2) Willow Brook (east branch), approximately 15 m up-stream from Highway 89; and
3) Willow Brook (downstream of the confluence of the west and east branches), at the Highway 89 culvert.

The estimated instantaneous flow rate for the west branch was approximately 55 litres per second (L/s). The estimated instantaneous flow rate for the east branch was approximately 59 L/s. The instantaneous flow rate on the downstream side of Highway 89 was estimated to be 112 L/s.

3.0 WILLOW BROOK WATER BUDGET

A water balance assessment was completed for Willow Brook, using Highway 89 as a downstream boundary.

A long term (1962 – 2008) Thornthwaite water budget model was developed based on climate information reported at the Orangeville MOE climate station (ID 6155790). The water balance model was derived using the following equation:

$$P = S + ET + R + I$$

Where P represents precipitation, S is the change in storage, ET is evapotranspiration, R accounts for surface runoff and I represents groundwater infiltration.

Precipitation (P)

Precipitation data, spanning 46 years (1962 – 2008), was obtained for the Environment Canada meteorological station in Orangeville. Based on the available data, annual precipitation at this location averaged approximately 826 mm.

Evapotranspiration (ET)

Evapotranspiration refers to water losses from soil and vegetated surfaces to the atmosphere. The term combines evaporation (e.g., water lost from soil and ponded water surfaces) and transpiration (e.g., water lost from plants and trees) due to the difficulties involved in separating these two processes. Potential ET refers to the loss of water from a vegetated surface to the atmosphere under conditions of an unlimited water supply. The actual rate of ET is typically lower than the potential rate under dry conditions (e.g., during the summer months when there is a soil moisture deficit). Based on the long-term (1962 – 2008) data provided by Environment Canada, the mean annual ET for the immediate area was estimated to average approximately 577 mm/year.

Change in Storage (S)

Short-term or seasonal changes in surface or groundwater storage occur on an annual basis as demonstrated by dry conditions in the summer months and flooded conditions in the winter and spring. Long-term changes (i.e., years or decades) in groundwater storage are generally considered to be negligible.

Surplus Water - Surface Runoff (R) and Infiltration (I)

Water surplus is the difference between mean annual precipitation and mean annual actual evapotranspiration, and represents the total amount of water, in the form of surface runoff and infiltration, that would flow through the catchment on an annual basis.

The total amount of water that contributes to surplus water is the result of rain and snow melt. Surplus water remains after actual evapotranspiration has been removed and maximum soil storage is exceeded. Maximum soil storage is quantified using a water holding capacity (WHC) specific to local soil types, vegetation and land use. Based on the varying soil types in the existing watershed areas an appropriate WHC value was selected using guidance provided in the Ministry of the Environment (MOE) Stormwater Management Planning and Design (SWM) Manual (2003).

Wetland Areas

Wetland areas are located within the drainage area. Potential evapotranspiration numbers provided in the EC water budget were used to estimate the actual evapotranspiration from the water body areas (i.e., actual ET was assumed equal to potential ET for wetland areas).

Results

Three water holding capacities (WHC) were chosen for the drainage area based on land use; 3 mm for roads (2% of total drainage area), 200 mm for agricultural areas (60% of total drainage area) and 350 for wooded areas (3% of total drainage area). Wetland areas (swamp/marsh) account for 35% of the total drainage area.

The drainage area to Willow Brook at Highway 89 is shown, with land uses, on Figure B1.

A summary of the estimated monthly surplus is provided in Table B1. A detailed water balance is provided in Attachment B1.

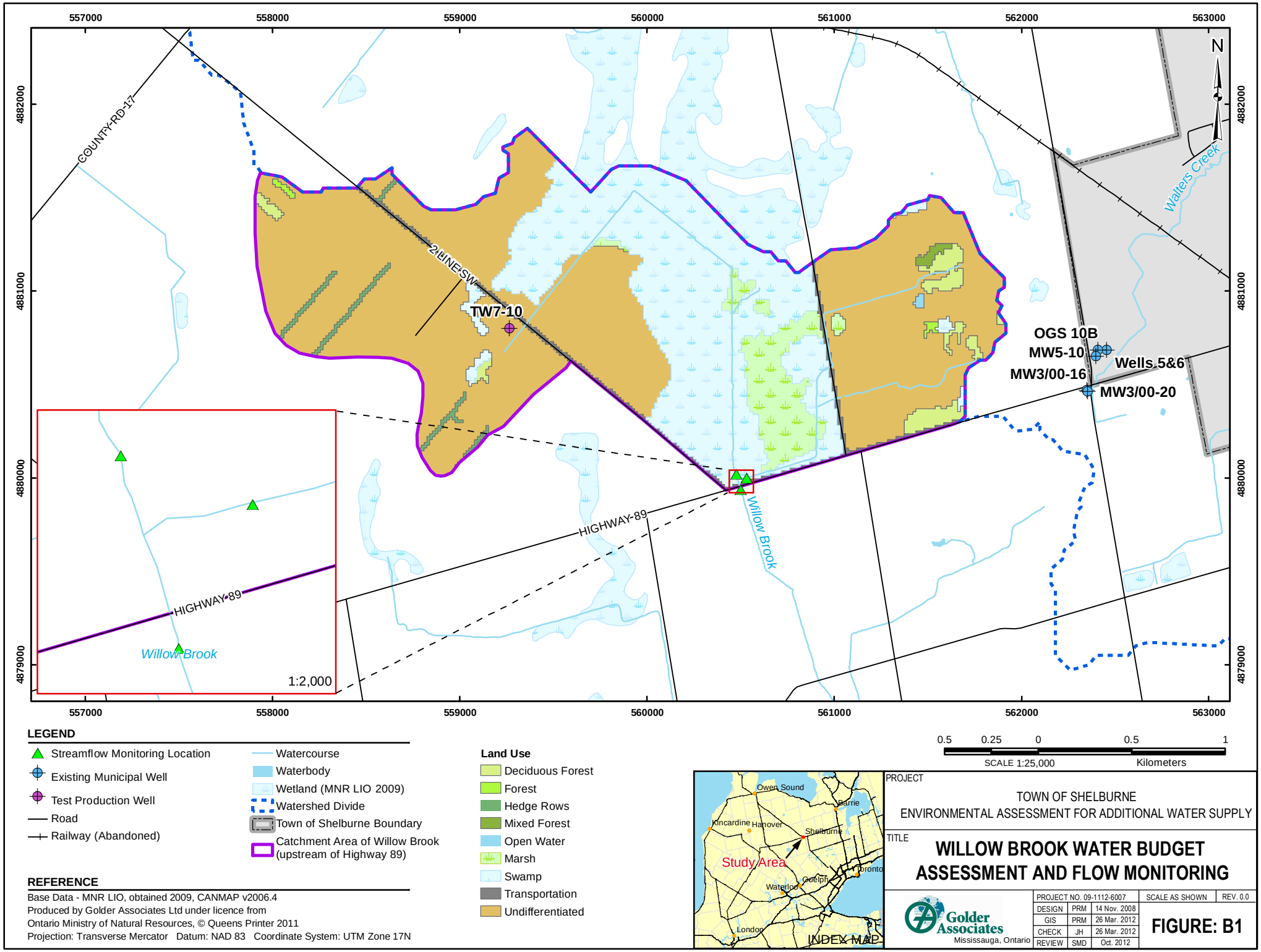
Based on the water balance estimates, the observed flow rate (from January 18, 2012) is approximately 65% higher than the average estimated water surplus for the month of January.

Table B1:
Water Balance Summary – Willow Brook at Highway 89

Month	Total Surplus		
	(L/s)	(m^3)	(mm)
January	67	179,688	39.4
February	75	182,389	40.0
March	131	352,053	77.1
April	103	266,323	58.3
May	23	61,316	13.4
June	7	17,233	3.8
July	0	2	0.0
August	2	5,751	1.3
September	10	27,202	6.0
October	23	60,927	13.3
November	43	110,225	24.1
December	50	134,860	29.5
Total	45	1,397,968	306.3

\\golder.gds\gal\mississauga\active\2009\1112\09-1112-6007 town of shelburne - hydrogeological assessment\reports\shelburne draft hydro-g oct 2012\appendix b_water budget\appendix b 02oct12.docx

FIGURE



LEGEND

- Streamflow Monitoring Location
- Existing Municipal Well
- Test Production Well
- Road
- Railway (Abandoned)
- Watercourse
- Waterbody
- Wetland (MNR LIO 2009)
- Watershed Divide
- Town of Shelburne Boundary
- Catchment Area of Willow Brook (upstream of Highway 89)

Land Use

- Deciduous Forest
- Forest
- Hedge Rows
- Mixed Forest
- Open Water
- Marsh
- Swamp
- Transportation
- Undifferentiated

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE
WILLOW BROOK WATER BUDGET ASSESSMENT AND FLOW MONITORING

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007		SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	14 Nov. 2008	
GIS	PRM	26 Mar. 2012	
CHECK	JH	26 Mar. 2012	
REVIEW	SMD	Oct. 2012	

FIGURE: B1

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\FinalEA_for_Additional_Water_Supple\WillowBrookWaterBudgetAssement.mxd

ATTACHMENT B1

Detailed Water Balance – Willow Brook at Highway 89

October 2012
Report No. 09-1112-6007

Golder Associates

				Roads (3 mm Water Holding Capacity)			Agricultural (200 mm Water Holding Capacity)			Wooded Areas (350 mm Water Holding Capacity)			Swamp/Marsh (Precip - PE)			Total Surplus	
Month	**Temp (°C)**	**Precipitation (mm)**	**Potential Evapotranspiration (mm)**	**Actual Evapotranspiration (mm)**	**Surplus (mm)**	**Surplus (m^3)**	**Actual Evapotranspiration (mm)**	**Surplus (mm)**	**Surplus (m^3)**	**Actual Evapotranspiration (mm)**	**Surplus (mm)**	**Surplus (m^3)**	**Actual Evapotranspiration (mm)**	**Surplus (mm)**	**Surplus (m^3)**	**Total Surplus (m^3)**	**Average Surplus (L/s)**
January	-7.8	65	1	1	1	37	1	27	74,283	1	23	2,755	1	64	102,613	179,688	67
February	-7.5	54	1	1	1	38	1	34	93,541	1	32	3,833	1	53	84,977	182,389	75
March	-2.4	62	7	7	7	96	7	92	253,112	7	89	10,661	7	55	88,183	352,053	131
April	5	69	30	30	30	71	30	71	195,336	30	70	8,385	30	39	62,530	266,323	103
May	11.5	79	73	63	73	18	73	18	49,522	73	18	2,156	73	6	9,620	61,316	23
June	16.7	78	107	72	107	7	107	6	16,507	107	6	719	107	-29	0	17,233	7
July	19.1	77	124	76	124	2	124	0	0	124	0	0	124	-47	0	2	0
August	18.1	89	110	80	110	9	110	2	5,502	109	2	240	110	-21	0	5,751	2
September	14.1	82	74	62	74	20	74	5	13,756	73	5	599	74	8	12,827	27,202	10
October	74	74	36	-2	36	0	37	0	0	0	0	0	36	38	60,927	60,927	23
November	83	70	12	0	12	6	12	6	16,507	0	6	719	12	58	92,993	110,225	43
December	73	27	2	0	2	33	2	33	90,790	0	33	3,953	2	25	40,083	134,860	50
Total per Year	***24.7***	***826***	***577***	***390***	***577***	***337***	***578***	***294***	***808,858***	***525***	***284***	***34,020***	***577***	***249***	***554,753***	1,397,968	***45***

P = ET + R + I + S

P = Precipitation
ET = Evapotranspiration (AE = Actual Evapotranspiration, PE = Potential Evapotranspiration)
R = Runoff
I = Infiltration
S = Storage

APPENDIX C

Well Construction and Borehole Logs

Table of Contents

1.0 INTRODUCTION 2

2.0 OGS BOREHOLES 2

3.0 WELL DRILLING AND INSTALLATION 2

3.1 Test Well TW7-10 3

3.2 Overburden Monitoring Well MW6/10-9 3

3.3 Piezometer Installation 3

FIGURE

Figure C1 Well Locations
Figure C2 TW7-10 Municipal Test Well As Constructed

ATTACHMENTS

Attachment C1 Borehole Logs
Attachment C2 MOE Water Well Records

1.0 INTRODUCTION

The Town of Shelburne (the Town) is undertaking Municipal and Federal Environmental Assessments (EA's) to identify the preferred alternative for developing additional municipal groundwater supply. As part of the field studies supporting the EA's, a test production well (TW7-10) was drilled, an overburden monitoring well (MW6/10-9) and two mini-piezometers were installed. This Technical Appendix (Appendix C) of the Hydrogeological Report (HR) presents the factual results of the well construction as well as interpretation of the collected data.

2.0 OGS BOREHOLES

In February and March 2010, the Ontario Geological Survey (OGS), as part of the OGS research program and in support of the Town's test well drilling program, drilled two test wells, OGS 10A and OGS 10B. The location of these wells is shown on Figure C1.

An area west of the Town was identified based on several factors, including geology, land use designation, proximity to surface water features, and distance to the municipal water supply system. Land owners in this area were approached by Town staff to determine willingness to enter into an agreement to permit test drilling. Based on the responses received, one test coring location (OGS 10A) was selected on 2nd Line Southwest in Melancthon Township, about three kilometres west of Town, and the second test coring location (OGS 10B) adjacent to existing Municipal Wells PW5 and PW6.

OGS 10A and OGS 10B are 100-mm diameter holes, cored into the Cabot Head Formation. Installation of the cored holes was carried out under the supervision of the OGS. Bedrock cores were retrieved for subsequent logging and geochemical analyses. Borehole logs for OGS 10A and OGS 10B are provided in Attachment C1. Various downhole investigative methods were utilized by the Project Team to evaluate the potential of developing a groundwater supply source from deeper bedrock formations. These methods included borehole geophysics and test pumping. Geophysical logs for the OGS boreholes are shown in Attachment C1.

The test results indicated that the Gasport Formation at OGS 10A (located on 2nd Line) was moderately transmissive (i.e., water bearing fractures apparent) and likely capable of supporting the development of a municipal supply well. Initial water quality results indicated groundwater pumped from the Gasport Formation was suitable as a municipal drinking water source. Water bearing fractures were not encountered within the bedrock deposits at OGS 10B, (located in proximity to Wells 5/6), therefore this location did not appear suitable for further groundwater supply development.

3.0 WELL DRILLING AND INSTALLATION

Based on the preliminary field study results, it was then decided that EA field studies should continue with a larger-diameter (i.e. 200 mm) test well located in proximity to OGS 10A. Performance testing of the test well could then be undertaken to confirm the groundwater quality and sustainability of pumping from deep bedrock formations in proximity to OGS 10A. The test well drilling program and subsequent pumping tests are described in the sections below

3.1 Test Well TW7-10

Drilling and construction of the test well (TW7-10) was completed in July 2010 by Gerrits Drilling & Engineering. A borehole log for TW7-10 is provided in Attachment C1. A draft MOE water well record for TW7-10 is provided in Attachment C2. The primary goal of the test well was to evaluate the quantity and quality of groundwater available from the deeper bedrock formations (i.e., the Gasport Formation). The well was temporarily constructed with a 200-mm diameter steel casing set at about 11 metres below grade, about one metre below bedrock surface. A nominal 200-mm open hole was then drilled in the bedrock to a depth of 86.5 metres. In order to isolate groundwater pumping from the Gasport Formation, an inflatable packer was seated at the bottom of the Eramosa Formation (i.e. 47 metres below grade), with the pump set at a depth below the packer. Details of the aquifer testing at TW7-10 are provided in Appendix D.

3.2 Overburden Monitoring Well MW6/10-9

Immediately adjacent to TW7-10, an overburden monitoring well was drilled and installed by Gerrits on date. This well was completed to a depth of 6 m, providing a deeper overburden groundwater monitoring interval. The location of this well is found on Figure C1. A copy of an MOE water well record is provided in Attachment C2.

3.3 Piezometer Installation

With advice from our project team surface water and biological specialists, two locations were selected within a 500 m radius of TW7-10 to monitor shallow groundwater levels adjacent to nearby surface water features (e.g., wetlands and creeks). The 20-mm diameter, steel piezometers were installed by Golder staff to a depth of 1.5 m. The MP1 location is adjacent to the wetland located closest to the test well site. The MP2 location was selected as representative of the large wetland located northeast of the test well site.

FIGURES

559000 560000 561000 562000 563000

4882000 4881000 4880000 4879000

N

MP2
OGS 10A
MW6/10-9
TW7-10
MP1
OGS 10B
SIDEROAD 30
2 LINE SW
5 LINE
4 LINE
6 LINE
BIRCH GROVE
MAPLE CRT
MAIN ST W

INSET MAP
N
OGS 10A
TW7-10
MW6/10-9
25 12.5 0 25 50
SCALE 1:2,000
METRES

LEGEND

- Test Production Well
- OGS Test Well
- Overburden Monitor
- Mini Piezometer
- Road
- Railway (Abandoned)
- Watercourse
- Wetland (MNR LIO 2009)

INDEX MAP
Owen Sound
Barrie
Kincardine
Hanover
Shelburne
Lake Huron
Study Area
Toronto
Guelph
Waterloo
Lake Ontario
London

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
MOE Well Records - MOE 2009
Imagery: GRCA (2006)
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

250 125 0 250 500
SCALE 1:15,000
METRES

PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

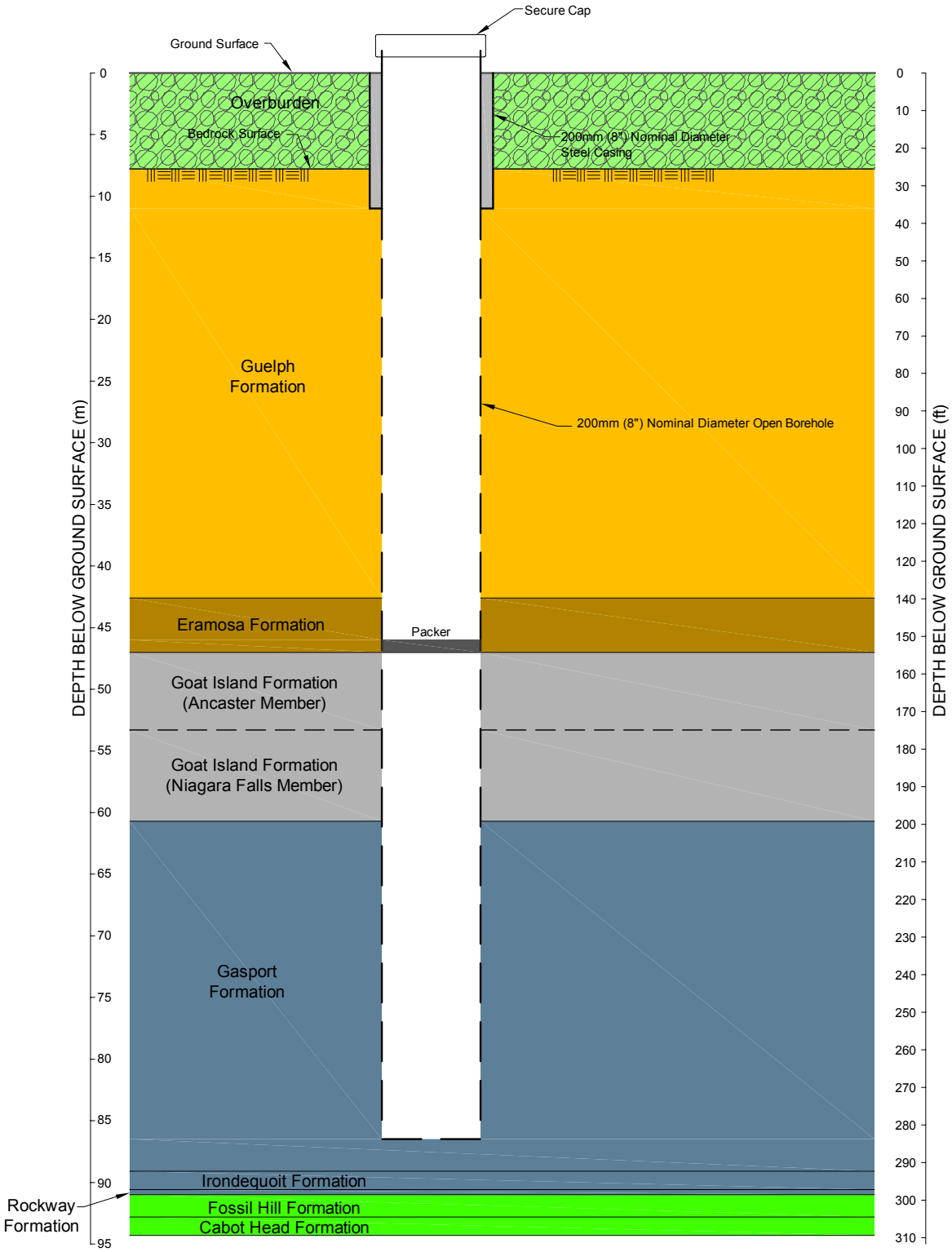
TITLE
NEW WELL LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	JO	7 Mar. 2012		
GIS	JO	18 Sep. 2012		
CHECK	JH	18 Sep. 2012		
REVIEW	SMD	Oct. 2012		

FIGURE: C1

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\Final\EA_for_Additional_Water_Supply\NewWellLocations.mxd



NOTE:
LOGGING REFLECTS THAT OF THE OGS10A BOREHOLE
LOCATED AT A DISTANCE OF 9 m FROM TW7-10

Golder Associates
Mississauga, Ontario, Canada

SCALE	AS SHOWN
DATE	Oct. 2012
DESIGN	KD
CAD	KD
CHECK	SMD
REVIEW	SMD

TITLE

TW7-10 MUNICIPAL TEST WELL AS CONSTRUCTED

FILE No.	0911126007BCC02.dwg		
PROJECT No.	09-1112-6007	REV.	A

TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

FIGURE
C2

PLOT DATE: December 06, 2012
FILENAME: T:\Projects\2009\09-1112-6007 (Town of Shelburn, Shelburn)\-BC-Final Report\0911126007BCC02.dwg

ATTACHMENT C1

Borehole Logs

GEOPHYSICAL RECORD OF BOREHOLE: OGS 10A

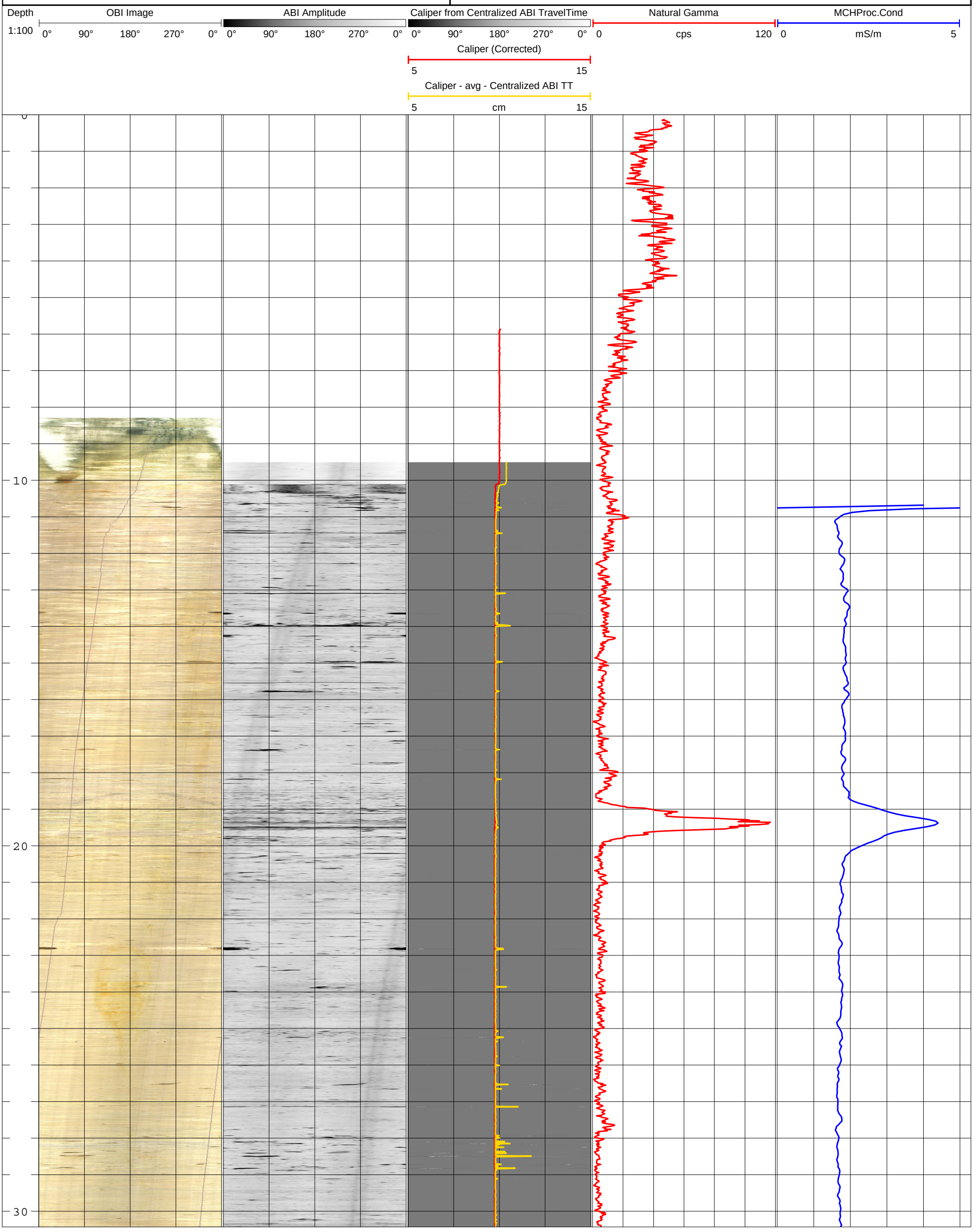
Town of Shelburne

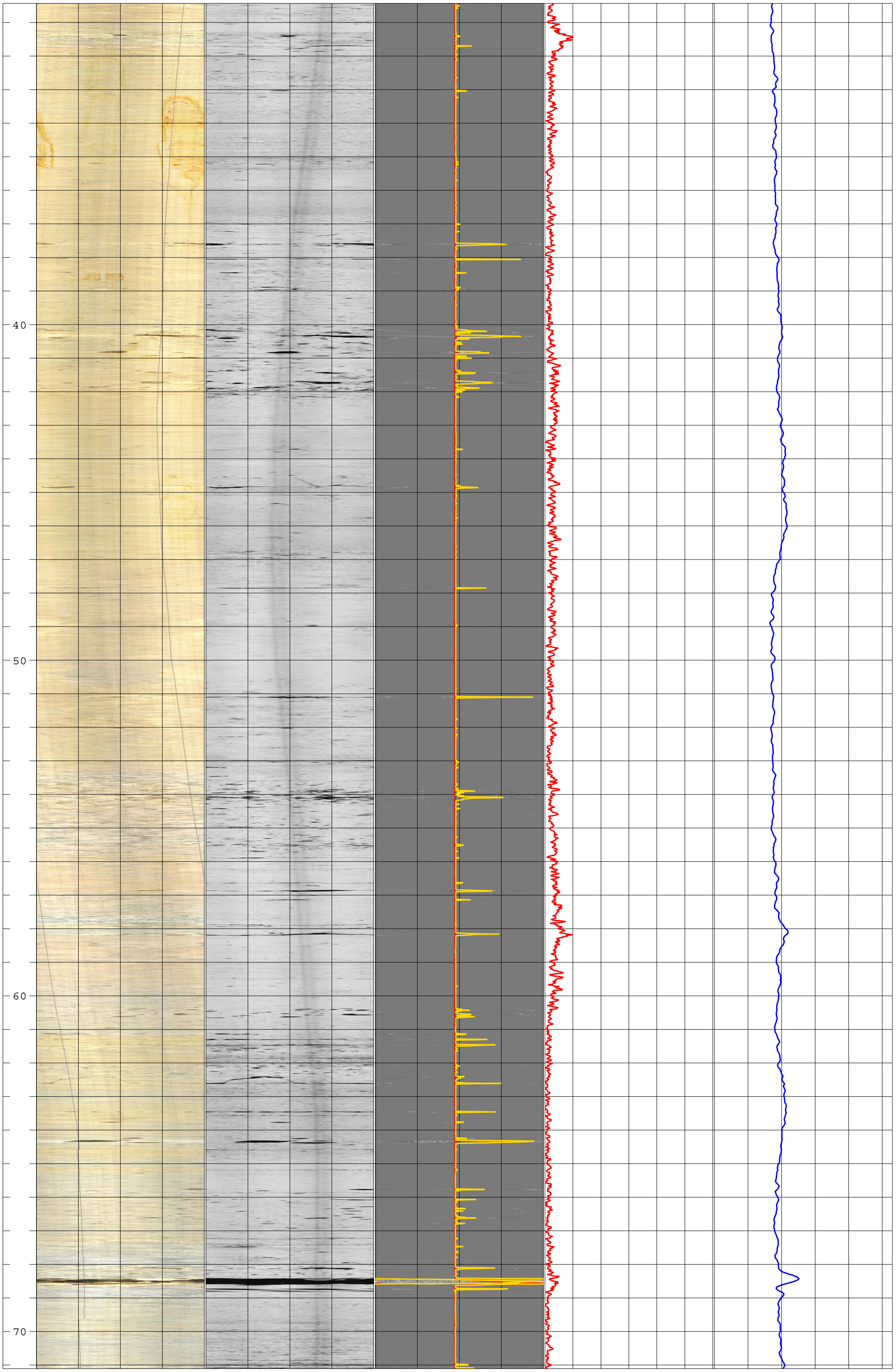
Client: Ontario Geological Survey

Project Number: 09-1112-6007

Date: September, 2012

Location:	Shelburne, Ontario	Depth Reference:	"0" at Ground
Easting:	559,259.37 m	Core Depth Ref:	Ground
Northing:	4,880,809.27 m	Drilling Method:	Cored
Elevation:	497.19 m - ground, asl	Borehole Diameter:	96 mm
Datum:	NAD 83, Zone 17	Drilled Depth:	93 m bgl
Log Date:	March 2, 2010	Casing Depth:	10.11 m bgl
Logged By:	WEM	Conductor Diameter:	101 mm

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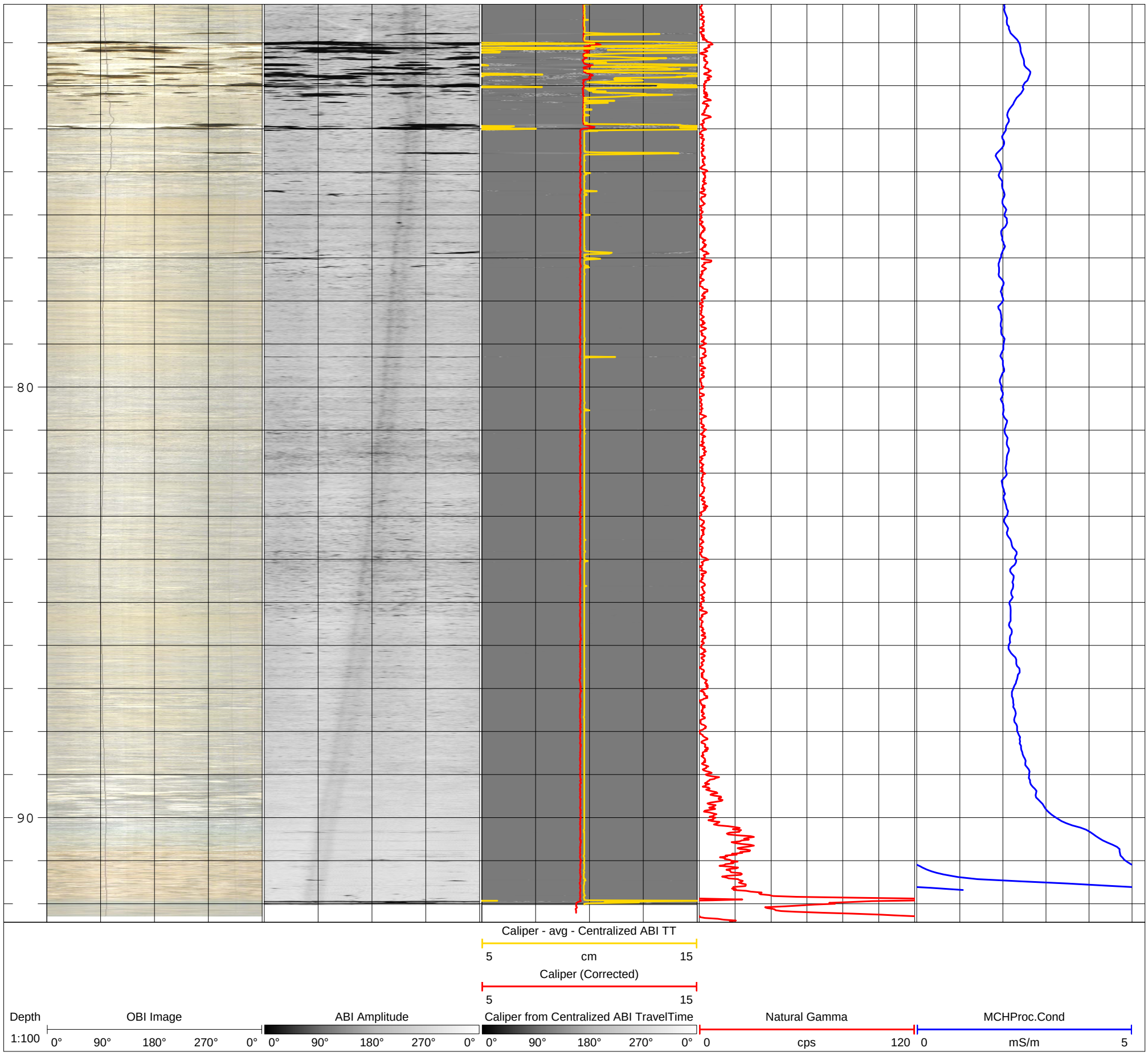
50
60
70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90
Caliper - avg - Centralized ABI TT
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cm
15
Caliper (Corrected)
5
15
Depth
1:100
OBI Image
0° 90° 180° 270° 0°
ABI Amplitude
0° 90° 180° 270° 0°
Caliper from Centralized ABI TravelTime
0° 90° 180° 270° 0°
Natural Gamma
0
cps
120
MCHProc.Cond
0
mS/m
5

GEOPHYSICAL RECORD OF BOREHOLE: OGS 10B

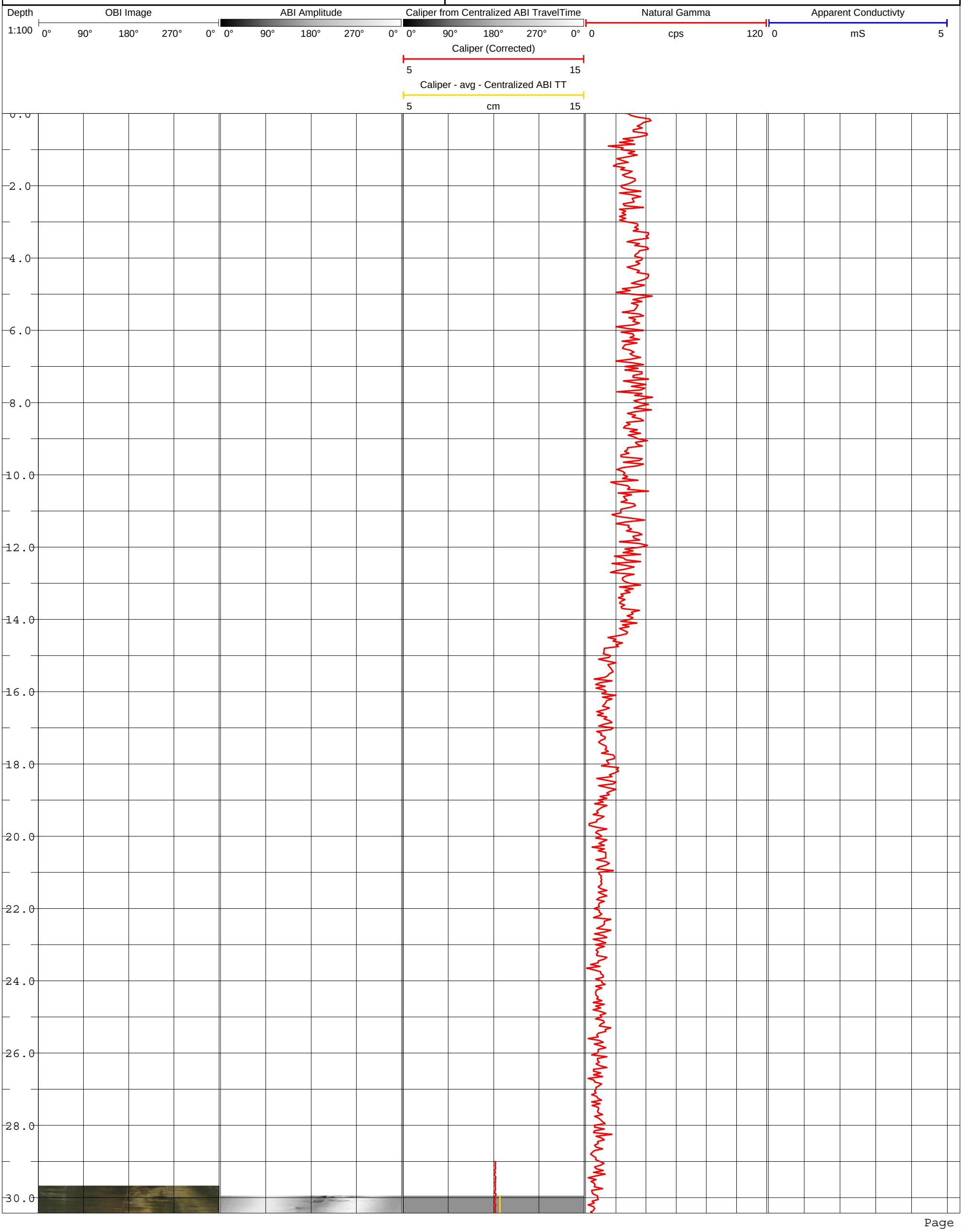
Town of Shelburne

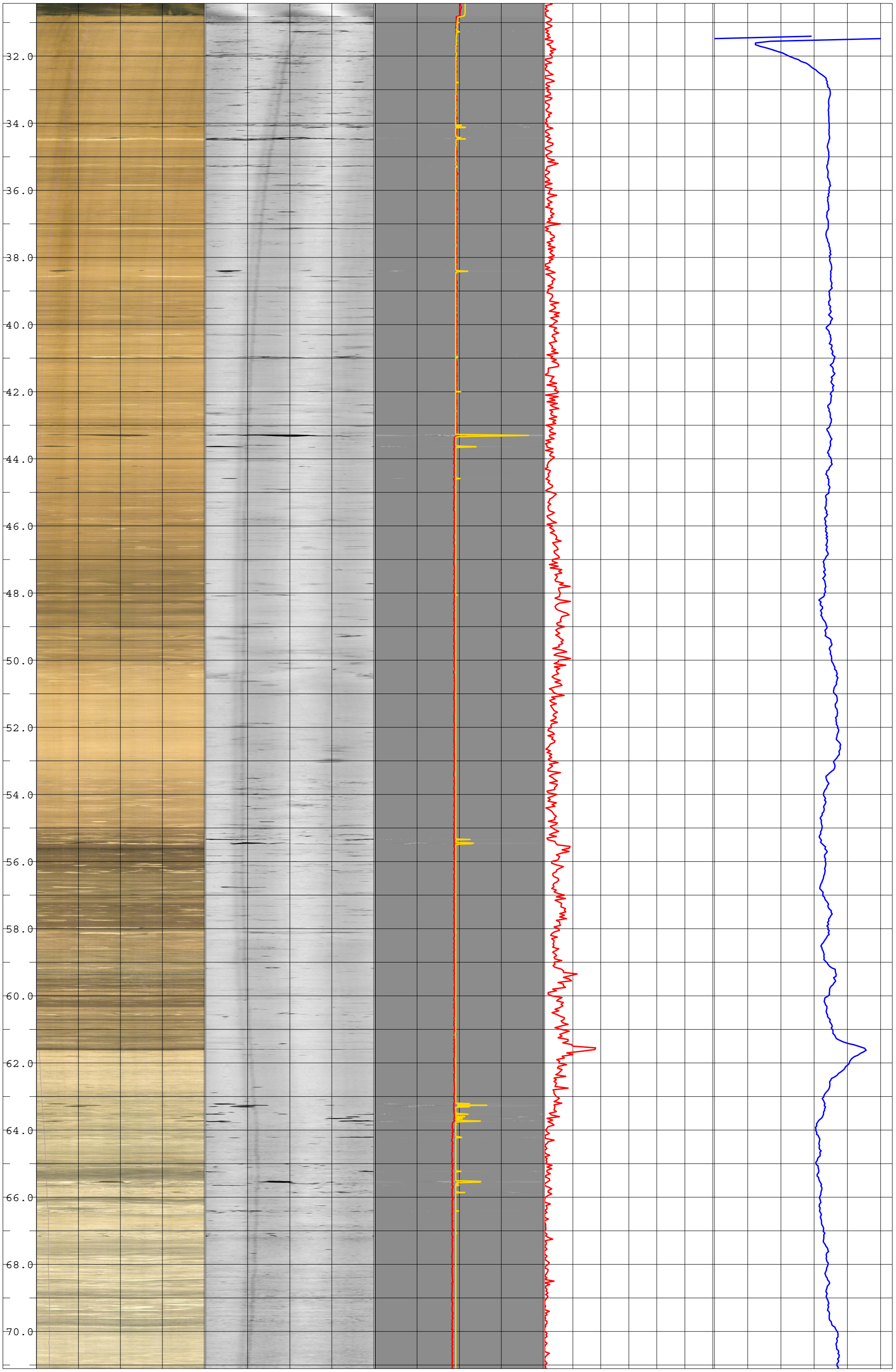
Client: Ontario Geological Survey

Project Number: 09-1112-6007

Date: September, 2012

Location:	Shelburne, Ontario	Depth Reference:	"0" at Ground
Easting:	562,410 m	Core Depth Ref:	Ground
Northing:	4,880,689 m	Drilling Method:	Cored
Elevation:	?488 m - ground, asl	Borehole Diameter:	96 mm
Datum:	NAD83, Zone 17	Drilled Depth:	~74.7 m bgl
Log Date:	March 19, 2010	Casing Depth:	30.81 m bgl
Logged By:	WEM	Conductor Diameter:	101 mm

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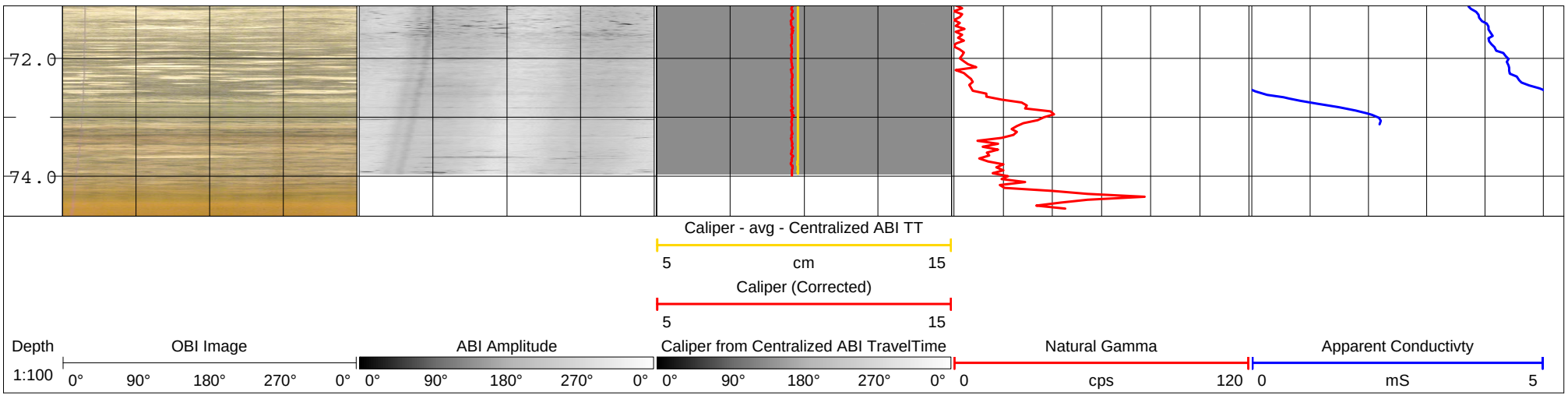
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cm
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Caliper (Corrected)
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15
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90°
180°
270°
0°
ABI Amplitude
0°
90°
180°
270°
0°
Caliper from Centralized ABI TravelTime
0°
90°
180°
270°
0°
Natural Gamma
0
cps
120
Apparent Conductivty
0
mS
5

ATTACHMENT C2

MOE Water Well Records

Ontario Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)* A071535

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Measurements recorded in: [X] Metric [ ] Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	[ ] Well Constructed by Well Owner
	TOWN OF SHELBURNE		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
203 MAIN ST. SHELBURNE		ON	L0N1S0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	MELANCTHON	303	2

County/District/Municipality	City/Town/Village	Province	Postal Code
DUFFERIN		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	559266	4880808		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	TOP SOIL			0	0.30
BROWN	CLAY	STONES		0.30	7.62
BROWN	CLAY	LIMESTONE	LAYERED / FRAGMENTED	7.62	9.14
BROWN / GREY	LIMESTONE / DOLOSTONE		LAYERED	9.14	86.56

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	47.24	NEAT CEMENT	7.57

Method of Construction

[ ] Cable Tool [ ] Diamond
[X] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[ ] Other, *specify* _____

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [X] Municipal [ ] Dewatering
[ ] Livestock [ ] Test Hole [ ] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, *specify* _____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
30.48	STEEL	0.711	+0.60	47.24
30.48	OPEN HOLE		47.24	86.56

Status of Well

[X] Water Supply
[ ] Replacement Well
[ ] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[ ] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, *specify*
[ ] Other, *specify*

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Water Details

Water found at Depth	Kind of Water	
14 (m/ft) [ ] Gas	[ ] Fresh [X] Untested	[ ] Other, *specify*
36 (m/ft) [ ] Gas	[ ] Fresh [X] Untested	[ ] Other, *specify*
54 (m/ft) [ ] Gas	[ ] Fresh [X] Untested	[ ] Other, *specify*

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	47.24	50.8
47.24	86.56	30.48

Results of Well Yield Testing

After test of well yield, water was:
[X] Clear and sand free
[ ] Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping 72 hrs + 0 min

Final water level end of pumping *(m/ft)* 17.69

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

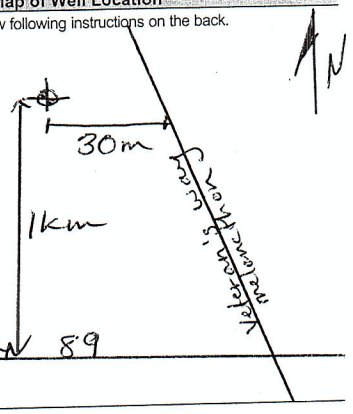
Well production *(l/min / GPM)*

Disinfected? [X] Yes [ ] No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	0.94			17.69
1			1	
2			2	
3			3	
4			4	
5	5.40		5	12.89
10	6.43		10	11.77
15	7.06		15	11.09
20	7.56		20	10.95
25	8.01		25	10.11
30	8.38		30	9.72
40	9.04		40	9.06
50	9.61		50	8.51
60	10.07		60	8.02

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Gerrits Drilling & Engineering Ltd.	3406

Business Address (Street Number/Name)	Municipality
215154 10th Line, R.R. #1	

Province	Postal Code	Business E-mail Address
Grand Valley, Ontario	L0N 1G0	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
	STEVE GERRITS

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2964		2012 09 20

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
[X] Yes [ ] No	2012 09 20	Audit No. Z153333
	Date Work Completed: 2012 09 12	Received

0506E (2007/12) © Queen's Printer for Ontario, 2007

Ministry's Copy

Ontario — Ministry of the Environment

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below): A076997

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Town of Shelburne		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
203 Main Street	Shelburne	ON	L0N1S0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	Melancthon	303	2

County/District/Municipality	City/Town/Village	Province	Postal Code
Dufferin		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	559269	4800005		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Clay			0	4.72
	Gravel	Coarse		4.72	9.75

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	4.27	Bentonite	0.068
4.27	9.75	Chlorinated Sand	0.088

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5.20	PVC	0.39	+0.91	5.79

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
6.03	PVC	10	5.79	8.84

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
9.75 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	0	9.75	15.2
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Geofirma Drilling & Engineering Ltd.	3406

Business Address (Street Number/Name)	Municipality
215154 10th Line, R.R. #1	

Province	Postal Code	Business E-mail Address
Grand Valley, Ontario	L0N 1G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	Steve Gerrits

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2464		2012/09/20

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

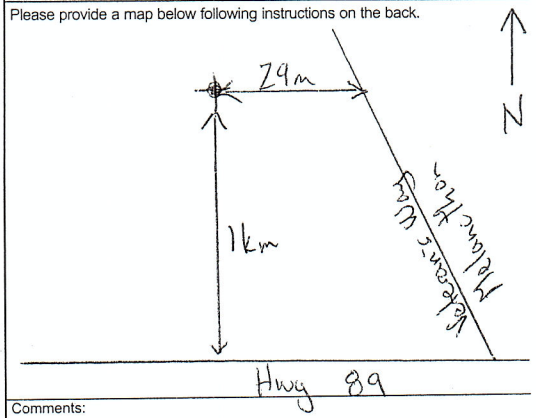
Well production (l/min / GPM)

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☑ Yes ☐ No	2012/09/20	Audit No. Z153334
	Date Work Completed 2012/09/20	Received

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APPENDIX D

Performance Assessment of TW7-10

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Attachment D2 Pumping Test Notice
Attachment D3 Certificates of Analysis
Attachment D4 Borehole Logs

1.0 INTRODUCTION

The Town of Shelburne (the Town) is undertaking Municipal and Federal Environmental Assessments (EA's) to identify the preferred alternative for developing additional municipal groundwater supply. As part of the field studies supporting the EA's, performance testing of a test production well (TW7-10) was undertaken. The purpose of this test was to identify the sustainable yield and evaluate potential environmental effects from the long term operation of TW7-10. This Technical Appendix (Appendix D) of the Hydrogeological Report (HR) presents the factual results of the TW7-10 performance test as well as interpretation of the collected data.

Details regarding the hydrogeological characterization of the Study Area are provided in Section 2 of the HR. Construction details of TW7-10 are provided in Appendix C of the HR.

1.1 Permitting and Test Methodology

Performance testing of TW7-10 was carried out in accordance with Ontario Ministry of Environment (MOE) Permit to Take Water (PTTW) No. 4820-895KBC. A copy of the PTTW is provided in Attachment D1.

The order of the TW7-10 pumping test is summarized in the timeline provided below.

Date	Pumping Test Details
November 25, 2010	Step testing within open borehole of TW7-10 (four 30 minute rate steps at 654, 1,308, 1,962 and 2,244 m^3/day).
November 26, 2010	Step testing below packer installed within TW7-10 (47 m bgs, approximately 450 masl) (four 30 minute rate steps at 654, 1,308, 1,962 and 2,244 m^3/day).
November 29 to December 2, 2010	72-hour groundwater pumping test (from below the packer within TW7-10) at a constant rate of 1,635 m^3/day.

As part of the test program, the following tasks were undertaken:

- A survey of well owners within a one-kilometre radius of the test well was conducted to request approval for access to their well for groundwater level monitoring before, during, and following the pumping test program. Well owners were also requested to provide a water sample for bacteriological analysis before monitoring began. Responses were received from five well owners, providing approval for sampling and monitoring. A copy of the approval form distributed to well owners is provided in Attachment D2 of the HR. A written notice of the TW7-10 pumping test was distributed to private well owners within a one-kilometre radius of the test well, which included the test schedule and contact information in the event that the private well supplied were interrupted during the test. A copy of the notice submitted to local well owners is provided in Attachment D2.
- Automated water level recorders (dataloggers) where installed in 11 monitoring wells at least 7 days prior to TW7-10 pumping, including five private wells. Monitoring well details and locations are summarized in Table D1 and shown on Figure D1, respectively. Dataloggers were removed from the monitoring locations approximately 1 month following the end of the performance test.

- On November 26, 2010 (i.e., following the open hole step test) a packer was installed within TW7-10 at a depth of 47 m bgs (approximately 449.5 masl, representing the interface between the Eramosa and Goat Island Formations). The purpose of the packer was to constrain groundwater inflow to TW7-10 borehole, such that horizontal inflow would only be possible from below the packer (i.e., groundwater pumping would be limited to the Goat Island and Gasport Formations).
- A packer was also installed in OGS 10A, so that groundwater levels above and below the interface of the Goat Island and Eramosa Formations could be monitored, respectively.
- During the Step Testing, one groundwater sample was collected from TW7-10 during the open borehole step test (Sample T-1) and another sample was collected during the puckered step test (Sample T-2). During the 72-hour pumping test period, groundwater samples were collected from TW7-10 after 30 minutes (Sample T-3), 48 hours (Sample T-4) and 72 hours (Sample T-5) of pumping. Samples T-1 through T-4 were analyzed for general chemistry (e.g., ions, metals, non-metals). Sample T-5 was analyzed with respect to all ODWS. Laboratory certificates of analyses for the Samples T-1 through T-5 are provided in Attachment D3. The results of these analyses are provided within Section 3.2.3 below.
- Throughout the 72-hour pumping test period, pumped groundwater was piped to an adjacent municipal drain located on the west side of 2nd Line (as shown on Figure D1). Prior to the 72-hour test, the municipal drain was inspected to confirm it was capable of receiving and discharging the anticipated flow rate and erosion controls were established at the discharge location.

2.0 PERFORMANCE TEST RESULTS

Groundwater hydrographs from all monitoring locations, (between November 16 and December 22, 2010), are presented on Figures D2 through D6. To understand hydrograph trends and level of response to TW7-10 pumping, all hydrographs were compared to the period of TW7-10 pumping and precipitation data from Environment Canada's Orangeville Station (ID No 6155790). Borehole logs from monitoring wells installed during this project are presented in Appendix C. Borehole logs from existing monitoring wells are included in Attachment D4.

2.1 TW7-10 Step Tests

Step-pumping within the open borehole of TW7-10 took place on November 25, 2010. The test consisted of four 30-minute steps. Pumping rates ranged from 654 to 2,244 m^3/day, with incremental increases of 654 m^3/day, except for the final step. Drawdown observed during each step is plotted versus time on Figure D6 and summarized in Table D2. Drawdown increased proportionally to increasing rate steps, ranging from approximately 1.08 m to 2.65 m between 654 to 2,244 m^3/day rate steps, respectively.

On November 26, 2010, the step-pumping tests were repeated with pumping constrained to bedrock formations below the packer. Drawdown (relative to the pre-test level) observed during each step is plotted versus time on Figure D7 and summarized in Table D2. Drawdown increased proportionally to increasing rate steps, ranging from approximately 1.08 m to 2.65 m between 654 to 2,244 m^3/day rate steps, respectively.

Figure D8 shows the drawdown observed at the end of the 30 minute step tests. For short duration pumping, the specific capacity of TW7-10 ranged from 847 m^3/day per m drawdown in the open borehole to 193 m^3/day

per m drawdown when pumping from below the packer. These results indicate that the transmissivity of the Guelph Formation is likely to be higher compared to the Gasport Formation locally.

3.0 72-HOUR PERFORMANCE TEST

Based on the results of the step-drawdown tests, a pumping rate of 1,635 m^3/day (250 Igpm) was selected for the 72-hour performance test of TW7-10 (from below the packer).

It is noted that groundwater levels in TW7-10 (below the packer) are not available for the performance test period, due to datalogger malfunction. Placement of the packer precluded access to this interval; therefore, manual readings are also not available.

3.1 Groundwater Level Response to TW7-10 Pumping (at 1,635 m^3/day)

Groundwater level response to pumping varied significantly depending on proximity to TW7-10 and stratigraphic setting (Gasport, Guelph and Overburden). Table D3 provides a summary of the observed response (if any) at monitoring locations. Key observations are noted as follows:

- A direct hydraulic connection was observed at OGS10A (below packer), which is the only monitoring well completed within the Gasport Formation. As shown on Figures D2 and D9, these hydrographs shows approximately 17 m of drawdown through the performance test period.
- Relative to groundwater level response in the Gasport Formation, monitoring wells completed within Guelph Formation showed a subdued response (if any) to TW7-10 pumping. Obvious responses to the start-up and shut-down of TW7-10 pumping were observed at OGS 10A (above the packer), OW1 and OW4. Groundwater level drawdown in the Guelph Formation in proximity to TW7-10 was approximately 2 m. Approximately 0.5 m of groundwater drawdown was observed in the Guelph Formation at a distance of 600 m (OW4).
- Monitoring wells OW2 and MW6/10-9 are completed deep within the overburden soils, immediately above the bedrock contact. As such, these wells are expected to respond similar to bedrock wells completed in the Guelph Formation. The hydrographs OW2 and MW6/10-9 show a sharp response to precipitation noted on November 30, 2010. While difficult to discern, approximately 2 m of groundwater level drawdown may be realized at these locations in response to TW7-10 pumping.
- The OW3 and OW5 hydrographs, which are located more than 700 m from TW7-10, did not show a clear response to the start-up and shut-down of TW7-10 pumping. Water level fluctuations within these wells are expected to reflect precipitation events and/or well usage.
- Shallow overburden piezometers (MP1 and MP2) showed no discernable response to the start-up or shut-down of TW7-10.
- Monitoring wells MW5-10, MW3/00-16 and MW3/00-20, which are located near existing municipal wells PW5 and PW6, showed no response to the TW7-10 pumping. Water level fluctuations at these locations reflect the operation and interference effects of existing municipal well pumping.

3.2 Interpretation of Results

This section interprets the factual data described above to develop a hydrogeological conceptual model for the Study Area and assessment of the water source supporting TW7-10 pumping.

3.2.1 Hydrogeological Conceptual Model

As shown on Figure D9, hydrographs of monitoring wells completed within the Guelph Formation show a clear but subdued response to TW7-10 pumping (i.e., total drawdown in the Guelph Formation was generally less than 10% compared to drawdown observed in the underlying Gasport Formation). Coupled with a 1 m head difference observed between the Guelph and Gasport Formation monitors under static conditions, a 3-layer groundwater flow conceptual model (as shown on Figure D10) is interpreted for the Study Area. As part of this conceptual model, the Guelph Formation represents a shallow aquifer that receives groundwater recharge from local infiltration of precipitation through the glacial till overburden. Collectively, the Eramosa and Goat Island Formations are recognized as an aquitard, limiting downward seepage of water from the overlying Guelph Formation to the underlying Gasport Formation. The Gasport Formation represents a deep aquifer, which is recharged from vertical seepage through the overlying aquitard over a broad area.

A solution for aquifer response to transient flow to a fully penetrating well in a two aquifer system with a leaky confining layer was developed by Neuman and Witherspoon (1969). Applying this solution to the Guelph and Gasport Formation hydrographs, the hydraulic parameters for each layer can be estimated. Figure D11 shows the hydrographs of simulated (i.e., modelled) and observed groundwater response to TW7-10 pumping at OGS 10A (above and below the packer). A good match between observed and simulated groundwater level response in the Guelph and Gasport Formations is achieved for the following hydraulic parameters of the aquifers and confining aquitard:

	Hydraulic Conductivity (m/s)	**Specific Storarage** (m^{-1})	**Thickness** (m)
Unpumped Aquifer (Guelph Formation)	5×10^{-5}	6×10^{-5}	35
Aquitard (Eramosa and Goat Island)	5×10^{-7}	1×10^{-10}	18
Pumped Aquifer (Gasport Formation)	2×10^{-5}	8×10^{-5}	28

The values listed above conform reasonably with values reported in local hydrogeological studies (see Table 1 in the HR).

Figure D12 expresses the results of the above modelling analysis as groundwater level drawdown (in both the Guelph and Gasport Formations) with respect to distance from TW7-10. The above modelling analysis is supported by the observed groundwater level drawdown observed at responding monitoring wells (OW1, OW2 and OW4). Groundwater level drawdown (with respect to distance from TW7-10) in the Gasport and Guelph Formations is therefore expected to be similar to the modelling analysis shown on Figure D12. These results indicate a radius of influence of approximately 1 km from TW7-10. Recognizing the low horizontal hydraulic gradient in the Guelph Formation in the vicinity of TW7-10 (approximately 0.004 m/m, as identified by the

groundwater elevation contours shown on Figure D13), the interpreted capture area is likely to be skewed slightly towards the northwest.

3.2.2 Water Source for TW7-10 Pumping (at 1,635 m^3/day)

All pumped groundwater is balanced by removal of water from somewhere. Relative to long term pumping from TW7-10, increased groundwater recharge to the Gasport Formation can be expected within the zone of influence. This will result in increased downward seepage of water across the aquitard and decreased groundwater contribution to principal watercourses. Stabilization of groundwater levels in the Gasport Formation during the test period indicate that aquifer storage had been reduced and steady-state drainage to the Gasport Formation (from the overlying Guelph Formation) had been established. The source of pumped groundwater to TW7-10 (at 1,635 m^3/day) is therefore interpreted as follows:

a) Horizontal groundwater flow from the deep aquifer (i.e., Gasport Formation) capture area; and

b) Increased downward seepage across the aquitard (i.e., Eramosa and Goat Island Formations) over the zone of influence.

The contribution from each source is estimated as follows:

Groundwater Flow from Deep Aquifer Capture Area

Recognizing the Study Area is located along a regional groundwater and watershed divide, it is reasonable to assume that the groundwater flow directions in the Gasport Formation are generally consistent relative to the overlying Guelph Formation. The interpreted capture area of groundwater flow (in the Gasport Formation) towards TW7-10 is shown on Figure D13. The capture area extends north-eastwards, to areas of higher groundwater elevation. The quantity of this horizontal groundwater flow (Q_h) within the Gasport Formation can be estimated using Darcy's Law as follows:

$Q_h = T\ i_h\ L$, where:

T = transmissivity of the deep aquifer (approximately 45 m^2/day inferred from pumping test results);

I_v = horizontal hydraulic gradient (0.004 m/m, as interpreted between the 500 and 495 masl groundwater contours shown on Figure D13); and

L = width of capture area up-gradient of inferred drawdown (1,300 m, as shown on Figure D13).

Based on this calculation, approximately 235 m^3/day of groundwater reporting to TW7-10 (when operating at a rate of 1,635 m^3/day) represents horizontal groundwater flow within the deep aquifer capture area. This deep aquifer groundwater flow would likely have reported to a major water courses (Grand River or Boyne River) well beyond the Study Area.

Increased Downward Seepage Across Aquitard

Within the TW7-10 zone of influence, as shown on Figure D12, the vertical hydraulic gradient is increased across the aquitard. As a result, increased downward seepage is occurring to sustain pumping from TW7-10. The total increase of downward seepage to the Gasport Formation (Q_v) in response to pumping at 1,635 m^3/day can be estimated by applying Darcy's Law as follows:

$Q_v = K\ i_v\ A$, where:

K_v = vertical hydraulic conductivity of the aquitard (5×10^{-7} m/s, as interpreted from the pumping test);

I_v = change in vertical hydraulic gradient (as shown on Figure D12); and

A = cross-sectional area (approximately 3 km^2, based on zone of influence shown on Figure D12).

The balance of the pumped groundwater, approximately 1,400 m^3/day, is interpreted to be sourced from increased groundwater recharge within the 3 km^2 zone of influence. It is expected that this captured groundwater would otherwise have reported to surface water courses surrounding the zone of influence. Since the zone of influence straddles the regional groundwater divide, it is reasonable to split the remaining contribution from nearby sub-catchments of the Nottawasaga and Grand River basins.

Summary

Based on the above assessment, the water source contributing to TW7-10 pumping (at 1,635 m^3/day) is summarized as follows:

Source	Approximate Quantity (m^3/day)	Percentage of overall pumping rate	Where captured flow would have otherwise reported to
Horizontal flow within deep aquifer capture area	235	14 %	Principal watercourses located well beyond Study Area (i.e., Boyne River, Grand River)
Drainage from Guelph Formation within Nottawasaga River Basin	~ 700	43 %	Reaches of the Boyne River
Drainage from Guelph Formation within Grand River Basin	~ 700	43 %	Reaches of Willow Brook
Total	1,635		

3.3 Results of Groundwater Quality Analysis

A summary of the TW7-10 groundwater quality analyses are provided in Table D4. The water quality data was evaluated with reference to the respective parameters listed in Schedule 1, 2 and 3 of the Ontario Drinking Water Quality Standards, and Table 4 of the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. A copy of the laboratory certificate of analysis is provided in Attachment D3.

Concentrations of all parameters analyzed were below the applicable ODWQS criteria, with the exception of Total Hardness (as $CaCO_3$), which exceeded the ODWQS of 100 mg/L. The ODWQS for Total Hardness is an operational guideline for drinking water supplies and the elevated levels are typical of groundwater in this area of Ontario. The concentration of arsenic in all TW7-10 samples was below the ODWQS, and also below the potential future standard of 10 µg/L. It is interpreted that the low level of arsenic observed in the samples collected from TW7-10 originated from dissolution of arsenopyrite during groundwater recharge through the overlying Guelph Formation.

4.0 REFERENCES

Neuman, S.P. and P.A. Witherspoon, 1969. Theory of flow in a confined two aquifer system. Water Resources Research, Vol. 5, no. 4: 817-829.

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TABLES

Table D1
Monitoring Well Details

Monitoring Well Name	Type	Easting	Northing	Measuring Point Elevation (mASL)	Ground Surface Elevation (mASL)	Depth (m below ground surface)	Hydrostratigraphic Layer
MP1	Municipal	559180.4	4880681.3	497.48	496.73	1.5	Overburden
MP2	Municipal	560026.3	4881197.4	494.35	494.35	1.5	Overburden
MW3/00-16	Municipal	562349.0	4880472.0	487.70	NA	15.9	Guelph
MW3/00-20	Municipal	562355.0	4880466.0	487.25	NA	19.8	Guelph
MW5-10	Municipal	NA	NA	NA	NA	9.8	Guelph
MW6/10-9	Municipal	559273.4	4880802.8	497.60	496.58	8.8	Overburden
OGS 10A	OGS Test	559259.4	4880809.3	497.19	496.64	94.2	Guelph to Gasport
OGS 10B	OGS Test	NA	NA	NA	NA	75.3	Gasport
OW1	Domestic	559578.3	4880705.6	498.41	498.18	31.1	Guelph
OW2	Domestic	559443.9	4880567.2	498.84	498.84	4.9	Overburden
OW3	Domestic	559984.9	4880384.7	495.26	494.63	19.8	Guelph
OW4	Domestic	558917.1	4881296.0	502.86	502.44	29.9	Guelph
OW5	Domestic	558692.5	4881251.4	503.67	502.95	NA	Guelph
TW7-10	Municipal	559266.1	4880803.2	497.03	496.57	86.5	Guelph to Gasport

NOTE:

NA - Information not available

Table D2
Summary of Step Test Results

		Observed Groundwater Drawdown (m)				
Test Date	**Test Type**	**Step 1 (654 m^3/day)**	**Step 2 (1,308 m^3/day)**	**Step 3 (1,962 m^3/day)**	**Step 4 (2,244 m^3/day)**	**Interpreted Specific Capacity (m^3/day per m drawdown)**
25-Nov-10	Open hole step test	1.08	1.60	2.29	2.65	847
26-Nov-10	Below packer step test	2.42	5.68	10.17	NA	193

NOTES:

1) Each step was 30 minutes long. Drawdown observed at conclusion of 30 minute step.

Observed Drawdown During TW7-10 Aquifer Test

Monitoring Well	Representative Hydrostratigraphic Layer	Depth (m bgs)	Maximum Drawdown During 72-hour Test [1]	Distance from TW7-10 (m)
TW7-10	Gasport	86.5	NA	0
TW7-10 - Above Packer	Guelph	~ 46	0.5	0
MW6/10-9	Overburden	8.8	0.5	7
OGS 10A - Below Packer	Gasport	94.2	16.8	9
OGS 10A - Above Packer	Guelph	~ 46	2.2	9
MP1	Overburden	1.5	0.0	149
OW2	Overburden	4.9	0.5	295
OW1	Guelph	31.1	0.9	327
OW4	Guelph	29.9	0.5	604
OW5	Guelph	NA	0.0	728
OW3	Guelph	19.8	0.7	832
MP2	Overburden	1.5	0.0	856
MW3/00-16	Guelph	15.9	0.0	3101
MW3/00-20	Guelph	19.8	0.0	3107
OGS 10B	Gasport	75.3	0.0	3130
MW5-10	Guelph	9.8	0.0	NA

NOTES:

1) Maximum drawdown for all wells (except OGS 10A - Below Packer and OW4) were measured at around 2100 minutes into the test. Drawdowns for OGS 10 A - Below Packer and OW4 were measured at the end of the 72-hour test.

NA - Information not available

Table D4
Summary of Water Quality Analysis

Analysis	Units	ODWQS[1] or AO/OG[2]	TW7-10 Step Test		TW7-10 72-hr Test		
			Open Hole	Packered			
			T-1 (25-Nov-2010)	T-2 (26-Nov-2010)	T-3 (29-Nov-2010)	T-4 (2-Dec-2010)	T-5 (3-Dec-2010)
pH	units	6.5-8.5	7.81	7.93	8.00	8.09	8.08
Conductivity	uS/cm		585	585	570	446	435
Alkalinity	mg/L as $CaCO_3$	30-500	278	273	268	216	211
Carbonate	mg/L as $CaCO_3$		< 2	< 2	< 2	< 2	< 2
HCO_3	mg/L as $CaCO_3$		278	273	268	216	211
OH	mg/L as $CaCO_3$		< 2	< 2	< 2	< 2	< 2
Dissolved Organic Carbon (DOC)	mg/L	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ammonia+Ammonium (NH_3+NH_4)	as N mg/L		< 0.1	< 0.1	0.2	< 0.1	< 0.1
Tot.Reactive Phos.	mg/L		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Sulphate(SO_4)	mg/L	500	8.3	14	13	13	13
Chloride (Cl)	mg/L	250	9.3	8.0	7.6	2.1	1.9
Nitrite (NO_2)	as N mg/L	1	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Nitrate (NO_3)	as N mg/L	10	5.53	5.00	4.82	0.83	0.63
Nitrate+Nitrite (NO_2+NO_3)	as N mg/L	10	5.53	5.00	4.82	0.83	0.63
Hardness	mg/L as $CaCO_3$	80-100	325	322	315	236	234
Arsenic(As)	mg/L	0.0250	0.0004	0.0012	0.0009	0.0038	0.0036
Calcium(Ca)	mg/L		87.9	85.4	83.4	57.1	56.3
Copper (Cu)	mg/L	0:00	< 0.002	< 0.002	< 0.002	0.003	< 0.002
Iron (Fe)	mg/L	0.3	0.023	0.008	0.003	< 0.002	< 0.002
Magnesium (Mg)	mg/L		25.6	26.5	25.9	22.8	22.7
Manganese (Mn)	mg/L	0.05	< 0.0002	< 0.0002	< 0.0002	0.0005	0.0006
Potassium (K)	mg/L		1.80	1.52	1.49	0.831	0.794
Sodium (Na)	mg/L	200	1.66	1.60	1.59	1.19	1.14
Zinc (Zn)	mg/L	5	0.078	0.063	0.069	0.026	0.022
Cation Sum	meq/L		6.61	6.55	6.40	4.80	4.75
Anion Sum	meq/L		6.07	6.05	5.91	4.64	4.54
Anion-Cation Balance	% difference		4.23	3.98	3.95	1.65	2.26
TDS (calculated)	mg/L		307	306	299	227	222
Saturation pH	pHs @ 4°C		7.57	7.59	7.61	7.85	7.87
Saturation pH	pHs @ 20°C		7.25	7.27	7.29	7.53	7.55
Langelier's Index	@ 4°C		0.24	0.34	0.39	0.24	0.21
Langelier's Index	@ 20°C		0.56	0.66	0.71	0.56	0.53

NOTES:
1) ODWQS = Ontario Drinking Water Quality Standards, MOE, Ontario Regulation 169/03
2) AO/OG = Aesthetic Objective or Operational Guideline from MOE Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, June 2003
Parameter exceeds ODWQS or AO/OG.

FIGURES

559000 560000 561000 562000 563000

4882000 4881000 4880000 4879000

N

OW4 (1706208)
OW5 (1706405)
MP2
SIDEROAD 30
OGS 10A
TW7-10-9
TW7-10
MP1
OW1 (1705460)
OW2
2 LINE SW
OW3 (1700396)
5 LINE
4 LINE
OGS 10B
MW5-10
MW3/00-16
MW3/00-20
MAIN ST W
BIRCH GROVE
MAPLE CRT
SIDEROAD 30

INSET MAP
N
OGS 10A
TW7-10
MW6/10-9
25 12.5 0 25 50
SCALE 1:2,000 METRES

LEGEND

- 1700396 MOE Water Well Record No.
- Domestic Well
- Municipal Monitoring Location
- Test Production Well
- Road
- Railway (Abandoned)
- Diversion of Pumped Groundwater from TW7-10
- Watercourse
- Wetland (MNR LIO 2009)

INDEX MAP
Owen Sound
Barrie
Lake Huron
Kincardine
Hanover
Shelburne
Study Area
Toronto
Guelph
Waterloo
Lake Ontario
London

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
MOE Well Records - MOE 2009
Imagery: GRCA (2006)
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

250 125 0 250 500
SCALE 1:15,000 METRES

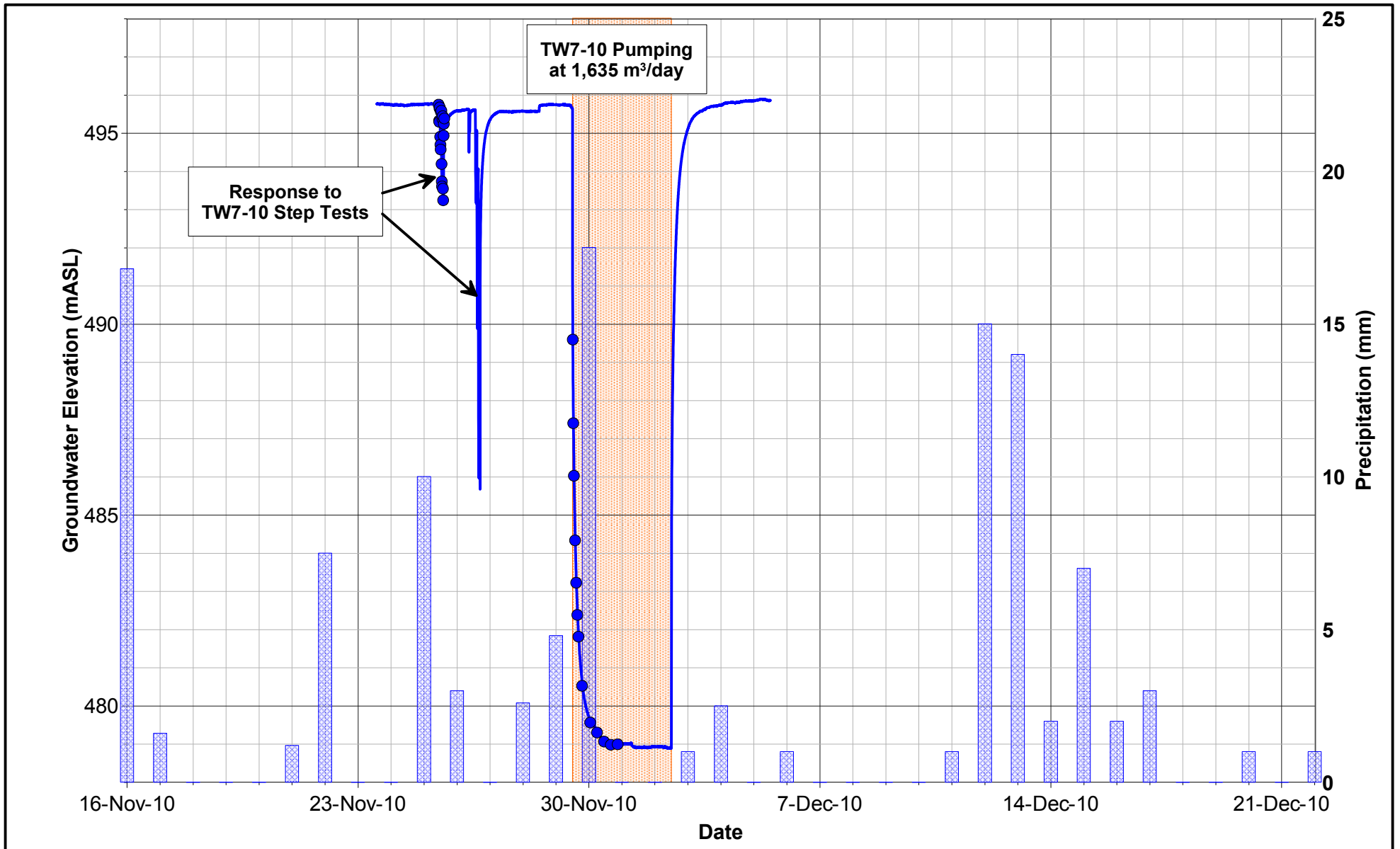
PROJECT
TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE
TW7-10 PERFORMANCE TEST MONITORING LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	JO	7 Mar. 2012	FIGURE: D1	
GIS	JO	14 Sep. 2012		
CHECK	JH	14 Sep. 2012		
REVIEW	SMD	Oct. 2012		

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\FinalEA_for_Additional_Water_Supply\TW7-10_Performance_Test_Mon_Location.mxd



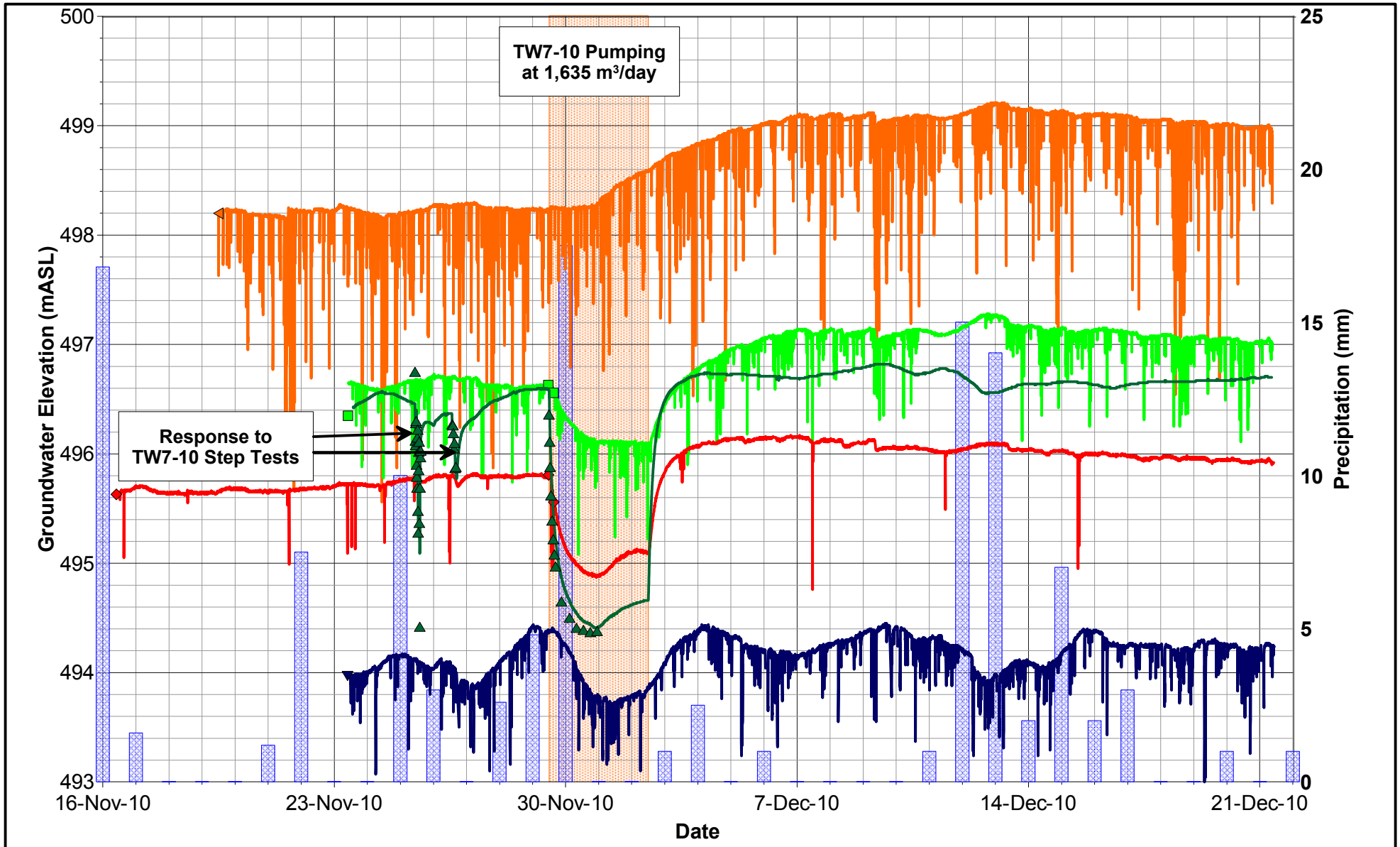
OGS 10A (Below Packer) Precipitation

Town of Shelburne
Environmental Assessment
For Additional Water Supply

Hydrograph of Gasport Formation Monitoring Well

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: D2

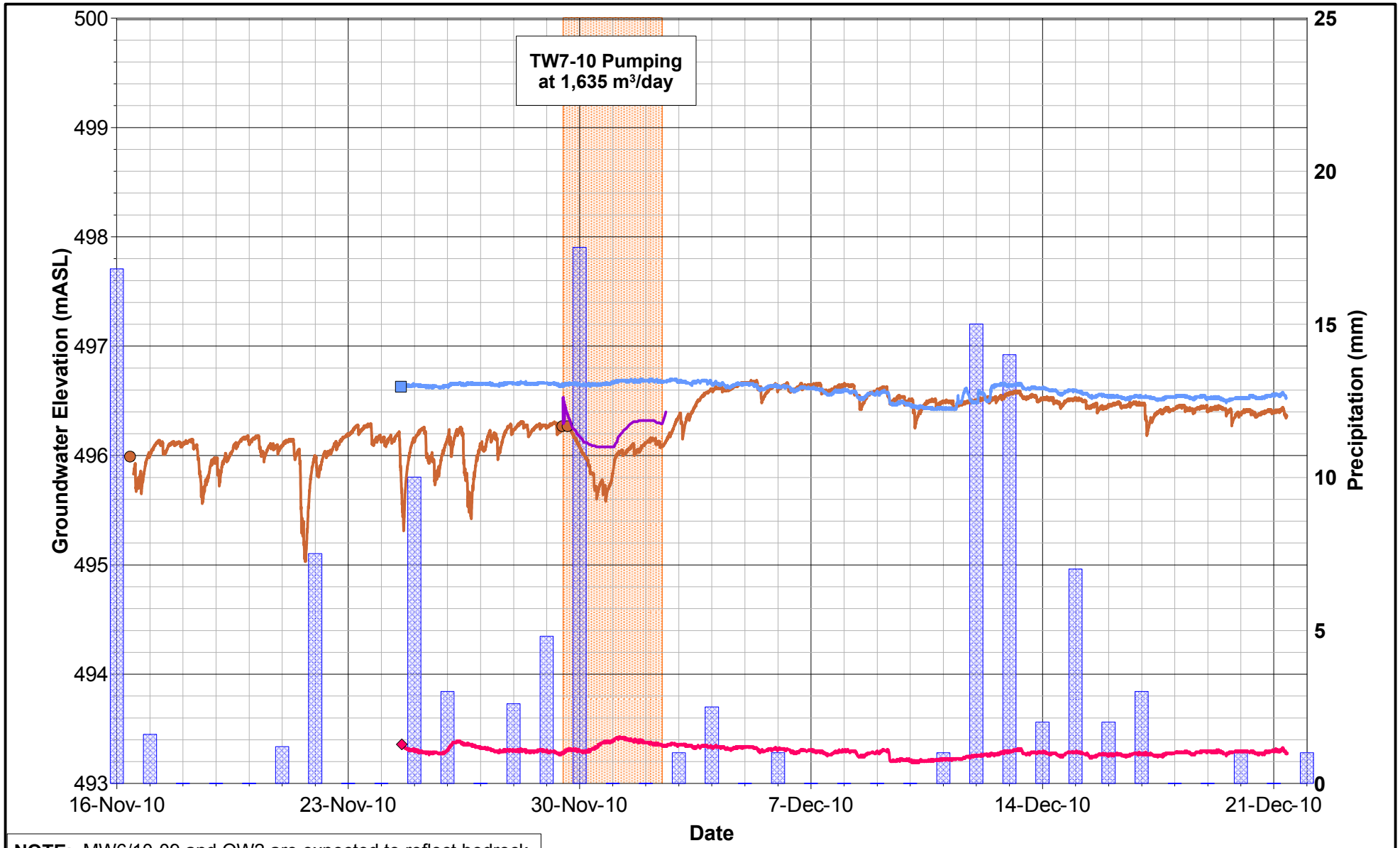


Town of Shelburne
Environmental Assessment
For Additional Water Supply

Hydrographs of Guelph Formation Wells in Proximity to TW7-10

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: D3



NOTE: MW6/10-09 and OW2 are expected to reflect bedrock conditions due to borehole completion on the bedrock surface.

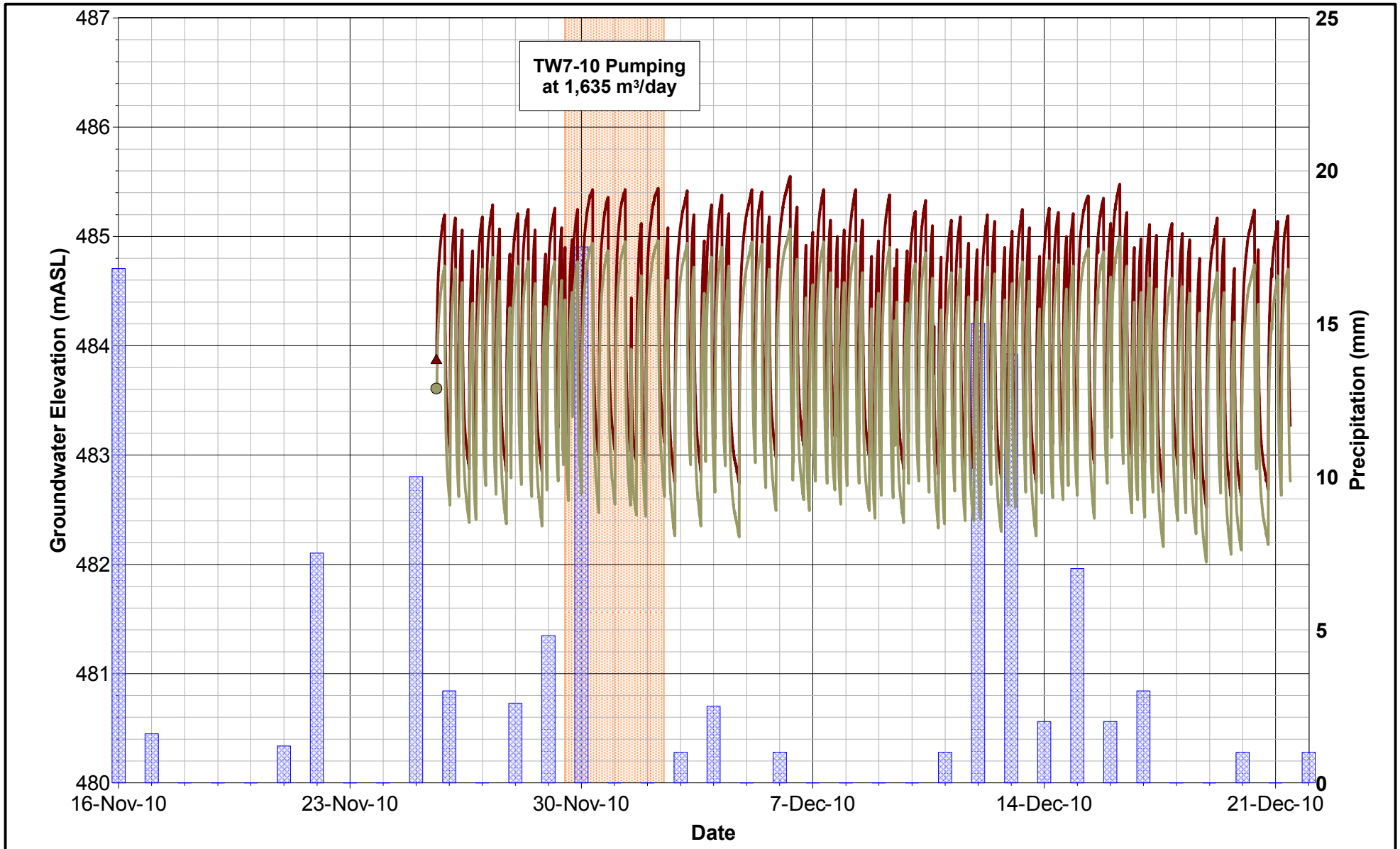
MP1
MP2
MW6/10-9
OW2
Precipitation

Town of Shelburne
Environmental Assessment
For Additional Water Supply

Hydrographs of Overburden Monitoring Wells

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: D4

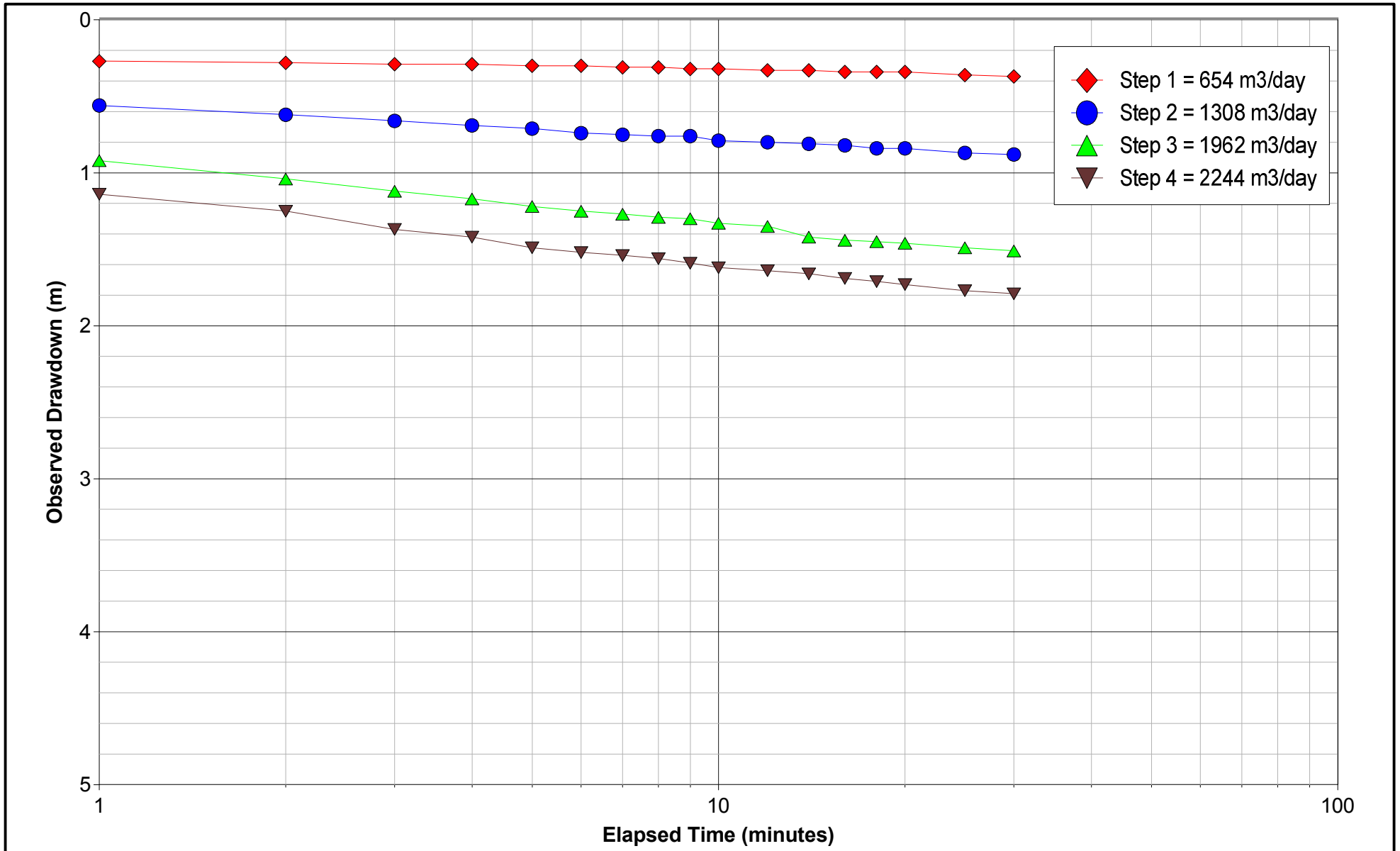


Town of Shelburne
Environmental Assessment
For Additional Water Supply

Hydrographs of Monitoring Wells Near PW5/6

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: D5



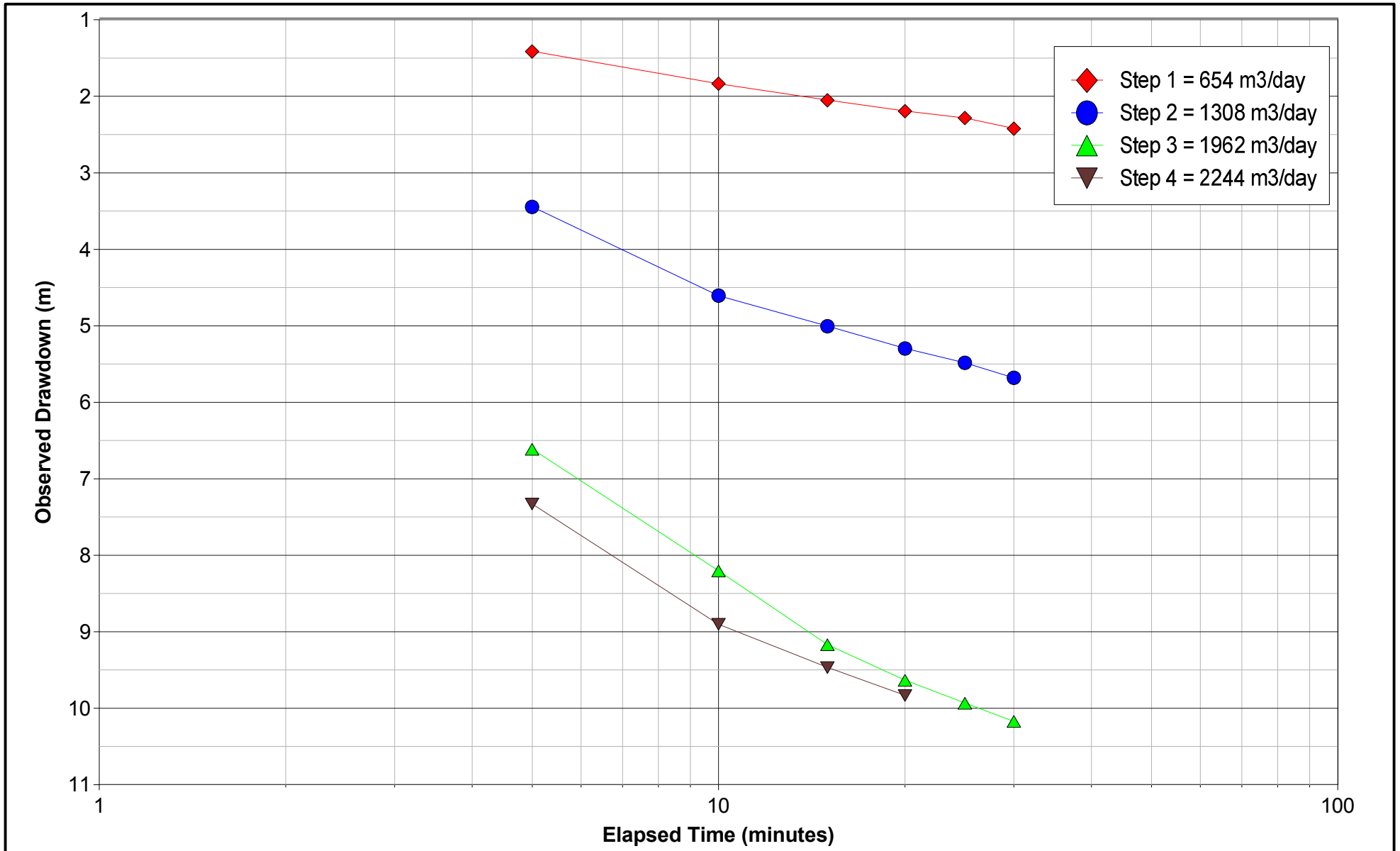
NOTES:
1) The Open Hole Step Test took place on Nov. 25, 2011.
2) Static Water Level in TW7-10 = 0.71 mbmp.

Town of Shelburne
Environmental Assessment
For Additional Water Supply

TW7-10
Open Hole Step Test:
Drawdown Versus Elapsed Time

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: D6



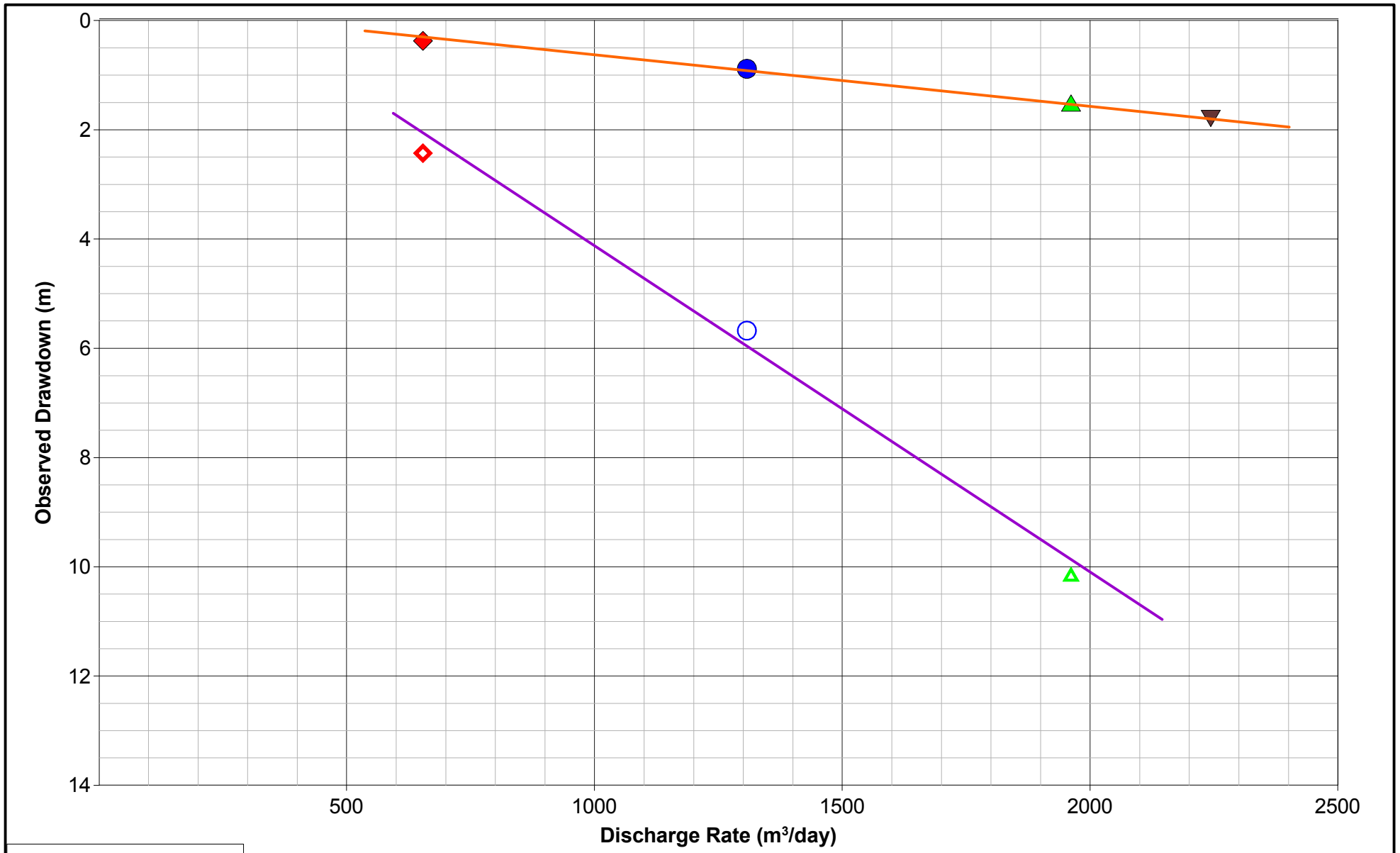
NOTES:
1) Observed drawdowns were measured below the packer.
2) The Packered Step Test took place on Nov. 26, 2011.
3) Static Water Level in TW7-10 = 0.85 mbmp.

Town of Shelburne
Environmental Assessment
For Additional Water Supply

TW7-10
Packered Step Test:
Drawdown Versus Elapsed Time

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: D7

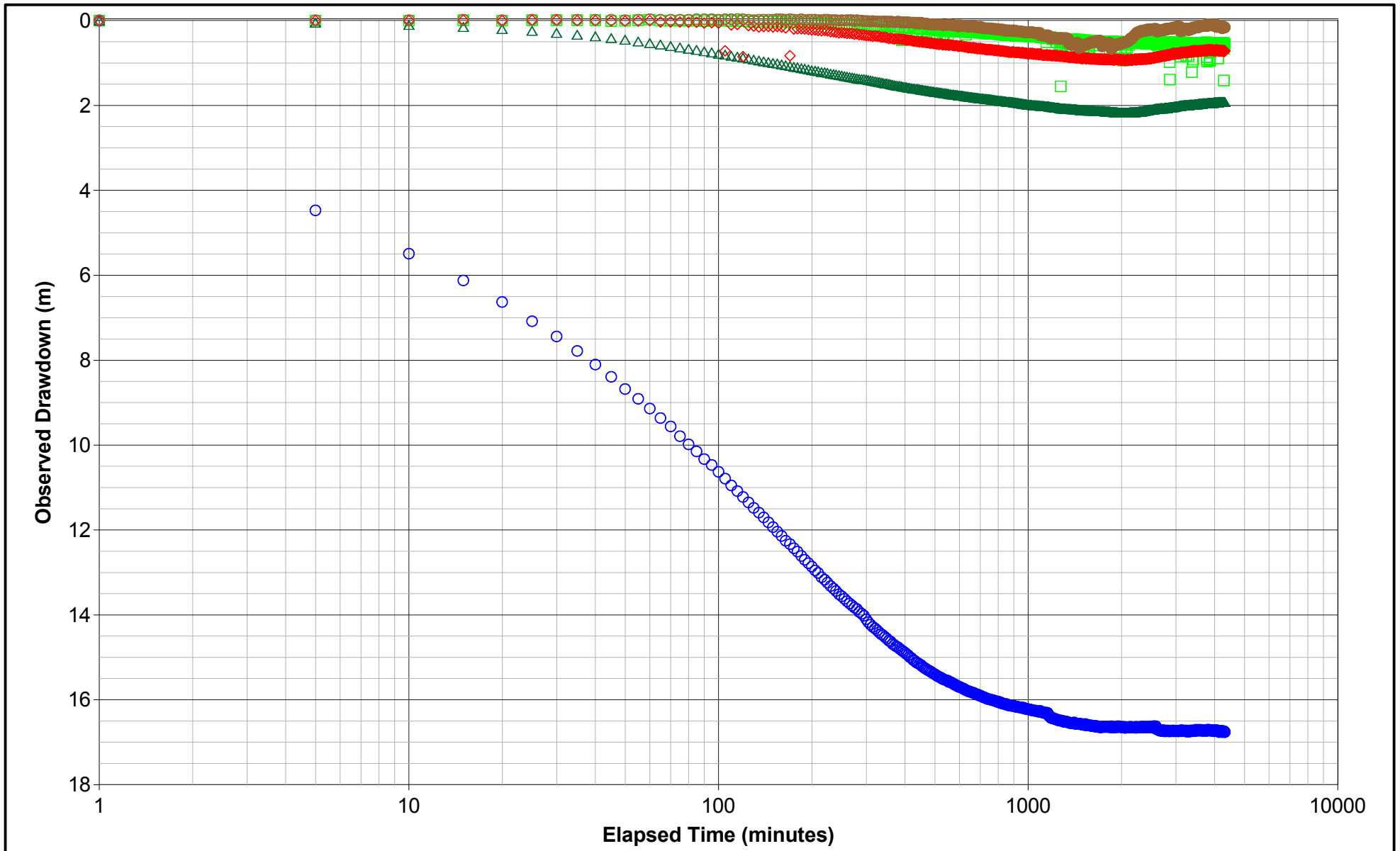


Town of Shelburne
Environmental Assessment
For Additional Water Supply

TW7-10 Step Tests: Drawdown Versus Discharge Rate

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: D8



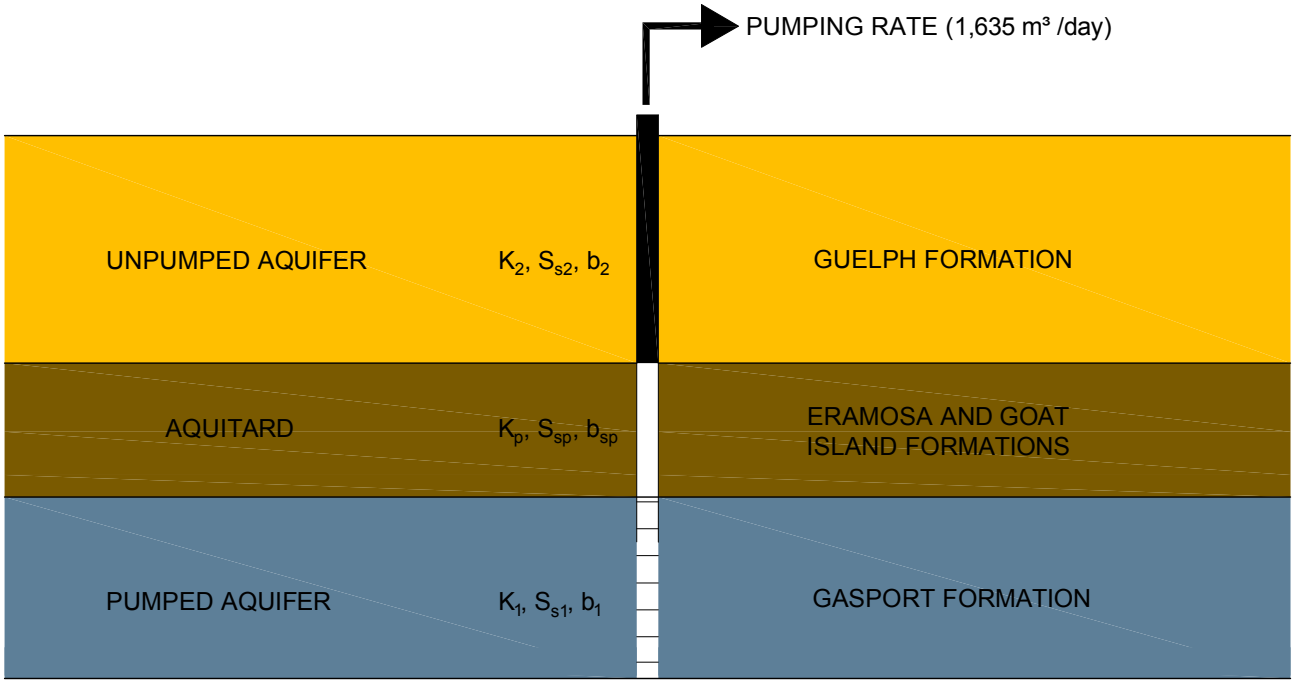
Town of Shelburne
Environmental Assessment
For Additional Water Supply

72-Hour Performance Test:
Drawdown Versus Log Time

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: D9

PLOT DATE: December 6, 2012
FILENAME: T:\Projects\2009\09-1112-6007 (Town of Shelburn, Shelburn)\-BC-Final Report\0911126007BCD10.dwg



HYDROGEOLOGIC PARAMETERS SUPPORTING ANALYTICAL MODELLING

Layer	Parameters	Deep Aquifer model	Units
Unpumped Aquifer Guelph Formation	K_2	5×10^{-5}	m/s
	Ss_2	6×10^{-5}	m^{-1}
	b_2	35	m
Aquitard Eramosa and Goat Island Formations	K_p	5×10^{-7}	m/s
	Ss_p	1×10^{-10}	m^{-1}
	b_p	18	m
Pumped Aquifer Gasport Formation	K_1	2×10^{-5}	m/s
	Ss_1	8×10^{-5}	m^{-1}
	b_1	28	m

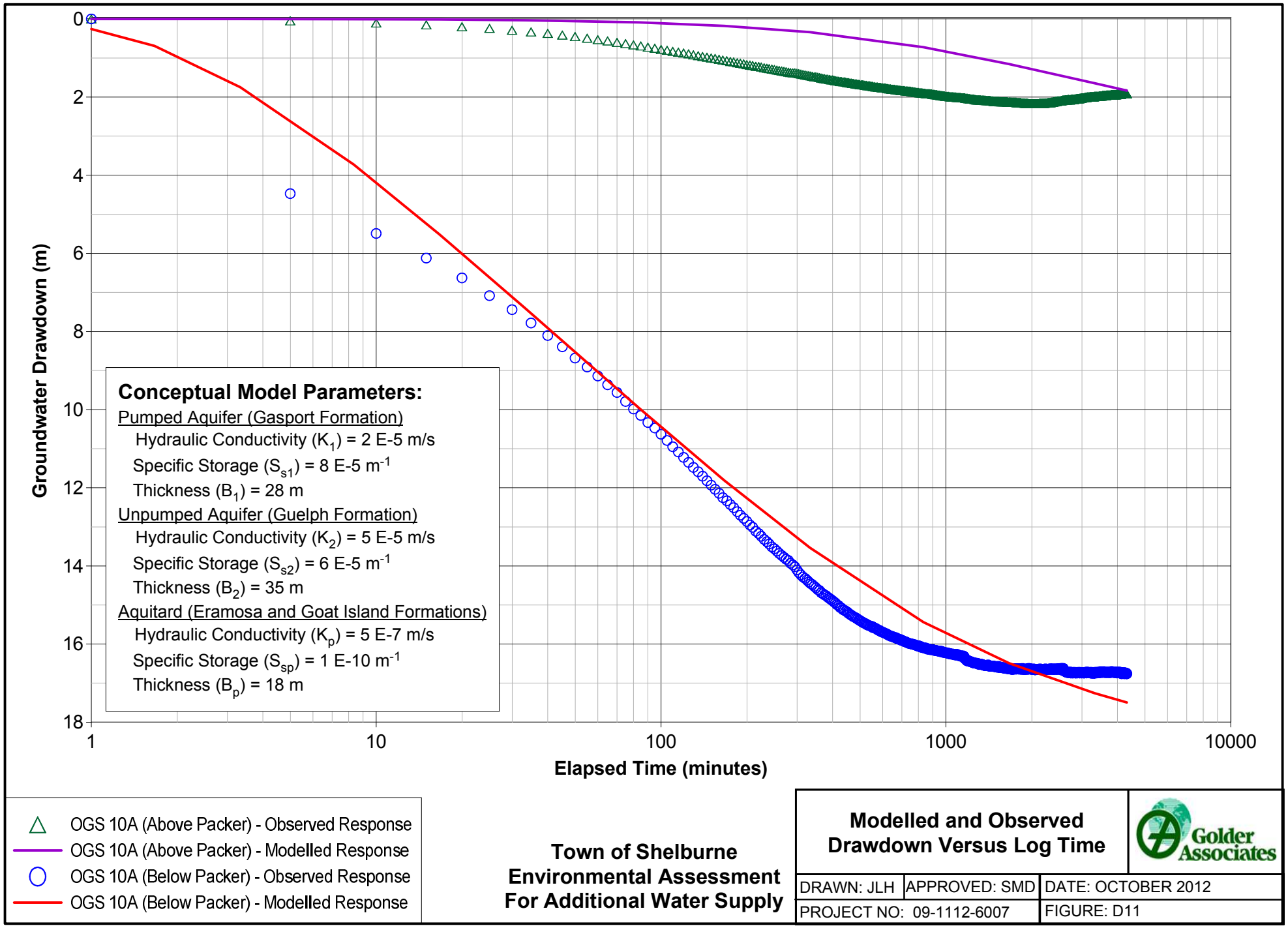
PROJECT
TOWN OF SHELBURNE
ENVIRONMENT ASSESSMENT FOR
ADDITIONAL WATER SUPPLY

TITLE
CONCEPTUAL MODEL FOR NEUMAN-WITHERSPOON ANALYSIS OF TW7-10 PUMPING

Golder Associates
Mississauga, Ontario, Canada

PROJECT No.		09-1112-6007	FILE No.	0911126007BCD10.dwg	
DESIGN	SMD	March 12, 2012	SCALE	AS SHOWN	REV. A
CAD	DD/KD	March 12, 2012	FIGURE No.		
CHECK	SMD	March 12, 2012			
REVIEW	SMD	Oct. 2012			

D10

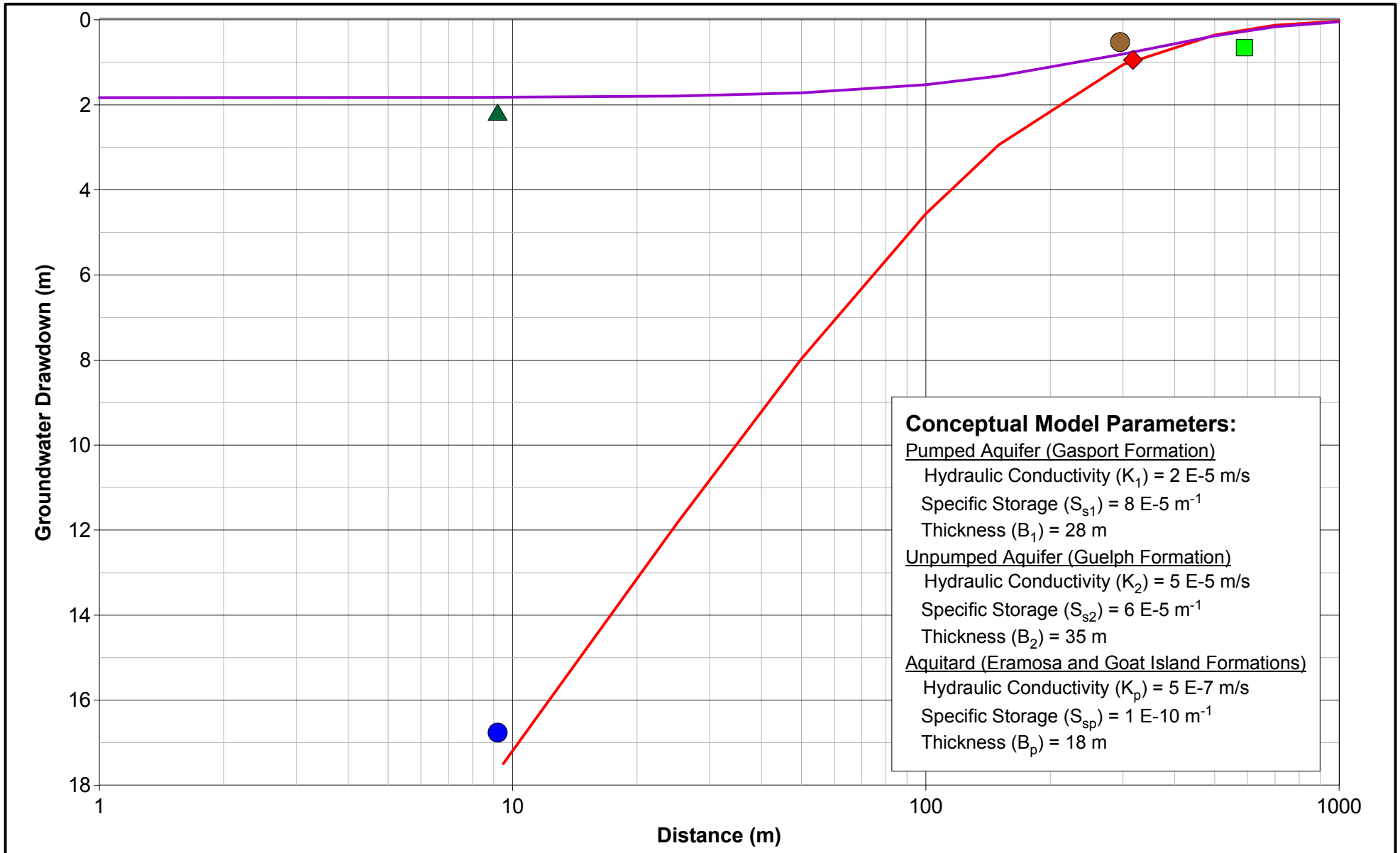


Town of Shelburne
Environmental Assessment
For Additional Water Supply

Modelled and Observed Drawdown Versus Log Time

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: D11

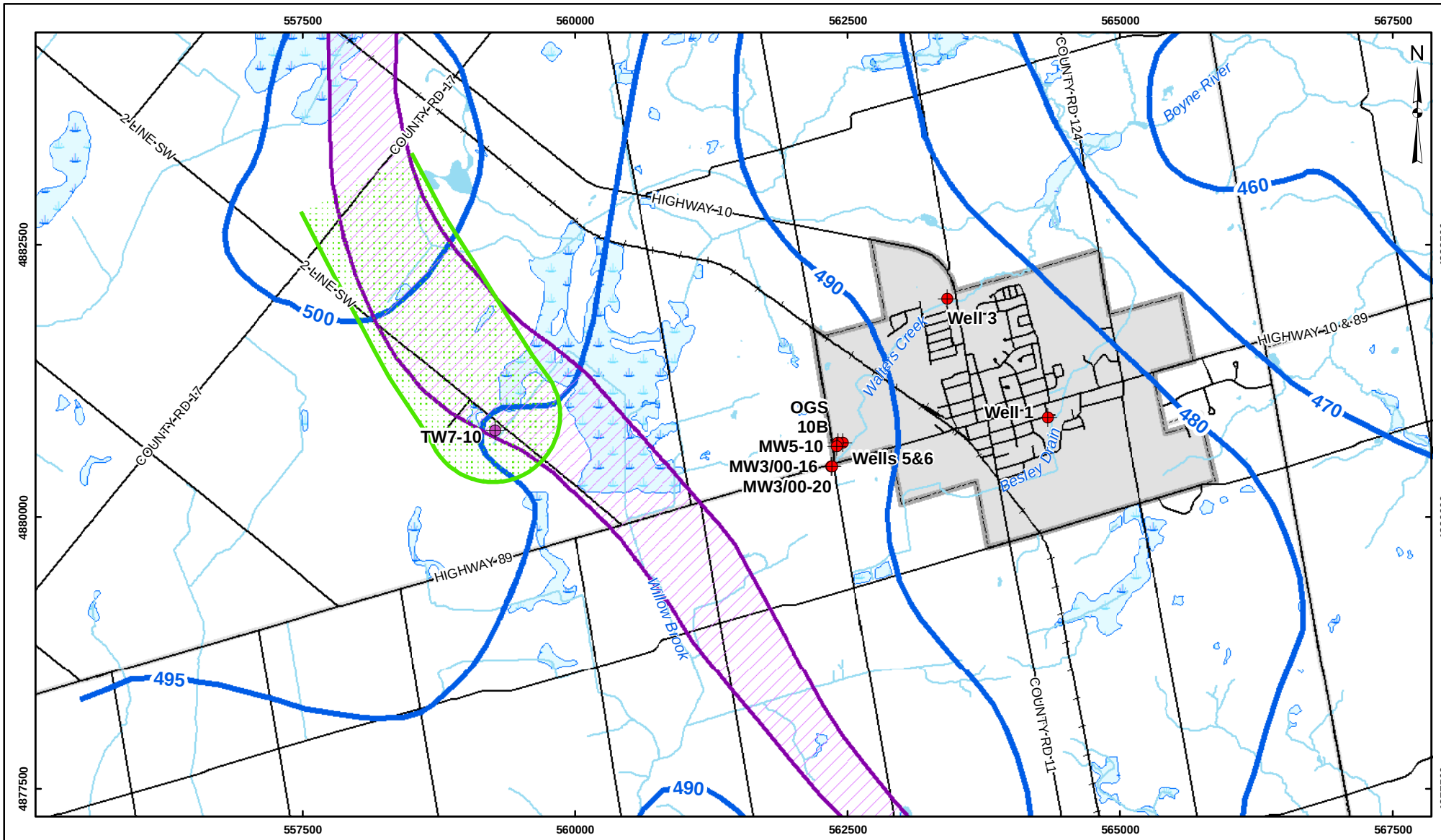


Town of Shelburne
Environmental Assessment
For Additional Water Supply

Model and Observed Drawdown Versus Distance

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT NO: 09-1112-6007		FIGURE: D12



LEGEND

- Existing Municipal Well
- Test Production Well
- Road
- Railway (Abandoned)
- Approximation of Groundwater Elevation Contour (Burnside 2002)*
- Watercourse
- Waterbody
- Wetland (MNR LIO 2009)
- Town of Shelburne Boundary
- Regional Groundwater Divide
- Interpreted Capture Area of TW7-10 Pumping (at 1,635 m³/day)

SCALE 1:50,000

1 0.5 0 1 2 Kilometers

REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4

* - Groundwater contours taken from Figure 3.9 of Town of Shelburne Groundwater Management and Protection Study (Burnside, 2002). Contours have been modified near TW7-10, based on groundwater elevation monitoring undertaken during TW7-10 performance test.

Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2011

Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

PROJECT

TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

TITLE

CAPTURE AREA OF TW7-10 PUMPING (AT 1,636 M³/DAY)

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	14 Nov. 2008		
GIS	PRM	3 Feb. 2012		
CHECK	SMD	3 Feb. 2012		
REVIEW	SMD	Oct. 2012		

FIGURE: D13

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\Final\EA_for_Additional_Water_Supple\Capture_Area_TW7-10_Pumping.mxd

ATTACHMENT D1

Permit to Take Water No. 4820-895KBC

Ontario

Ministry of the Environment
Ministère de l'Environnement

PERMIT TO TAKE WATER
Pumping Test
NUMBER 4820-895KBC

Pursuant to Section 34 of the Ontario Water Resources Act, R.S.O. 1990 this Permit To Take Water is hereby issued to:

The Corporation of the Town of Shelburne
203 Main St E P.O. Box 69
Shelburne, Ontario
L0N 1S0

For the water taking from: Test Well 7/10
Located at: Lot 303, Concession 3
Melancthon, County of Dufferin

For the purposes of this Permit, and the terms and conditions specified below, the following definitions apply:

DEFINITIONS

(a) "Director" means any person appointed in writing as a Director pursuant to section 5 of the OWRA for the purposes of section 34, OWRA.

(b) "Provincial Officer" means any person designated in writing by the Minister as a Provincial Officer pursuant to section 5 of the OWRA.

(c) "Ministry" means Ontario Ministry of the Environment.

(d) "District Office" means the Guelph District Office.

(e) "Permit" means this Permit to Take Water No. 4820-895KBC including its Schedules, if any, issued in accordance with Section 34 of the OWRA.

(f) "Permit Holder" means The Corporation of the Town of Shelburne.

(g) "OWRA " means the *Ontario Water Resources Act,* R.S.O. 1990, c. O. 40, as amended.

You are hereby notified that this Permit is issued subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. Compliance with Permit

1.1 Except where modified by this Permit, the water taking shall be in accordance with the application for this Permit To Take Water, dated July 29, 2010 and signed by Cecile Grant, and all Schedules included in this Permit.

1.2 The Permit Holder shall ensure that any person authorized by the Permit Holder to take water under this Permit is provided with a copy of this Permit and shall take all reasonable measures to ensure that any such person complies with the conditions of this Permit.

1.3 Any person authorized by the Permit Holder to take water under this Permit shall comply with the conditions of this Permit.

1.4 This Permit is not transferable to another person.

1.5 This Permit provides the Permit Holder with permission to take water in accordance with the conditions of this Permit, up to the date of the expiry of this Permit. This Permit does not constitute a legal right, vested or otherwise, to a water allocation, and the issuance of this Permit does not guarantee that, upon its expiry, it will be renewed.

1.6 The Permit Holder shall keep this Permit available at all times at or near the site of the taking, and shall produce this Permit immediately for inspection by a Provincial Officer upon his or her request.

2. General Conditions and Interpretation

2.1 Inspections

The Permit Holder must forthwith, upon presentation of credentials, permit a Provincial Officer to carry out any and all inspections authorized by the OWRA, the *Environmental Protection Act*, R.S.O. 1990, the *Pesticides Act*, R.S.O. 1990, or the *Safe Drinking Water Act*, S. O. 2002.

2.2 Other Approvals

The issuance of, and compliance with this Permit, does not:

(a) relieve the Permit Holder or any other person from any obligation to comply with any other applicable legal requirements, including the provisions of the *Ontario Water Resources Act*, and the *Environmental Protection Act*, and any regulations made thereunder; or

(b) limit in any way any authority of the Ministry, a Director, or a Provincial Officer, including the authority to require certain steps be taken or to require the Permit Holder to furnish any further information related to this Permit.

2.3 Information

The receipt of any information by the Ministry, the failure of the Ministry to take any action or require any person to take any action in relation to the information, or the failure of a Provincial Officer to prosecute any person in relation to the information, shall not be construed as:

(a) an approval, waiver or justification by the Ministry of any act or omission of any person that contravenes this Permit or other legal requirement; or

(b) acceptance by the Ministry of the information's completeness or accuracy.

2.4 Rights of Action

The issuance of, and compliance with this Permit shall not be construed as precluding or limiting any legal claims or rights of action that any person, including the Crown in right of Ontario or any agency thereof, has or may have against the Permit Holder, its officers, employees, agents, and contractors.

2.5 Severability

The requirements of this Permit are severable. If any requirements of this Permit, or the application of any requirements of this Permit to any circumstance, is held invalid or unenforceable, the application of such requirements to other circumstances and the remainder of this Permit shall not be affected thereby.

2.6 Conflicts

Where there is a conflict between a provision of any submitted document referred to in this Permit, including its Schedules, and the conditions of this Permit, the conditions in this Permit shall take precedence.

3. Water Takings Authorized by This Permit

3.1 **Expiry**

This Permit expires on **December 15, 2010**. No water shall be taken under authority of this Permit after the expiry date.

3.2 Amounts of Taking Permitted

The Permit Holder shall only take water from the source, during the periods and at the rates and amounts of taking specified in Table A. Water takings are authorized only for the purposes specified in Table A.

Table A

	Source Name / Description:	Source: Type:	Taking Specific Purpose:	Taking Major Category:	Max. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken:	Zone/ Easting/ Northing:
1	Test Well 7/10	Well Drilled	Pumping Test	Miscellaneous	1,817	24	2,616,480	4	17 559264 4880805
						Total Taking:	2,616,480		

3.3 Notwithstanding Condition 3.1, water taking shall only occur for a maximum period of 4 days between the date of issuance and expiry date of this Permit.

4. Monitoring

4.1 Notification to Well Owners
Prior to commencement of the pumping test, the Permit Holder shall identify all wells within the area of the anticipated potential cone of influence, or within 500 metres of the test site, whichever is greater. At least 24 hours prior to beginning the pumping test, the Permit Holder shall provide written notification to the owners of the wells identified within the potential cone of influence. The notification shall include the expected date, time and duration of the pumping test, and a contact telephone number that may be used to report any interferences with water supplies.

4.2 Measuring Water Depths
To establish baseline conditions, well depths and depths to water levels for identified representative wells in the area of the water taking shall be recorded by the Permit Holder. During the pumping test, water levels in the identified wells shall be recorded. The pumping test must be of sufficient duration to accurately predict the long term impacts of the proposed water taking. Water levels in the identified wells shall continue to be monitored beyond the water taking period until at least 85% recovery is achieved.

4.3 Under section 9 of O. Reg. 387/04, and as authorized by subsection 34(6) of the Ontario Water Resources Act, the Permit Holder shall, on each day water is taken under the authorization of this Permit, record the date, the volume of water taken on that date and the rate at which it was taken. The daily volume of water taken shall be measured by a flow meter or calculated in accordance with the method described in the application for this Permit, or as otherwise accepted by the Director. A separate record shall be maintained for each source (used for multiple sources). The Permit Holder shall keep all records required by this condition current and available at or near the site of the taking and shall produce the records immediately for inspection by a Provincial Officer upon his or her request. The Permit Holder, unless otherwise required by the Director, shall submit, on or before March 31st in every year, the records required by this condition to the ministry's Water Taking Reporting System.

5. Impacts of the Water Taking

5.1 Notification

The Permit Holder shall immediately notify the local District Office of any complaint arising from the taking of water authorized under this Permit and shall report any action which has been taken or is proposed with regard to such complaint. The Permit Holder shall immediately notify the local District Office if the taking of water is observed to have any significant impact on the surrounding waters. After hours, calls shall be directed to the Ministry's Spills Action Centre at 1-800-268-6060.

5.2 Restoration of Water Supply

Where the taking of water is observed to cause any negative impact to other water supplies obtained from any adequate sources that were in use prior to initial issuance of a Permit for this water taking, the Permit Holder shall take such action necessary to make available to those affected, a supply of water equivalent in quantity and quality to their normal takings, or shall compensate such persons for their reasonable costs of doing so.

5.3 Siltation control measures shall be installed at the discharge site and shall be sufficient to control the volumes. Continuous care shall be taken to properly maintain the siltation control devices.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act* , Section 100 (4).

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is included to ensure that the conditions in this Permit are complied with and can be enforced.

2. Condition 2 is included to clarify the legal interpretation of aspects of this Permit.

3. Conditions 3 through 6 are included to protect the quality of the natural environment so as to safeguard the ecosystem and human health and foster efficient use and conservation of waters. These conditions allow for the beneficial use of waters while ensuring the fair sharing, conservation and sustainable use of the waters of Ontario. The conditions also specify the water takings that are authorized by this Permit and the scope of this Permit.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the hearing shall state:

1. The portions of the Permit or each term or condition in the Permit in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Permit to Take Water number;
6. The date of the Permit to Take Water;
7. The name of the Director;
8. The municipality within which the works are located;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5

AND

The Director, Section 34
Ministry of the Environment
733 Exeter Rd
London ON N6E 1L3
Fax: (519)873-5020

Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal:

by telephone at (416) 314-4600 ***by fax at (416) 314-4506*** ***by e-mail at www.ert.gov.on.ca***

Dated at London this 16th day of September, 2010.

Ian Kerr
Director, Section 34
Ontario Water Resources Act , R.S.O. 1990

ATTACHMENT D2

Pumping Test Notice

The Corporation of
THE TOWN OF SHELBURNE

October 21, 2010

Attention: Resident

Re: Consent to Access on Private Land to Measure Private Water Supply Well and for Well Water Sampling
Town of Shelburne Hydrogeological Study and Class Environmental Assessment
for Additional Water Supply

Dear Resident,

The Town of Shelburne and their consultant Golder Associates are conducting a pumping test program on a test well located on 2nd Line Southwest, Melancthon Township (refer to attached map). An important aspect of the testing program will be to monitor any influence the test well pumping might have on private wells in the local area. In this regard, the Town is seeking your permission to access your well for the purpose of installing an electronic water level monitoring device. We are also requesting your approval to sample your water well for bacteriological analysis.

The water level monitoring device would be installed following receipt of your approval by a licensed water well technician and removed following the testing program later in November 2010. There would be no disruption to your water supply during installation or removal. You will be provided with a record of the water level data for your well following the testing period.

The water sample would be collected from a raw water tap and should take less than ten minutes to complete. The sample will then be submitted for bacteriological analysis by an accredited laboratory and you will be provided with a copy of the water quality results.

Therefore, we kindly request that you complete the enclosed approval form. Please mail the completed form no later than October 29, 2010 to the Town of Shelburne at 203 Main Street East, Shelburne, Ontario LON 1JO, in the enclosed, postage-paid envelope. Alternatively, you may also drop off the completed form to the Town Administration office at 203 Main Street East, which is open Monday to Friday from 8:30AM to 4:30PM. Once we receive your approval, a representative of the Golder consulting team will contact you to arrange a convenient time to install the monitoring device and collect the water sample.

A notice will be delivered in advance of the pumping test to confirm the timing and to provide contact information in the unlikely event that water supplies are disrupted during the test.

Should you have any questions regarding this study and/or the well sampling, please call the Town's Project Coordinator, Kelly McDowell (Tel: 519-925-2600 ext. 252), or the consulting team's Project Manager, Bill Banks (Guelph Tel: 519-829-4808).

We appreciate your cooperation and assistance with this study.

Sincerely,

John Telfer, CAO/Clerk

Town of Shelburne

Encl.

Approval for Access on Private Land to Measure Private Water Supply Well and for Well Water Sampling

Town of Shelburne Hydrogeological Study and Class Environmental Assessment for Additional Water Supply

Owner: _____

Telephone: _____

Address: _____

_____

_____

I hereby authorize the Town of Shelburne and/or its consultant to install an access pipe and data logger in my water supply well for the purpose of monitoring groundwater levels during November 2010 for the test well program on a well located on 2nd Line Southwest.

In addition, I hereby authorize the Town of Shelburne and/or its consultant to collect a well water sample at the above address. I understand that the water sample is to be collected at a mutually agreeable date and time, which is to be arranged with the consultant, but prior to the pumping period in November 2010.

Signature: _____

Name (please print): _____

Date: _____

The Corporation of
THE TOWN OF SHELBURNE

November 12, 2010

Attention: Resident

Re: Notice of Well Testing Schedule
Town of Shelburne Hydrogeological Study and Class Environmental Assessment for Additional Water Supply

Dear Resident,

As indicated in our letter to you, dated October 21, 2010, the Town of Shelburne is conducting a pumping test program at a test well site located on 2nd Line Southwest, in Melancthon Township. The testing program is part of a Hydrogeological Study and Class Environmental Assessment to identify an additional water supply source to accommodate potential future growth and provide security for the Town's water supply.

The purpose of this notice is to confirm the pumping test will be conducted during the week of November 29, 2010. The testing will be supervised by Golder Associates on behalf of the Town of Shelburne.

A comprehensive monitoring program has been established and will include monitoring of water levels in private water wells, ponds, and wetlands. The results of the pumping test will be presented during the public consultation phase of the Environmental Assessment. The water level record obtained from private wells will be provided to the owner.

In the unlikely event that water supplies during testing are disrupted at any private well, the Town will immediately provide an alternative temporary water supply. If you experience water supply problems in your well during the testing, you can call the Town of Shelburne at 519-925-2600 or after hours call on the Public Works Emergency Phone, 519-939-1342.

We thank you for your cooperation during this program. If you have any questions about the project please contact the Town's Project Coordinator, Kelly McDowell (Tel: 519-925-2600 ext. 252), or the consulting team's Project Manager, Bill Banks (Guelph Tel: 519-829-4808).

Sincerely,

John Telfer, CAO/Clerk
Town of Shelburne

ATTACHMENT D3

Certificates of Analysis

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Thursday, December 09, 2010

Golder Associates
Attn : Alex Ivanoff

2390 Argentia Road, Mississauga
, L5N 5Z7
Phone: 905-567-4444, Fax:pdf, excel

Date Rec. : 30 November 2010
LR Report: **CA11713-NOV10**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	6: PW1 Open Hole	7: PW1 Packer	8: PW1 1/2 Hour
Sample Date & Time			25-Nov-10 14:30	26-Nov-10 16:00	29-Nov-10 12:30
Temperature Upon Receipt [°C]	---	---	9.0	9.0	9.0
pH [no unit]	03-Dec-10	11:49	7.81	7.93	8.00
Conductivity [uS/cm]	03-Dec-10	11:49	585	585	570
Alkalinity [mg/L as CaCO3]	03-Dec-10	11:49	278	273	268
Carbonate [mg/L as CaCO3]	03-Dec-10	11:49	< 2	< 2	< 2
Bicarbonate [mg/L as CaCO3]	03-Dec-10	11:49	278	273	268
OH [mg/L as CaCO3]	03-Dec-10	11:49	< 2	< 2	< 2
Dissolved Organic Carbon [mg/L]	03-Dec-10	11:35	< 1.0	< 1.0	< 1.0
Ammonia+Ammonium (N) [mg/L]	03-Dec-10	09:48	< 0.1	< 0.1	0.2
Tot.Reactive Phos. [mg/L]	03-Dec-10	11:37	< 0.03	< 0.03	< 0.03
Sulphate [mg/L]	08-Dec-10	15:08	8.3	14	13
Chloride [mg/L]	08-Dec-10	15:08	9.3	8.0	7.6
Nitrite (as nitrogen) [mg/L]	02-Dec-10	16:40	< 0.06	< 0.06	< 0.06
Nitrate (as nitrogen) [mg/L]	02-Dec-10	16:40	5.53	5.00	4.82
Nitrate + Nitrite (as nitrogen) [mg/L]	02-Dec-10	16:40	5.53	5.00	4.82
Hardness [mg/L as CaCO3]	06-Dec-10	15:04	325	322	315
Arsenic [mg/L]	05-Dec-10	18:55	0.0004	0.0012	0.0009
Calcium [mg/L]	06-Dec-10	15:04	87.9	85.4	83.4
Copper [mg/L]	05-Dec-10	18:55	< 0.002	< 0.002	< 0.002
Iron [mg/L]	05-Dec-10	18:55	0.023	0.008	0.003
Potassium [mg/L]	06-Dec-10	15:04	1.80	1.52	1.49
Magnesium [mg/L]	06-Dec-10	15:04	25.6	26.5	25.9
Manganese [mg/L]	06-Dec-10	15:04	< 0.0002	< 0.0002	< 0.0002
Sodium [mg/L]	06-Dec-10	15:04	1.66	1.60	1.59
Zinc [mg/L]	06-Dec-10	15:05	0.078	0.063	0.069
Cation sum [meq/L]	---	---	6.61	6.55	6.40
Anion Sum [meq/L]	---	---	6.07	6.05	5.91
Anion-Cation Balance [% difference]	---	---	4.23	3.98	3.95
Total Dissolved Solids (calculated) [mg/L]	---	---	307	306	299
Saturation pH [pHs @ 4°C]	---	---	7.57	7.59	7.61
Saturation pH [pHs @20°C]	---	---	7.25	7.27	7.29
Langelier's Index [@4°C]	---	---	0.24	0.34	0.39
Langelier's Index [@20°C]	---	---	0.56	0.66	0.71

OnLine LIMS

Data reported represents the sample submitted to SGS. Reproduction of this analytical report in full or in part is prohibited without prior written approval. Please refer to SGS General Conditions of Services located at http://www.sgs.com/terms_and_conditions_service.htm. (Printed copies are available upon request.)
Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA11713-NOV10**

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Wednesday, December 15, 2010

Golder Associates
Attn : Alex Ivanoff

2390 Argentia Road, Mississauga
, L5N 5Z7
Phone: 905-567-4444, Fax:pdf, excel

Date Rec. : 03 December 2010
LR Report: **CA10852-DEC10**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	6: 48hr	7: PW1-72
Sample Date & Time			01-Dec-10 12:00	02-Dec-10 11:00
Temperature Upon Receipt [°C]	---	---	9.0	9.0
pH [no unit]	07-Dec-10	13:39	8.09	8.08
Conductivity [uS/cm]	07-Dec-10	13:39	446	435
Alkalinity [mg/L as CaCO3]	07-Dec-10	13:39	216	211
Carbonate [mg/L as CaCO3]	07-Dec-10	13:39	< 2	< 2
Bicarbonate [mg/L as CaCO3]	07-Dec-10	13:39	216	211
OH [mg/L as CaCO3]	07-Dec-10	13:39	< 2	< 2
Dissolved Organic Carbon [mg/L]	08-Dec-10	13:22	< 1.0	< 1.0
Ammonia+Ammonium (N) [mg/L]	09-Dec-10	11:17	< 0.1	< 0.1
Tot.Reactive Phos. [mg/L]	07-Dec-10	10:17	< 0.03	< 0.03
Sulphate [mg/L]	10-Dec-10	14:24	13	13
Chloride [mg/L]	10-Dec-10	14:24	2.1	1.9
Nitrite (as nitrogen) [mg/L]	07-Dec-10	16:16	< 0.06	< 0.06
Nitrate (as nitrogen) [mg/L]	07-Dec-10	16:16	0.83	0.63
Nitrate + Nitrite (as nitrogen) [mg/L]	07-Dec-10	16:16	0.83	0.63
Hardness [mg/L as CaCO3]	07-Dec-10	11:30	236	234
Arsenic [mg/L]	08-Dec-10	14:27	0.0038	0.0036
Calcium [mg/L]	07-Dec-10	11:30	57.1	56.3
Copper [mg/L]	07-Dec-10	11:30	0.003	< 0.002
Iron [mg/L]	07-Dec-10	11:30	< 0.002	< 0.002
Potassium [mg/L]	07-Dec-10	11:30	0.831	0.794
Magnesium [mg/L]	07-Dec-10	11:30	22.8	22.7
Manganese [mg/L]	07-Dec-10	11:30	0.0005	0.0006
Sodium [mg/L]	07-Dec-10	11:30	1.19	1.14
Zinc [mg/L]	07-Dec-10	11:30	0.026	0.022
Cation sum [meq/L]	---	---	4.80	4.75
Anion Sum [meq/L]	---	---	4.64	4.54
Anion-Cation Balance [% difference]	---	---	1.65	2.26
Total Dissolved Solids (calculated) [mg/L]	---	---	227	222
Saturation pH [pHs @ 4°C]	---	---	7.85	7.87
Saturation pH [pHs @20°C]	---	---	7.53	7.55
Langelier's Index [@4°C]	---	---	0.24	0.21
Langelier's Index [@20°C]	---	---	0.56	0.53

OnLine LIMS

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA10852-DEC10**

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

ANALYSIS REPORT

Becquerel Laboratories Inc.
6790 Kitimat Rd., Unit 4
Mississauga, Ontario
Canada, L5N 5L9

Phone: (905) 826-3080
FAX: (905) 826-4151

Batch: T10-01770.0

Date: 31-Dec-2010

Lakefield Research Ltd.

185 Concession St., Postal Bag 4300
Lakefield, ON, K0L 2H0

attn: Brian Graham

Phone: (705) 652-2038
FAX: (705) 652-1918

Client Ref.
Dec 10851.R10
P.O: 55876

1 water sample Sampled: 02-Dec-2010 Received: 07-Dec-2010

Results of Analysis

Sample	Test	Result	Units	Date	Method
NR PW1	Gross Alpha	< 0.1	Bq/l	19-Dec-2010	GFPC
NR PW1	Gross Beta	< 0.1	Bq/l	19-Dec-2010	GFPC
NR PW1	Tritium	< 1000	Bq/l	19-Dec-2010	LSC

Methods: GFPC BQ-RAD-GFPC gas-flow proportional counting
LSC BQ-RAD-LSC liquid scintillation counting

Units: Bq/l Becquerels per litre

These results relate only to the samples analysed and only to the items tested. This analysis is not for the determination of the quality of any waters in respect of a drinking-water system in Ontario.

31-Dec-2010 approved by: Donald D. Burgess PhD
Senior Scientist, Division Supervisor

This test report shall not be reproduced, except in full, without written approval of Becquerel Laboratories Inc.

WELLINGTON
LABORATORIES
345 Southgate Drive, Guelph, ON Canada N1G 3M5
Phone: (519) 822-2436 Fax: (519) 822-2849 Website: **www.well-labs.com**

SAMPLE RECEIPT FORM/CHEMICAL ANALYSIS REPORT

FILE #: 2010-689-LR **CLIENT:** SGS Lakefield Research Ltd.
Postal Bag 4300
185 Concession Street
Lakefield ON K0L 2H0

PROJECT #: Dec 10851 R10 **P.O.#** PO #44246
(blanket purchase order)

RECEIVED BY: B. Sharratt **DATE/TIME:** December 7/2010 (12:00 pm)
CHECKED BY: B. Sharratt **DATE/TIME:** December 7/2010 (12:00 pm)

CONDITION: INTACT
LABELLING: NO ANOMOLIES

# of Samples	Sample Type	Sample (Client Codes)	Lab Codes
1	water	Dec 10851 R10, NR PWI Dec 2/10	2010689-10851

STORAGE: Refrigerated at 4°C in the dark until processed
ANALYTES: HRGC/HRMS analysis for PCDD/PCDFs

SPECIAL INSTRUCTIONS: e-mail results to Brian Graham at *brian.graham@sgs.com*
Non-reportable Drinking Water

METHODOLOGY:
Reference Method: Modified from Environment Canada EPS 1/RM/19
CALA Scope: PCDD/PCDF - Water/Effluents (003)
Date Sample Extracted: December 14/2010
Date Sample Analyzed: December 17/2010
Data summarized in Table A (attached)
Data emailed to: Brian Graham **Date:** December 21/2010
Report sent to: Brian Graham **Date:** December 22/2010

Comments: Surrogate recoveries, the lab blank and all other QA/QC data associated with this analysis were acceptable according to the reference method.
The results relate only to the sample(s) tested.

Approved by: C. Tashiro **Date:** December 22/2010

WELLINGTON LABORATORIES

345 Southgate Drive
Guelph ON N1G 3M5 CANADA
Tel: 519-822-2436
Fax: 519-822-2849

2010-689-LR

Table A: Dioxins and Furans: Water (ppt - pg/g)

	Lab Blank	# of pks	NR PWI Dec 2/10 Dec 10851 R10	# of pks
Furans:				
2378-TCDF	ND (1)		ND (1)	
Total TCDFs	ND (1)		ND (1)	
12378-PeCDF	ND (1)		ND (1)	
23478-PeCDF	ND (1)		ND (1)	
Total PeCDFs	ND (1)		ND (1)	
123478-HxCDF	ND (1)		ND (1)	
123678-HxCDF	ND (1)		ND (1)	
234678-HxCDF	ND (1)		ND (1)	
123789-HxCDF	ND (1)		ND (1)	
Total HxCDFs	ND (1)		ND (1)	
1234678-HpCDF	ND (1)		ND (1)	
1234789-HpCDF	ND (1)		ND (1)	
Total HpCDFs	ND (1)		ND (1)	
OCDF	ND (1)		ND (1)	
Dioxins:				
2378-TCDD	ND (1)		ND (1)	
Total TCDDs	ND (1)		ND (1)	
12378-PeCDD	ND (1)		ND (1)	
Total PeCDDs	ND (1)		ND (1)	
123478-HxCDD	ND (1)		ND (1)	
123678-HxCDD	ND (1)		ND (1)	
123789-HxCDD	ND (1)		ND (1)	
Total HxCDDs	ND (1)		ND (1)	
1234678-HpCDD	ND (1)		ND (1)	
Total HpCDDs	ND (1)		ND (1)	
OCDD	ND (1)		ND (1)	
TEQ	0 ppq		0 ppq	
TEQ 1/2 DL	1.44 ppq		1.44 ppq	
WHO 1/2 DL	1.69 ppq		1.69 ppq	

L. Tashiro
Analyst

December 20, 2010
Date

WELLINGTON LABORATORIES

345 Southgate Drive
Guelph ON N1G 3M5 CANADA
Tel: 519-822-2436
Fax: 519-822-2849

2010-689-LR

Table A (cont.)

% Recovery of Surrogates:	Lab Blank	NR PWI Dec 2/10 Dec 10851 R10
13C-2378-TCDF	87	95
13C-2378-TCDD	67	83
13C-12378-PeCDF	74	88
13C-23478-PeCDF	72	89
13C-12378-PeCDD	78	93
13C-123478-HxCDF	82	92
13C-123678-HxCDF	93	88
13C-234678-HxCDF	86	87
13C-123789-HxCDF	71	74
13C-123478-HxCDD	100	107
13C-123678-HxCDD	86	93
13C-1234678-HpCDF	75	73
13C-1234789-HpCDF	74	65
13C-1234678-HpCDD	75	76
13C-OCDD	73	68

ND - none detected (detection limits in brackets)
NDR - none detected based on peak ratio
NDS - none detected based on peak shape

L. Tashiro
Analyst

December 20, 2010
Date

ATTACHMENT D4

Borehole Logs

Burnside Environmental
A DIVISION OF R.J. BURNSIDE & ASSOCIATES LIMITED
15 TOWNLINE, ORANGEVILLE, ONTARIO L9W 3R4 TEL: (519) 941-5331

SH-MW3/00-16(DO)

Log of Drilling Operations

Client: **Town of Shelburne** Project: **Groundwater Management Study**
Project No.: **M-1132** Location: **Shelburne, Ontario** Supervised by: **J. Baxter**
Drilling Co.: **Gerrits Well Drilling Limited** Drilling Method: **Air Rotary**
Borehole Location: Date Started: **8/29/2000** Date Completed: **8/29/2000**

Depth Scale (ft)	Depth Scale (m)	Stratigraphic Description (Surface Elevation (m): 486.82)	Strat. Plot	Depth (m)	mp elev. (m asl) 487.7	SAMPLE Num.	SAMPLE Type	SAMPLE Int.	SAMPLE %Recov.
		Brown topsoil.		0.61					
5.0	1.0	Brown clay, stones.							
10.0	3.0								
	4.0			4.27					
15.0	5.0	Brown clay.							
20.0	6.0				bentonite seal				
25.0	8.0					N/A	WC		N/A
30.0	9.0								
	10.0								
35.0	11.0								
40.0	12.0								
	13.0	Grey clay, silt.		12.80					
45.0	14.0								
50.0	15.0	Brown gravel, sand, silt.		14.94	silica sand pack				
				15.85	15.85				

Prepared By: **P. Workman** Checked By: **J. Baxter** Date Prepared: **06/29/01**

This borehole log was prepared for hydrogeological and/or environmental purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions.Borehole data requires interpretation by Burnside Environmental personnel before use by others.

LEGEND
- Water found @ time of drilling
- Static Water Level - 12/18/2000

MONITORING WELL DATA
- Pipe: 51 mm dia. PVC
- Screen: 51 mm dia. PVC #10 slot

SAMPLE TYPE
- AC Auger Cutting
- CS Continuous
- RC Rock Core
- SS Split Spoon
- AR Air Rotary
- WC Wash Cuttings

BHLOG H:\GINT\PROJECTS\MM-1132.GPJ TEMPLATE.GDT 11/09/01

A DIVISION OF R.J. BURNSIDE & ASSOCIATES LIMITED
15 TOWNLINE, ORANGEVILLE, ONTARIO L9W 3R4 TEL: (519) 941-5331

SH-MW3/00-20(B)

Log of Drilling Operations

Client: Town of Shelburne | Project: Groundwater Management Study
Project No.: M-1132 | Location: Shelburne, Ontario | Supervised by: J. Baxter
Drilling Co.: Gerrits Well Drilling Limited | Drilling Method: Air Rotary
Borehole Location: | Date Started: 8/29/2000 | Date Completed: 8/29/2000

Surface Elevation (m): 486.44 | mp elev. (m asl): 487.25

Depth Scale (ft)	Depth Scale (m)	Stratigraphic Description	Depth (m)
		Brown topsoil.	
5.0	1.0	Brown clay, stones.	0.81
10.0	3.0		
15.0	5.0	Brown clay.	4.27
30.0	9.0		
40.0	12.0	Grey clay, silt.	12.80
45.0	14.0	Brown gravel, sand, silt.	14.63
50.0	15.0	Brown san, clay, stones.	15.85
55.0	17.0	Brown limestone, broken.	17.37
60.0	18.0	Brown limestone.	17.68
	19.0		19.81

steel casing

open hole 19.81

SAMPLE Num.	Type	Int.	%Recov.
N/A	WC		N/A

Prepared By: P. Workman | Checked By: J. Baxter | Date Prepared: 06/29/01

This borehole log was prepared for hydrogeological and/or environmental purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions.Borehole data requires interpretation by Burnside Environmental personnel before use by others.

LEGEND
- Water found @ time of drilling
- Static Water Level - 12/18/2000

MONITORING WELL DATA
- Pipe: 15.2 cm dia. steel
- Screen:

SAMPLE TYPE
- AC Auger Cutting
- CS Continuous
- RC Rock Core
- SS Split Spoon
- AR Air Rotary
- WC Wash Cuttings

TSWMM-1132.GPJ TEMPLATE.GDT 11/09/01
BHLOG H:\GINTPI

APPENDIX E

GUDI Assessment of TW7-10

Table of Contents

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1.1 Current Regulations and Guidelines for Determining GUDI Status 2

2.0 FIELD STUDY METHODOLOGY AND RESULTS 2

2.1 Water Level Response to Test Pumping 2

2.2 Geochemical Analyses 3

3.0 SUMMARY OF TEST PRODUCTION WELL CONSTRUCTION DETAILS 3

4.0 GUDI ASSESSMENT OF TW7-10 3

5.0 CONCLUSIONS 4

6.0 REFERENCES 5

TABLES

Table E1 Groundwater and Surface Water Quality Comparison

FIGURES

Figure E1 Study Area – GUDI Assessment

Figure E2 Water Quality Comparison

ATTACHMENTS

Attachment E1 Certificates of Analysis

1.0 INTRODUCTION

The Town of Shelburne (the Town) is undertaking municipal and federal Environmental Assessments (EA's) to identify the preferred alternative for developing additional municipal groundwater supply. As part of the field studies supporting the EA's, performance testing of a test production well (TW7-10) was undertaken. An objective of this testing was to collect information that could be used to evaluate the potential for this TW7-10 to yield Groundwater Under the Direct Influence (GUDI) of surface water. This Technical Appendix (Appendix E) of the Hydrogeological Report (HR) provides an assessment of the GUDI potential during the operation of TW7-10.

Details regarding the hydrogeological characterization of the Study Area are provided in Section 2 of the HR. Construction details of TW7-10 are provided in Appendix C of the HR. During the 72-hour Constant Rate Test, TW7-10 was open across the Goat Island and Gasport Formations.

1.1 Current Regulations and Guidelines for Determining GUDI Status

In October 2001, the Ontario Ministry of Environment (MOE) issued a final Terms of Reference (ToR) for Hydrogeological Studies to Examine Groundwater Sources Potentially Under Direct Influence of Surface Water (GUDI) for communal groundwater supply wells (MOE, 2001). The requirements of the ToR are affected by Ontario Regulation 459/00, Drinking Water Protection Regulation, made under the Ontario Water Resources Act. Owners of potential GUDI wells must either treat the water as if it is from a surface water source or complete a hydrogeological study to assess supply integrity and to determine appropriate treatment options.

2.0 FIELD STUDY METHODOLOGY AND RESULTS

Several analytical approaches were carried out to support the GUDI assessment of TW7-10. These approaches included:

- Monitoring groundwater level response to test production well pumping in nearby shallow overburden monitors; and
- A geochemical comparison of pumped groundwater from the test production wells to that of nearby surface water.

This section provides a detailed discussion on the methodology and results of these approaches.

2.1 Water Level Response to Test Pumping

A detailed discussion of groundwater level response to pumping from the test production wells is provided in Section 3.2 of the HR report as well as Appendix D. For the purpose of the GUDI assessment of TW7-10, the following observations are re-iterated:

Hydrographs of overburden monitors in the study area are shown on Figure D4 in Appendix D. Shallow overburden piezometers (MP1 and MP2) show no response to TW7-10 pumping. Deep overburden monitoring wells (OW2 and MW6/10-9), immediately above the bedrock contact, respond similarly to bedrock wells completed in the Gasport Formation. The total drawdown observed at these deep overburden monitors (approximately 2 m) is small compared to drawdown in the Gasport Formation (approximately 17 m in the vicinity

of TW7-10). These results indicate that pumped groundwater is drawn from the deep aquifer only. Groundwater level response in the deep overburden reflects a response to the depressurization of the Gasport Formation.

2.2 Geochemical Analyses

During the TW7-10 Performance Testing, five groundwater samples were collected from TW7-10 (two during Step Tests and three during the 72-Hour Constant Rate Test. The groundwater samples were submitted to SGS Canada Inc. in Lakefield Ontario for analysis with respect to Ontario Drinking Water Quality Standards (ODWQS). A summary of the sampling dates and analytical results for the groundwater samples are proved in Appendix D of the HR. The Certificate of Analyses for the groundwater samples are also provided in Attachment D2 of Appendix D.

On January 18, 2012, a surface water sample (SW1) was collected from Willow Brook Creek at the culvert at the intersection of Highway 89 and 2nd Line, as shown on Figure E1. This sample was submitted to Maxxam Analytics in Mississauga, Ontario for analysis of general chemistry, anions and cations. The Certificate of Analysis for the surface water sample is provided in Attachment E1.

A comparison of the analytical results from the surface water and the representative groundwater sample taken at the end of the 72-Hour Pumping Test is provided in Table E1 and shown on Figure E2. Both groundwater and surface water are characterized as calcium bicarbonate type water, but are shown to have slightly different signals on the Piper Plot (Figure E2). Significant differences are observed in the concentration of dissolved organic carbon (DOC) and chloride between the groundwater and surface water samples. The concentration of DOC is significantly higher in the surface water (about 15 mg/l) compared to below detection (<1 mg/l) in the groundwater. Chloride concentrations are also higher in the surface water (10 mg/l) compared to concentrations in the groundwater of less than 2 mg/l.

These results indicate some differences in the water chemistry in the TW7-10 Well and in the surface water.

3.0 SUMMARY OF TEST PRODUCTION WELL CONSTRUCTION DETAILS

Construction details for the test well, TW7-10 is as follows:

TW7-10 is a 200 mm (8-inch nominal) well completed to a depth of 86.5 m below ground surface (m bgs). The well is currently comprised of a 200 mm diameter casing extending from ground surface to a depth of 11 m bgs. Below the depth of the casing the well is currently an open borehole with a packer installed at approximately 46 to 47 m bgs at the interface of the Eramosa Formation and the Goat Island Formation.

4.0 GUDI ASSESSMENT OF TW7-10

The MOE's approach for designating groundwater sources as GUDI are provided in the TOR for Hydrogeological Studies to Examine GUDI for communal supply wells (MOE, 2001). The TOR establishes a protocol for recognizing groundwater sources as being potentially GUDI if they:

1) Regularly contain Total Coliforms and/or periodically contain E. Coli; or

2) Are located within approximately 50 days horizontal saturated travel time from surface water or are within 100 m (for overburden wells) or 500 m (for bedrock wells) of surface water (whichever is greater) and meet one or more of the following criteria:

   a. wells may be drawing water from an unconfined aquifer;

   b. wells may be drawing water from formations within approximately 15 m of surface;

   c. wells are part of an enhanced recharge/infiltration project;

   d. when the well is pumped, water levels in surface water rapidly change or hydraulic gradients beside the surface water significantly increase in a downward direction; or

   e. chemical water quality parameters (such as temperature, conductivity, turbidity, total dissolved solids, pH, colour, oxygen) are more consistent with nearby surface water than local groundwater and/or if they fluctuate significantly and rapidly in response to climatological or surface water conditions.

This Section responds to the considerations listed above, based on the field study results discussed in Section 2.

Item 1: Regularly contain Total Coliforms and/or periodically contain E. Coli.

TW7-10 was not tested with respect to Total Coliforms or E. Coli. As this is a test well, it does not have a history of production and there is no historical bacteriological data available.

Item 2: Are located within approximately 50 days horizontal saturated travel time from surface water or are within 100 m of surface water (whichever is greater) and meet one or more of the following criteria below:

TW7-10 draws groundwater from a confined aquifer (Gasport Formation) encountered at a depth of greater than 45 m bgs. Due to the low hydraulic conductivity and the regional extent of the confining layer (Eramosa and Goat Island Formations), groundwater recharge to the Gasport Formation is sourced from seepage over a broad area. Based on the groundwater response to pumping at TW7-10 and the compositional difference between groundwater in the Gasport Formation and surface water, the travel time of pumped groundwater from TW7-10 is expected to be greater than 50 days.

Willow Brook Creek is the closest surface water feature to TW7-10. It is located at a distance of greater than 1 km from TW7-10.

5.0 CONCLUSIONS

In support of the Town of Shelburne's EAs, hydrogeological field studies have been carried out to evaluate the potential for GUDI conditions at TW7-10. Based on the analyses and interpretation of the field study results, the following conclusions have been drawn:

- Groundwater pumped from TW7-10 is drawn from a confined aquifer at a depth of greater than 60 m bgs;
- Groundwater travel to TW7-10 is expected to be greater than 50 days; and

- The geochemical composition of groundwater pumped at TW7-10 is different from that of local surface water.

6.0 REFERENCES

Ministry of the Environment (MOE), 2001. Terms of Reference Hydrogeological Study to Examine Groundwater Sources Potentially Under Direct Influence of Surface Water.

n:\active\2009\1112\09-1112-6007 town of shelburne - hydrogeological assessment\reports\shelburne final hydro-g dec 2012\appendix e\appendix e gudi assessment 19mar2012.docx

TABLE

Groundwater and Surface Water Quality Comparison

Parameter	TW7-10	SW1
	03-Dec-10	18-Jan-12
pH	8.08	7.76
Conductivity	435	447
Alkalinity	211	188
Carbonate	< 2	1
HCO_3	211	187
OH	< 2	1
Dissolved Organic Carbon (DOC)	< 1.0	14.5
Ammonia+Ammonium (NH_3+NH_4)	< 0.1	<0.05
Tot.Reactive Phos.	< 0.03	<0.01
Sulphate(SO_4)	13	29
Chloride (Cl)	1.9	10.0
Nitrite (NO_2)	< 0.06	<0.01
Nitrate (NO_3)	0.63	1.30
Nitrate+Nitrite (NO_2+NO_3)	0.63	1.30
Hardness	234	250
Arsenic(As)	0.0036	< 0.001
Calcium(Ca)	56.3	71.0
Copper (Cu)	< 0.002	0.0017
Iron (Fe)	< 0.002	< 0.1
Magnesium (Mg)	22.7	17.0
Manganese (Mn)	0.0006	0.0220
Potassium (K)	0.794	1.200
Sodium (Na)	1.14	3.00
Zinc (Zn)	0.022	0.007
TDS (calculated)	222	256

FIGURES

559500 560000 560500

4881000

4880500

4880000

TW7-10

MW6/10-9

MP1

OW2

SW

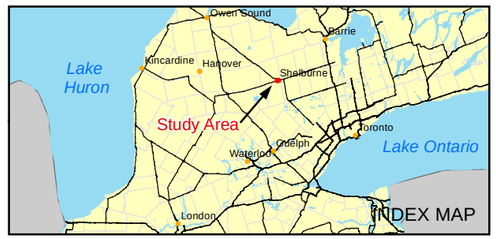
2-LINE SW

HIGHWAY-89

N

LEGEND

- Shallow Piezometer
- Overburden Monitoring Well
- Test Production Well
- Surface Water Monitoring Site
- Road
- Railway (Abandoned)
- Watercourse
- Wetland (MNR LIO 2009)



REFERENCE

Base Data - MNR LIO, obtained 2009, CANMAP v2006.4
Imagery: GRCA (2006)
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2011
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

100 50 0 100 200
SCALE 1:5,000 METRES

PROJECT

TOWN OF SHELBURNE
ENVIRONMENTAL ASSESSMENT FOR ADDITIONAL WATER SUPPLY

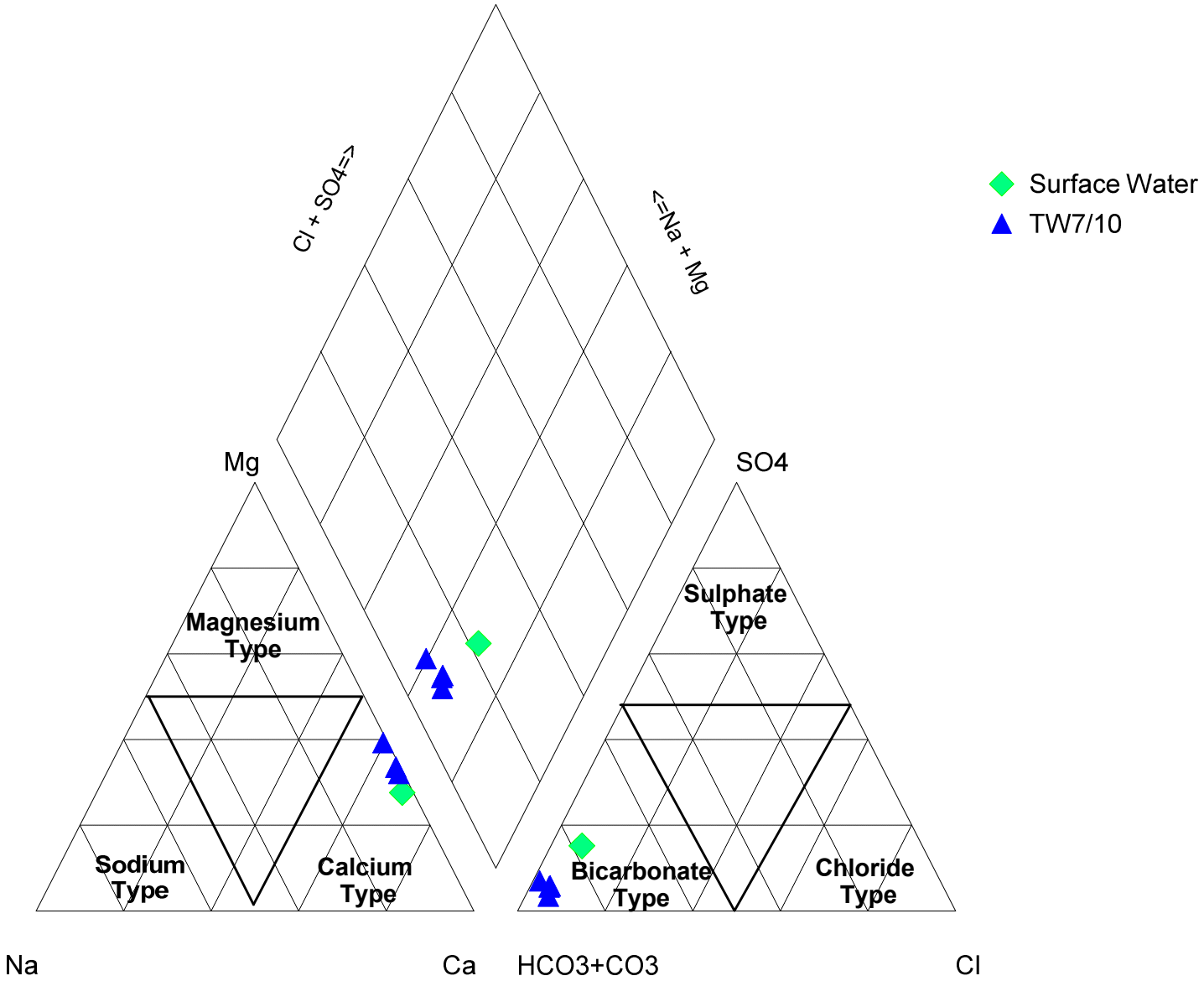
TITLE

STUDY AREA GUDI ASSESSMENT

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	7 Mar. 2012	FIGURE: E1	
GIS	PRM	21 Mar. 2012		
CHECK	JH	21 Mar. 2012		
REVIEW	SMD	Oct. 2012		

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\FinalEA_for_Additional_Water_Supply\Study_Area_GUDI_Assessment.mxd



Town of Shelburne
GUDI Assessment

Water Quality Comparison

Golder Associates

DRAWN: JLH	APPROVED: SMD	DATE: OCTOBER 2012
PROJECT: 09-1112-6007		FIGURE: E2

ATTACHMENT E1

Certificate of Analysis

Success Through Science®

Your Project #: 09-1112-6007
Your C.O.C. #: 32094001, 320940-01-01

Attention: Alexandra Lenarduzzi
Golder Associates Ltd
Mississauga - Standing Offer
2390 Argentia Rd
Mississauga, ON
L5N 5Z7

Report Date: 2012/01/25

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B208380
Received: 2012/01/19, 08:10

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Alkalinity	1	N/A	2012/01/23	CAM SOP-00448	SM 2320B
Carbonate, Bicarbonate and Hydroxide	1	N/A	2012/01/23	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	1	N/A	2012/01/23	CAM SOP-00463	EPA 325.2
Conductivity	1	N/A	2012/01/23	CAM SOP-00448	SM 2510
Dissolved Organic Carbon (DOC)	1	N/A	2012/01/24	CAM SOP-00446	SM 5310 B
Hardness (calculated as CaCO3)	1	N/A	2012/01/24	CAM SOP 00102	SM 2340 B
Dissolved Metals by ICPMS	1	N/A	2012/01/24	CAM SOP-00447	EPA 6020
Ion Balance (% Difference)	1	N/A	2012/01/24		
Anion and Cation Sum	1	N/A	2012/01/24		
Total Ammonia-N	1	N/A	2012/01/24	CAM SOP-00441	US GS I-2522-90
Nitrate (NO3) and Nitrite (NO2) in Water	1	N/A	2012/01/23	CAM SOP-00440	SM 4500 NO3I/NO2B
pH	1	N/A	2012/01/23	CAM SOP-00448	SM 4500H+ B
Orthophosphate	1	N/A	2012/01/23	CAM SOP-00461	EPA 365.1
Sat. pH and Langelier Index (@ 20C)	1	N/A	2012/01/24		
Sat. pH and Langelier Index (@ 4C)	1	N/A	2012/01/24		
Sulphate by Automated Colourimetry	1	N/A	2012/01/23	CAM SOP-00464	EPA 375.4
Total Dissolved Solids (TDS calc)	1	N/A	2012/01/24		

Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

The CWS PHC methods employed by Maxxam 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 the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited by SCC (Lab ID 97) for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

MATHURA THIRUKKUMARAN, CS Rep
Email: MThirukkumaran@maxxam.ca
Phone# (905) 817-5700

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B208380
Report Date: 2012/01/25

Golder Associates Ltd
Client Project #: 09-1112-6007

Sampler Initials: AL

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		MH0308		
Sampling Date		2012/01/18 11:00		
	Units	**SW1**	**RDL**	**QC Batch**
Calculated Parameters				
Anion Sum	me/L	4.74	N/A	2740925
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	187	1.0	2740854
Calculated TDS	mg/L	256	1.0	2740928
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.0	1.0	2740854
Cation Sum	me/L	5.08	N/A	2740925
Hardness (CaCO3)	mg/L	250	1.0	2740820
Ion Balance (% Difference)	%	3.49	N/A	2740924
Langelier Index (@ 20C)	N/A	0.481		2740926
Langelier Index (@ 4C)	N/A	0.232		2740927
Saturation pH (@ 20C)	N/A	7.28		2740926
Saturation pH (@ 4C)	N/A	7.53		2740927
Inorganics				
Total Ammonia-N	mg/L	<0.05	0.05	2744268
Conductivity	umho/cm	447	1	2742897
Dissolved Organic Carbon	mg/L	14.5	0.2	2742171
Orthophosphate (P)	mg/L	<0.01	0.01	2742777
pH	pH	7.76		2742899
Dissolved Sulphate (SO4)	mg/L	29	1	2742778
Alkalinity (Total as CaCO3)	mg/L	188	1	2742896
Dissolved Chloride (Cl)	mg/L	10	1	2742772
Nitrite (N)	mg/L	<0.01	0.01	2742934
Nitrate (N)	mg/L	1.3	0.1	2742934
Nitrate + Nitrite	mg/L	1.3	0.1	2742934

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B208380
Report Date: 2012/01/25

Golder Associates Ltd
Client Project #: 09-1112-6007

Sampler Initials: AL

RCAP - COMPREHENSIVE (WATER)

Maxxam ID		MH0308		
Sampling Date		2012/01/18 11:00		
	Units	**SW1**	**RDL**	**QC Batch**
Metals				
Dissolved Aluminum (Al)	ug/L	8.7	5.0	2744556
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	2744556
Dissolved Arsenic (As)	ug/L	<1.0	1.0	2744556
Dissolved Barium (Ba)	ug/L	16	2.0	2744556
Dissolved Beryllium (Be)	ug/L	<0.50	0.50	2744556
Dissolved Boron (B)	ug/L	13	10	2744556
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	2744556
Dissolved Calcium (Ca)	ug/L	71000	200	2744556
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	2744556
Dissolved Cobalt (Co)	ug/L	<0.50	0.50	2744556
Dissolved Copper (Cu)	ug/L	1.7	1.0	2744556
Dissolved Iron (Fe)	ug/L	<100	100	2744556
Dissolved Lead (Pb)	ug/L	<0.50	0.50	2744556
Dissolved Magnesium (Mg)	ug/L	17000	50	2744556
Dissolved Manganese (Mn)	ug/L	22	2.0	2744556
Dissolved Molybdenum (Mo)	ug/L	0.65	0.50	2744556
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	2744556
Dissolved Phosphorus (P)	ug/L	<100	100	2744556
Dissolved Potassium (K)	ug/L	1200	200	2744556
Dissolved Selenium (Se)	ug/L	<2.0	2.0	2744556
Dissolved Silicon (Si)	ug/L	2800	50	2744556
Dissolved Silver (Ag)	ug/L	<0.10	0.10	2744556
Dissolved Sodium (Na)	ug/L	3000	100	2744556
Dissolved Strontium (Sr)	ug/L	80	1.0	2744556
Dissolved Thallium (Tl)	ug/L	<0.050	0.050	2744556
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	2744556
Dissolved Uranium (U)	ug/L	1.3	0.10	2744556
Dissolved Vanadium (V)	ug/L	0.53	0.50	2744556
Dissolved Zinc (Zn)	ug/L	6.5	5.0	2744556

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B208380
Report Date: 2012/01/25

Golder Associates Ltd
Client Project #: 09-1112-6007

Sampler Initials: AL

Test Summary

Maxxam ID MH0308
Sample ID SW1
Matrix Water

Collected 2012/01/18
Shipped
Received 2012/01/19

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Alkalinity	PH	2742896	N/A	2012/01/23	YOGESH PATEL
Carbonate, Bicarbonate and Hydroxide	CALC	2740854	N/A	2012/01/23	AUTOMATED STATCHK
Chloride by Automated Colourimetry	AC	2742772	N/A	2012/01/23	DEONARINE RAMNARINE
Conductivity	COND	2742897	N/A	2012/01/23	YOGESH PATEL
Dissolved Organic Carbon (DOC)	TOCV/NDIR	2742171	N/A	2012/01/24	CHARLES OPOKU-WARE
Hardness (calculated as CaCO3)		2740820	N/A	2012/01/24	AUTOMATED STATCHK
Dissolved Metals by ICPMS	ICP/MS	2744556	N/A	2012/01/24	HUA REN
Ion Balance (% Difference)	CALC	2740924	N/A	2012/01/24	AUTOMATED STATCHK
Anion and Cation Sum	CALC	2740925	N/A	2012/01/24	AUTOMATED STATCHK
Total Ammonia-N	LACH/NH4	2744268	N/A	2012/01/24	ALINA DOBREANU
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	2742934	N/A	2012/01/23	BAVANI KAILAYA
pH	PH	2742899	N/A	2012/01/23	YOGESH PATEL
Orthophosphate	AC	2742777	N/A	2012/01/23	DEONARINE RAMNARINE
Sat. pH and Langelier Index (@ 20C)	CALC	2740926	N/A	2012/01/24	AUTOMATED STATCHK
Sat. pH and Langelier Index (@ 4C)	CALC	2740927	N/A	2012/01/24	AUTOMATED STATCHK
Sulphate by Automated Colourimetry	AC	2742778	N/A	2012/01/23	DEONARINE RAMNARINE
Total Dissolved Solids (TDS calc)	CALC	2740928	N/A	2012/01/24	AUTOMATED STATCHK

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B208380
Report Date: 2012/01/25

Golder Associates Ltd
Client Project #: 09-1112-6007

Sampler Initials: AL

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
2742171	Dissolved Organic Carbon	2012/01/24	92	80 - 120	98	80 - 120	<0.2	mg/L	15.3	20		
2742772	Dissolved Chloride (Cl)	2012/01/23	NC	75 - 125	101	80 - 120	<1	mg/L	0.4	20		
2742777	Orthophosphate (P)	2012/01/23	110	75 - 125	104	80 - 120	<0.01	mg/L	NC	25		
2742778	Dissolved Sulphate (SO4)	2012/01/23	NC	75 - 125	101	80 - 120	<1	mg/L	3.4	20		
2742896	Alkalinity (Total as CaCO3)	2012/01/23					<1	mg/L	0.4	25	97	85 - 115
2742897	Conductivity	2012/01/23					<1	umho/cm	0.09	25	103	85 - 115
2742934	Nitrite (N)	2012/01/23	104	80 - 120	107	85 - 115	<0.01	mg/L	NC	25		
2742934	Nitrate (N)	2012/01/23	97	80 - 120	104	85 - 115	<0.1	mg/L	0.08	25		
2744268	Total Ammonia-N	2012/01/24	98	80 - 120	96	85 - 115	<0.05	mg/L	1.9	20		
2744556	Dissolved Aluminum (Al)	2012/01/24	NC	80 - 120	108	80 - 120	<5.0	ug/L				
2744556	Dissolved Antimony (Sb)	2012/01/24	112	80 - 120	103	80 - 120	<0.50	ug/L				
2744556	Dissolved Arsenic (As)	2012/01/24	105	80 - 120	97	80 - 120	<1.0	ug/L				
2744556	Dissolved Barium (Ba)	2012/01/24	95	80 - 120	91	80 - 120	<2.0	ug/L				
2744556	Dissolved Beryllium (Be)	2012/01/24	110	80 - 120	106	80 - 120	<0.50	ug/L				
2744556	Dissolved Boron (B)	2012/01/24	105	80 - 120	100	80 - 120	<10	ug/L				
2744556	Dissolved Cadmium (Cd)	2012/01/24	107	80 - 120	103	80 - 120	<0.10	ug/L				
2744556	Dissolved Calcium (Ca)	2012/01/24	110	80 - 120	107	80 - 120	<200	ug/L				
2744556	Dissolved Chromium (Cr)	2012/01/24	106	80 - 120	103	80 - 120	<5.0	ug/L				
2744556	Dissolved Cobalt (Co)	2012/01/24	103	80 - 120	101	80 - 120	<0.50	ug/L				
2744556	Dissolved Copper (Cu)	2012/01/24	102	80 - 120	101	80 - 120	<1.0	ug/L				
2744556	Dissolved Iron (Fe)	2012/01/24	104	80 - 120	102	80 - 120	<100	ug/L				
2744556	Dissolved Lead (Pb)	2012/01/24	101	80 - 120	101	80 - 120	<0.50	ug/L	NC	20		
2744556	Dissolved Magnesium (Mg)	2012/01/24	112	80 - 120	110	80 - 120	<50	ug/L				
2744556	Dissolved Manganese (Mn)	2012/01/24	101	80 - 120	99	80 - 120	<2.0	ug/L				
2744556	Dissolved Molybdenum (Mo)	2012/01/24	110	80 - 120	100	80 - 120	<0.50	ug/L				
2744556	Dissolved Nickel (Ni)	2012/01/24	102	80 - 120	102	80 - 120	<1.0	ug/L				
2744556	Dissolved Phosphorus (P)	2012/01/24	114	80 - 120	105	80 - 120	<100	ug/L				
2744556	Dissolved Potassium (K)	2012/01/24	NC	80 - 120	107	80 - 120	<200	ug/L				
2744556	Dissolved Selenium (Se)	2012/01/24	103	80 - 120	96	80 - 120	<2.0	ug/L				
2744556	Dissolved Silicon (Si)	2012/01/24	113	80 - 120	107	80 - 120	<50	ug/L				
2744556	Dissolved Silver (Ag)	2012/01/24	99	80 - 120	100	80 - 120	<0.10	ug/L				
2744556	Dissolved Sodium (Na)	2012/01/24	NC	80 - 120	112	80 - 120	<100	ug/L				
2744556	Dissolved Strontium (Sr)	2012/01/24	101	80 - 120	96	80 - 120	<1.0	ug/L				
2744556	Dissolved Thallium (Tl)	2012/01/24	103	80 - 120	104	80 - 120	<0.050	ug/L				
2744556	Dissolved Titanium (Ti)	2012/01/24	108	80 - 120	106	80 - 120	<5.0	ug/L				
2744556	Dissolved Uranium (U)	2012/01/24	108	80 - 120	102	80 - 120	<0.10	ug/L				

Maxxam Job #: B208380
Report Date: 2012/01/25

Golder Associates Ltd
Client Project #: 09-1112-6007

Sampler Initials: AL

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
2744556	Dissolved Vanadium (V)	2012/01/24	108	80 - 120	103	80 - 120	<0.50	ug/L				
2744556	Dissolved Zinc (Zn)	2012/01/24	102	80 - 120	103	80 - 120	<5.0	ug/L				

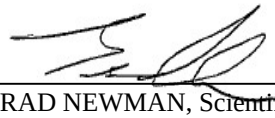
N/A = Not Applicable
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Validation Signature Page

Maxxam Job #: B208380

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



BRAD NEWMAN, Scientific Specialist

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MATHURA THIRUKKUM
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Only:

BOTTLE ORDER #: 320940

PROJECT MANAGER: MATHURA THIRUKKUMARA

C#320940-01-01

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:	
Company Name:	#1326 Golder Associates Ltd	Company Name:		Quotation #:	B02761
Contact Name:	Central Acct:1112, 1113, 1151	Contact Name:		P.O. #:	
Address:	2390 Argentia Rd	Address:		Project #:	09-1112-6007
	Mississauga ON L5N 5Z7			Project Name:	
Phone:	(905)567-4444 Fax: (905)567-6561	Phone:	Fax:	Site #:	
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Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___ ☐ For RSC

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg. 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality _____
☐ PWQO
☐ Other _____

SPECIAL INSTRUCTIONS

Include Criteria on Certificate of Analysis (Y/N)? ___

Note: For MOE regulated drinking water samples - please use the Drinking Water Chain of Custody Form

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

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	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	RCAp - Comprehensive								# of Bottles	Comments
1		SW1	18-Jan-12	11:00	GW	N	Y	X								4	
2																	
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*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
A Lenarduzzi	12/01/19	8:10	ASAD BHATTI	2012/01/19	08:10	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
	6/6/6 C	Present		✓
		Intact		✓

* 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.

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APPENDIX C

Species At Risk and Ontario Breeding Bird Atlas Data

Table C-1: Species at Risk Ranges with the Town of Shelburne Long-term Well for Additional Water Supply Project Study Area

Common Name	Scientific Name	COSEWIC	SARA Schedule 1	ESA (reg. 230/08) SARO List Status	Provincial Rank	ROM	NHIC	Atlas			Probability of Occurrence in Project Site	Rationale	Preferred Habitat
								OBBA	Herps	Mammals			
Birds													
Barn Swallow	*Hirundo rustica*	THR	Not Listed	THR	S4B			x			High/Confirmed	Observed foraging within the habitats in the Project site. Observed nesting in culverts adjacent to the Project site.	Open habitat, especially fields and agricultural land and buildings near water.
Bobolink	*Dolichonyx oryzivorus*	THR	Not Listed	THR	S4B			x			High/Confirmed	Observed within the habitats in the Project site.	large, open expansive grasslands with dense ground cover; hayfields, meadows of fallow fields; marshes require tracks of grasslands >50ha
Canada Warbler	*Wilsonia canadensis*	THR	THR	SC	S4B	x		x			Low	Canada warbler were not observed during the breeding bird surveys conducted by Golder in 2012. Suitable habitat for this species does not exist within the footprint of the Project.	Uses a wide range of deciduous, coniferous and mixed forests, with a well-developed shrub layer and a structurally complex forest floor. It is most abundant in moist, mixed forests. It also occurs in riparian shrub forest on slopes and in ravines, in stands regenerating after natural and anthropogenic disturbances and in old-growth forests with canopy openings and a well-developed shrub layer.
Chimney Swift	*Chaetura pelagica*	THR	THR	THR	S4B, S4N	x		x			Low	Chimney swifts were not observed during the breeding bird surveys conducted by Golder in 2012. Suitable habitat for this species does not exist within the footprint of the Project.	Chimney swifts nest primarily in old chimneys and similar structures in buildings, and in large hollows of trees.
Common Nighthawk	*Chordeiles minor*	THR	THR	SC	S4B			x			Low	Common nighthawk were not observed during the breeding bird surveys conducted by Golder in 2012.	These aerial forages require areas with large open habitat. This includes farmland, open woodlands, clearcuts, burns, rock outcrops, alvars, bog ferns, prairies, gravel pits and rooftops in cities.
Eastern Meadowlark	*Sturnella magna*	THR	Not Listed	THR	S4B			x			High/Confirmed	Observed within the habitats in the Project site.	The Eastern Meadowlark prefers native grasslands; it will nest in pastures and agricultural fields, especially those in alfalfa and hay. It also uses old fields and meadows, more often overgrown with

Table C-1: Species at Risk Ranges with the Town of Shelburne Long-term Well for Additional Water Supply Project Study Area (continued)

Common Name	Scientific Name	COSEWIC	SARA Schedule 1	ESA (reg. 230/08) SARO List Status	Provincial Rank	ROM	NHIC	Atlas			Probability of Occurrence in Project Site	Rationale	Preferred Habitat
								OBBA	Herps	Mammals			
													shrubs, and prefers dry habitat to wet and tall grass to short. Occasionally it will use other areas such as golf courses or sand dunes.
Golden-winged Warbler	*Vermivora chrysoptera*	THR	THR	SC	S4B			x			Low	This species was observed in the OBBA square the encompasses the Project site. However, ideal habitat for this species does not exist within the Project footprint. Golden-winged warbler were not observed during the breeding bird surveys conducted by Golder in 2012.	This warbler has a broad range and variety of plant communities it uses for nesting, but its territories have a consistent pattern: patches of herbs, shrubs, and scattered trees, plus a forested edge. During the breeding season, this warbler occurs in various semi-open habitats: areas with abundant herbaceous vegetation, large clumps of bushes and relatively few trees. Such habitat may be found in a marsh surrounded by forest or fields left fallow for 10–30 years. Breeds in patchy shrubland and forest edge, such as shrubby fields, marshes, and bogs. Winters in canopy of tropical forests. Their preferred breeding habitat is areas of early successional vegetation, found primarily on field edges, hydro or utility right-of-ways, or recently logged areas.
Least Bittern	*Ixobrychus exilis*	THR	THR	THR	S4B	x	x				Low	This species was not found in the OBBA square that includes the Project site. The ideal habitat for Least bittern is not present on or in the vicinity of the Project site.	Nests in freshwater marshes, where dense tall aquatic vegetation is interspersed with clumps of woody vegetation and open water; are most regular in marshes exceeding 5 ha.
Henslow's Sparrow	*Ammodramus henslowii*	END	END	END	SHB	x	x				Low	Suitable habitat for this species does not exist within the footprint of the Project Site, and no detections of Henslow's sparrow were made by Golder on breeding bird surveys, and no records of this species were listed in the OBBA	This secretive sparrow occupies open fields and meadows. The vegetation of these areas includes tall grasses that are interspersed with tall herbaceous plants, or shrubby species. The sparrow avoids areas that have been grazed or burned. It prefers undisturbed areas with dense living grasses and a dense thatch of dead grasses. The species may occupy hayfields, but if the hay is cut early, the nests are destroyed and the resulting losses are severe. Only areas that remain

Table C-1: Species at Risk Ranges with the Town of Shelburne Long-term Well for Additional Water Supply Project Study Area (continued)

Common Name	Scientific Name	COSEWIC	SARA Schedule 1	ESA (reg. 230/08) SARO List Status	Provincial Rank	ROM	NHIC	Atlas			Probability of Occurrence in Project Site	Rationale	Preferred Habitat
								OBBA	Herps	Mammals			
												square containing the LSA (Cadman et. al. 2007)	undisturbed for several years appear to be more successfully colonized.
Red-headed Woodpecker	*Melanerpes erythrocephalus*	THR	THR	SC	S4B						Low	Red-headed woodpecker were not observed during the breeding bird surveys conducted by Golder in 2012. Suitable habitat for this species does not exist within the footprint of the Project.	The red-headed woodpecker nests in open deciduous forest where it requires dead standing snags for nest sites and feeding. This medium-size bird (20cm) lives in open woodland and woodland edges, especially in oak savannahs and riparian forest, which can often be found in parks, golf courses and cemeteries. These habitats contain a higher density of dead trees, which they commonly use for nesting and perching.
Reptiles and Amphibians													
Snapping Turtle	*Chelydra serpentina*	SC	SC	SC	S3	x			x		Low	Suitable habitat for this species does not exist within the footprint of the Project.	Usually found in large bodies of water, but can be found in smaller ponds. They rarely leave the water except to lay eggs in moist soil. They prefer shallow waters so they can hide under the soft mud and leaf litter. During the nesting season females travel overland in search of a suitable nesting site, usually gravely or sandy areas along streams. Snapping Turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits.
Blanding's Turtle	*Emydoidea blandingii*	THR	THR	THR	S3	x	x				Low	Suitable habitat for this species does not exist within the footprint of the Project.	Found in shallow water; prefers marshes, bogs, secluded bays, shallow parts of lakes and creeks with soft bottoms and dense aquatic vegetation. It can also spend significant portions of time in upland areas moving between wetlands.
Milksnake	*Lampropeltis triangulum*	SC	SC	SC	S3								Inhabits rural areas; most frequently reported in and around buildings, especially old structures; however, it is found in a wide variety of habitats, from prairies, pastures, and hayfields, to rocky hillsides and a wide variety of forest types; occurs along the border between Quebec and Ontario, south of the St. Lawrence River, and east of the St.

Table C-1: Species at Risk Ranges with the Town of Shelburne Long-term Well for Additional Water Supply Project Study Area (continued)

Common Name	Scientific Name	COSEWIC	SARA Schedule 1	ESA (reg. 230/08) SARO List Status	Provincial Rank	ROM	NHIC	Atlas			Probability of Occurrence in Project Site	Rationale	Preferred Habitat
								OBBA	Herps	Mammals			
													Francois River.
Eastern Ribbonsnake (Great Lakes population)	*Thamnophis sauritus*	SC	SC	SC	S3						Low	Suitable habitat for this species does not exist within the footprint of the Project.	The Eastern Ribbonsnake (Great Lakes population) is semi-aquatic. It is most frequently found along the edges of shallow ponds, streams, marshes, swamps, or bogs bordered by dense vegetation that provides cover. Abundant exposure to sunlight is also required, and adjacent upland areas may be used for nesting. During winter (October to April), Eastern Ribbonsnakes (Great Lakes population) hibernate in rock crevices, animal burrows, and even in ant mounds.
Vascular Plants													
Butternut	*Juglans cinerea*	END	END	END	S3?	x	x				None/confirmed	No observations of butternut trees were made within the Project footprint.	Grows best on rich, moist, well-drained loams often found on stream bank sites but may be found on well-drained gravelly sites, especially those of limestone origin; common associates include basswood, black cherry, beech, black walnut, elm, hemlock, hickory, oak, red maple, sugar maple, white ash and yellow birch; may be an indicator /associate of ginseng.
American Ginseng	*Panax quinquefolius*	END	END	END	S2	x	x				None/confirmed	Suitable habitat for this species does not exist within the footprint of the Project.	Found in rich, moist, undisturbed and relatively mature deciduous woods in areas of neutral soil (such as over limestone or marble bedrock; forest canopy is usually dominated by sugar maple, white ash, bitternut hickory, and basswood; colonies are often found near the bottom of gentle south-facing slopes, where the microhabitat is warm and well-drained.
Mammals													
Grey Fox	*Urocyon cinereoargenteus*	THR	THR	THR	S1	x	x			x	Low	Outside of Pelee Island, gray fox sightings are exceedingly rare in Ontario (ROM 2012)	Inhabit deciduous forests and marshes, den in many different kinds of substrate (rock outcrops, hollow trees, underground burrows dug by other animals, or piles of brush), but the dens are usually located close to a water source and in an area of dense brush. Considered a habitat generalist and is

Table C-1: Species at Risk Ranges with the Town of Shelburne Long-term Well for Additional Water Supply Project Study Area (continued)

Common Name	Scientific Name	COSEWIC	SARA Schedule 1	ESA (reg. 230/08) SARO List Status	Provincial Rank	ROM	NHIC	Atlas			Probability of Occurrence in Project Site	Rationale	Preferred Habitat
								OBBA	Herps	Mammals			
													often found on the outskirts of cities.
	Arthropods												
Monarch	*Danaus plexippus*	SC	SC	SC	S2N, S4B	x					Low	Although small patches of suitable habitat may be present in the Project Site, no detections of monarch were made by Golder	Found in Ontario wherever there are milkweed plants for its caterpillars and wildflowers for a nectar source; often found on abandoned farmland and roadsides, but also in city gardens and parks.
West Virginia white	*Pieris virginiensis*	Not Listed	Not Listed	SC	S3	x					Low	Suitable habitat for this species does not exist within the footprint of the Project.	Lives in moist, deciduous woodlands, and the larvae feed only on the leaves of toothwort (Dentaria diphylla; Dentaria X maxima), which is a small, spring-blooming plant of the forest floor.

Table C-2: Avifauna listed in the OBBA found in the Study Area

Common Name	Scientific Name
Alder Flycatcher	*Empidonax alnorum*
American Bittern	*Botaurus lentiginosus*
American Crow	*Corvus brachyrhynchos*
American Goldfinch	*Carduelis tristis*
American Kestrel	*Falco sparverius*
American Redstart	*Setophaga ruticilla*
American Robin	*Turdus migratorius*
American Woodcock	*Scolopax minor*
Baltimore Oriole	*Icterus galbula*
Bank Swallow	*Riparia riparia*
Barn Swallow	*Hirundo rustica*
Belted Kingfisher	*Megaceryle alcyon*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Black-and-white Warbler	*Mniotilta varia*
Blackburnian Warbler	*Dendroica fusca*
Black-capped Chickadee	*Poecile atricapillus*
Black-throated Blue Warbler	*Setophaga caerulescens*
Black-throated Green Warbler	*Setophaga virens*
Blue Jay	*Cyanocitta cristata*
Blue or Golden-winged Warbler	*Vermivora chrysoptera*
Blue-headed Vireo	*Vireo solitarius*
Blue-winged Teal	*Anas discors*
Blue-winged Warbler	*Vermivora cyanoptera*
Bobolink	*Dolichonyx oryzivorus*
Broad-winged Hawk	*Buteo platypterus*
Brown Creeper	*Certhia americana*
Brown Thrasher	*Toxostoma rufum*
Brown-headed Cowbird	*Molothrus ater*
Canada Goose	*Branta canadensis*
Cedar Waxwing	*Bombycilla cedrorum*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Chimney Swift	*Chaetura pelagica*
Chipping Sparrow	*Spizella passerina*
Clay-colored Sparrow	*Spizella pallida*
Cliff Swallow	*Petrochelidon pyrrhonota*
Common Grackle	*Quiscalus quiscula*
Common Nighthawk	*Chordeiles minor*

Table C-2: Avifauna listed in the OBBA found in the Study Area (continued)

Common Raven	*Corvus corax*
Common Snipe	*Gallinago gallinago*
Common Yellowthroat	*Geothlypis trichas*
Cooper's Hawk	*Accipiter cooperii*
Downy Woodpecker	*Picoides pubescens*
Eastern Bluebird	*Sialia sialis*
Eastern Kingbird	*Tyrannus tyrannus*
Eastern Meadowlark	*Sturnella magna*
Eastern Phoebe	*Sayornis phoebe*
Eastern Screech-Owl	*Megascops asio*
Eastern Towhee	*Pipilo erythrophthalmus*
Eastern Wood-Pewee	*Contopus virens*
European Starling	*Sturnus vulgaris*
Field Sparrow	*Spizella pusilla*
Golden-crowned Kinglet	*Regulus satrapa*
Grasshopper Sparrow	*Ammodramus savannarum*
Gray Catbird	*Dumetella carolinensis*
Great Blue Heron	*Ardea herodias*
Great Crested Flycatcher	*Myiarchus crinitus*
Green Heron	*Butorides virescens*
Hairy Woodpecker	*Picoides villosus*
Hermit Thrush	*Catharus guttatus*
Hooded Warbler	*Wilsonia citrina*
Horned Lark	*Eremophila alpestris*
House Finch	*Carpodacus mexicanus*
House Sparrow	*Passer domesticus*
House Wren	*Troglodytes aedon*
Indigo Bunting	*Passerina cyanea*
Killdeer	*Charadrius vociferus*
Least Flycatcher	*Empidonax minimus*
Magnolia Warbler	*Setophaga magnolia*
Mallard	*Anas platyrhynchos*
Marsh Wren	*Cistothorus palustris*
Mourning Dove	*Zenaida macroura*
Mourning Warbler	*Oporornis philadelphia*
Nashville Warbler	*Oreothlypis ruficapilla*
Northern Cardinal	*Cardinalis cardinalis*
Northern Flicker	*Colaptes auratus*
Northern Harrier	*Circus cyaneus*

Table C-2: Avifauna listed in the OBBA found in the Study Area (continued)

Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Northern Waterthrush	*Parkesia noveboracensis*
Ovenbird	*Seiurus aurocapilla*
Pie-billed Grebe	*Podilymbus podiceps*
Pileated Woodpecker	*Dryocopus pileatus*
Pine Warbler	*Dendroica pinus*
Purple Finch	*Carpodacus purpureus*
Red-breasted Nuthatch	*Sitta canadensis*
Red-eyed Vireo	*Vireo olivaceus*
Red-shouldered Hawk	*Buteo lineatus*
Red-tailed Hawk	*Buteo jamaicensis*
Red-winged Blackbird	*Agelaius phoeniceus*
Ring-necked Pheasant	*Phasianus colchicus*
Rock Pigeon	*Columba livia*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Ruby-throated Hummingbird	*Archilochus colubris*
Ruddy Duck	*Oxyura jamaicensis*
Ruffed Grouse	*Bonasa umbellus*
Savannah Sparrow	*Passerculus sandwichensis*
Scarlet Tanager	*Piranga olivacea*
Sedge Wren	*Cistothorus platensis*
Sharp-shinned Hawk	*Accipiter striatus*
Short-eared owl	*Asio flammeus*
Song Sparrow	*Melospiza melodia*
Sora	*Porzana carolina*
Spotted Sandpiper	*Actitis macularius*
Swamp Sparrow	*Melospiza georgiana*
Tree Swallow	*Tachycineta bicolor*
Turkey Vulture	*Cathartes aura*
Upland Sandpiper	*Bartramia longicauda*
Veery	*Catharus fuscescens*
Vesper Sparrow	*Pooecetes gramineus*
Virginia Rail	*Rallus limicola*
Warbling Vireo	*Vireo gilvus*
White-breasted Nuthatch	*Sitta carolinensis*
White-throated Sparrow	*Zonotrichia albicollis*
Wild Turkey	*Meleagris gallopavo*
Willow Flycatcher	*Empidonax traillii*
Winter Wren	*Troglodytes hiemalis*

Table C-2: Avifauna listed in the OBBA found in the Study Area (continued)

Wood Duck	*Aix sponsa*
Wood Thrush	*Hylocichla mustelina*
Yellow Warbler	*Dendroica petechia*
Yellow-bellied Sapsucker	*Sphyrapicus varius*
Yellow-rumped Warbler	*Setophaga coronata*

APPENDIX D

Stage 1 Archaeological Assessment

ORIGINAL REPORT

December 7, 2012

STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Schedule B Class Environmental Assessment for Additional Water Supply Townships of Amaranth and Melancthon Dufferin County, Ontario

Submitted to:
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P.O. Box 69, 203 Main Street East
Shelburne, Ontario L0N 1S0

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PIF Number: P243-128-2011

Report Number: 09-1112-6007-3000-R01

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Executive Summary

Golder Associates Ltd. (Golder) was retained by the Town of Shelburne to conduct a Stage 1 archaeological assessment to satisfy the requirements of a Class "B" Municipal Class Environmental Assessment governed by Ontario's *Environmental Assessment Act* as outlined in the *Municipal Class Environmental Assessment* guidance document (Municipal Engineers Association 2007). This assessment was conducted to determine the archaeological potential of an approximately 3,500 hectare area under consideration as a future groundwater well expansion area to increase the water supply for the Town of Shelburne, Dufferin County

The Stage 1 assessment has resulted in the determination that archaeological potential for the recovery of pre- and post-contact Aboriginal cultural material and Euro-Canadian historic cultural material exists within the study area. This potential is negated in areas within the site that have been impacted by previous disturbance or are found to be poorly drained; these areas can be identified during a field survey. Any areas that have not been subject to previous disturbance retain their archaeological potential. **Stage 2 archaeological assessment is recommended for areas determined to have archaeological potential prior to ground disturbance activities.**

The Ontario Ministry of Tourism, Culture and Sport is asked to review the results presented and to accept this report into the Provincial Register of archaeological reports. Portions of the study area that exhibit archaeological potential are subject to Section 48(1) of the *Ontario Heritage Act* and may not be altered, or have artifacts removed, except by a person holding an archaeological licence.

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*. 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*.

The Executive Summary highlights key points from the report only; for complete information and findings, as well as the limitations, the reader should examine the complete report.

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Ministry of Tourism, Culture and Sport	Robert von Bitter, B.A., Shari Prowse, M.A.

1.0 PROJECT CONTEXT

1.1 Development Context

Golder was retained by the Town of Shelburne to conduct a Stage 1 archaeological assessment to satisfy the requirements of a Class "B" Municipal Class Environmental Assessment governed by Ontario's *Environmental Assessment Act* as outlined in the *Municipal Class Environmental Assessment* guidance document (Municipal Engineers Association 2007). This assessment was conducted to determine the archaeological potential of an approximately 3,500 hectare area under consideration as a future groundwater well expansion area to increase the water supply for the Town of Shelburne, Dufferin County. The study area spans various lots and concessions in the townships of Melancthon and Amaranth, Dufferin County, Ontario as listed in Table 1 below and in Figure 1.

Table 1: Location of Study Area

Township	Concession	Lot
Amaranth	3	Part of 26 to 32
	4	26 to 32
	5	26 to 32
	6	Part of 26 to 32
Melancthon	3 Old Survey	Part of 1 to 5
	4 Old Survey	1 to 5
	1 North of Toronto-Sydenham Road	Part of 300
	1 South of Toronto-Sydenham Road	Part of 295 to 299,301 to 303
	2 South of Toronto-Sydenham Road	Part of 292 to 295,296 to 305
	3 South of Toronto-Sydenham Road	Part of 294 to 300, 301 to 305
	4 South of Toronto-Sydenham Road	Part of 300 to 302

The objective of the Stage 1 assessment was to compile all available information about the known and potential cultural heritage resources within the study area and to provide specific direction for the protection, management and/or recovery of these resources. In compliance with the provincial standards and guidelines set out in the *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), the objectives of the Stage 1 Archaeological Overview/Background Study are as follows:

- To provide information about the study area's geography, history, previous archaeological fieldwork and current land conditions;
- To evaluate in detail the study area's archaeological potential which will support recommendations for Stage 2 survey for all or parts of the property; and
- To recommend appropriate strategies for Stage 2 survey.

To meet these objectives Golder archaeologists employed the following research strategies:

- A review of relevant archaeological, historic and environmental literature pertaining to the study area,
- A review of the land use history, including pertinent historic maps; and
- An examination of the Ontario Archaeological Sites Database (ASDB) to determine the presence of known archaeological sites in and around the project area.

Background research was conducted in consultation with the Ministry of Tourism, Culture and Sport (MTCS), McGill University's Digital Atlas Project, online sources and within Golder's corporate library. The Stage 1 assessment was conducted under archaeological consulting licence P243, issued to Carla Parslow, Ph.D., by the Ontario Ministry of Tourism, Culture and Sport.

1.2 Archaeological Context

1.2.1 The Natural Environment

The study area is situated within the Dundalk Till Plain physiographic region (Chapman and Putnam 1984:130-133):

> *The "roof" of peninsular Ontario in the counties of Dufferin, Grey, and Wellington comprises an area of 925 square miles of gently undulating till plain.…The main part of the area is a fluted till plain, the flutings running southeastward; in other words the surface appears planed but scored by shallow troughs which are barely perceptible to the eye.…The plain is characterized by swamps or bogs and by poorly drained depressions.*
>
> (Chapman and Putnam 1984:130)

The predominant soil types within the study area are Honeywood Silt Loam, Bennington Fine Sand Loam and Parkhill Loam (Figure 2). As shown in Figure 2, a band of muck soil runs north-south through the central part of the study area. The till plain in this area is known for its prevalence of bogs, swamps and poorly drained depressions, but pockets of well drained soils are successfully cultivated for agriculture (Chapman and Putnam 1966:205). The band of muck soil that runs through the study area is associated with a marsh area of substantial size. This marsh area drains in the Grand River watershed; the Grand River watershed and it major tributaries drain an area of over 6800 km2. Drainage is also provided by watercourses that have been created or modified as linear agricultural drains (Dillon Consulting 2009).

1.2.2 Pre-contact Aboriginal Archaeological Resources and Surveys

In order that an inventory of archaeological resources could be compiled, the registered archaeological site records kept by the MTC were consulted. In Ontario, information concerning archaeological sites is stored in the ASDB maintained by the MTC. This database contains archaeological sites registered according to the Borden system. Under the Borden system, Canada is divided into grid blocks based on latitude and longitude. A Borden Block is approximately 13 kilometres east to west and approximately 18.5 kilometres north to south. Each Borden Block is referenced by a four-letter designator and sites within a block are numbered sequentially as they are found. The study area under review is located within Borden Block *AjHa*.

Information concerning specific site locations is protected by provincial policy, and is not fully subject to the Freedom of Information Act. The release of such information in the past has led to looting or various forms of illegally conducted site destruction. Confidentiality extends to all media capable of conveying location, including maps, drawings, or textual descriptions of a site location. The MTC 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.

According to the ASDB, there are no registered pre-contact Aboriginal archaeological sites located within the study area and a surrounding one kilometre buffer (personal communication, Robert von Bitter, March 22, 2011; Government of Ontario). Table 2 provides a general outline of the culture history of Dufferin County (based on Ellis and Ferris 1990). The study area falls within a region that could have been occupied by either Huron or Petun peoples prior to Euro-Canadian settlement (Ramsden 1990).

Table 2: Cultural Chronology for the Wellington County Area

Period	Characteristics	Time	Comments
Early Paleo-Indian	Fluted Projectiles	9000 - 8400 B.C.	spruce parkland/caribou hunters
Late Paleo-Indian	Hi-Lo Projectiles	8400 - 8000B.C.	smaller but more numerous sites
Early Archaic	Kirk and Bifurcate Base Points	8000 - 6000 B.C.	slow population growth
Middle Archaic	Brewerton-like points	6000 - 2500 B.C.	environment similar to present
Late Archaic	Lamoka (narrow points)	2000 - 1800 B.C.	increasing site size
	Broadpoints	1800 - 1500 B.C.	large chipped lithic tools
	Small Points	1500 - 1100B.C.	introduction of bow hunting
Terminal Archaic	Hind Points	1100 - 950 B.C.	emergence of true cemeteries
Early Woodland	Meadowood Points	950 - 400 B.C.	introduction of pottery
Middle Woodland	Dentate/Pseudo-Scallop Pottery	400 B.C. - A.D.500	increased sedentism
	Princess Point	A.D. 550 - 900	introduction of corn
Late Woodland	Early Ontario Iroquoian	A.D. 900 - 1300	emergence of agricultural villages
	Middle Ontario Iroquoian	A.D. 1300 - 1400	long longhouses (100m +)
	Late Ontario Iroquoian	A.D. 1400 - 1650	tribal warfare and displacement
Contact Aboriginal	Various Algonkian Groups	A.D. 1700 - 1875	early written records and treaties
Historic	Euro-Canadian	A.D. 1796 - present	European settlement

One previous archaeological assessment has been conducted adjacent to the study area, a Stage 1 archaeological assessment in advance of the proposed Hatherton/Maxwell Windfarms and Masonville/Shrigley Wind Farms (TMHC 2007). The MTC Project Information Number (PIF) for this assessment was P064-163-2007. In particular, the Masonville Wind Farm area is located in Melancthon Township, just northeast of the current study area. This 2007 report found that areas of archaeological potential exist within the Masonville

Wind Farm study area and further Stage 2 survey was recommended for these areas in advance of ground disturbing activities (TMHC 2007:35-37).

1.3 Historical Context

1.3.1 Historic First Nations

The post-contact Aboriginal occupation of Southern Ontario was heavily influenced by the dispersal of various Iroquoian-speaking peoples 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 (Schmalz 1991). The nature of their settlement size, population distribution, and material culture shifted as European settlers encroached upon their territory. However, despite this shift, "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 Iroquoian systems of ideology and thought" (Ferris 2009:114). As a result, First Nation peoples of Southern Ontario have left behind archaeologically significant resources throughout Southern Ontario which show continuity with past peoples, even if they have not been recorded in historical Euro-Canadian documentation.

Local traditions preserved in a history of Dufferin County (Sawden 1952) record encounters with local aboriginal peoples living in Melancthon Township in the early 19th century and before. The study area first enters the historic record when Treaty Number 18 was signed between the Crown and Chippewas on October 17, 1818. Treaty Number 18:

> *was a provisional agreement made the 17th day of October, 1818, between the Honourable William Claus on behalf of His Majesty the King and the Principal Men of the Chippewa Nation of Indians, inhabiting the northern parts of the unpurchased lands, within the Home District, on consideration of a yearly payment of twelve hundred pounds by His Majesty to the Chippewa Indians, the said tract being described as follows: Bounded by the District of London on the west, by Lake Huron on the north, by the Penetanguishene purchase (made in 1815) on the east; by the south shore of Kempenfeldt Bay; the western shore of Lake Simcoe and Cooks Bay and the Holland River to the north west angle of the Township of King.*
>
> J. Morris 1943: 23-24

While it is difficult to exactly delineate treaty boundaries today, Figure 3 provides an approximate outline of the limits of Treaty Number 18.

1.3.2 Historic Euro-Canadian

The study area falls within the "Old Survey" of Melancthon Township, the "New Survey" of Melancthon Township, and Amaranth Township (see Table 1). The original survey, known as the "old survey", of the first four concessions of Melancthon Township was made by Hugh Black in 1825 (Black 1825) but it was resurveyed in 1830 by Charles Rankin. The subsequent "new survey" was completed by David Gibson in 1853 and was aligned to the "Toronto Line" surveyed in 1848 which accounts for the unusual township configuration. Since the

study area covers a portion of Melancthon's "old survey" it also means that much of the area's original recorded Euro-Canadian settlement was located in this area. The location of the study area within the old survey of Melancthon Township is illustrated in Figure 4 (Black n.d.a). While the map does not illustrate any structures, it does name the original settlers to whom each lot was granted (marked "D") and also which lots were forfeited and returned to the Commissioner of Crown Lands as of August 19th, 1842 (marked "C.L.") or as of July 23rd, 1844 (marked "C.C.L."). The location of the study area within the new survey of Melancthon Township is illustrated in Figure 5.

Amaranth Township was first surveyed by Hugh Black in 1822 (survey map dated 1823) and is decidedly more traditionally laid out than Melancthon Township (Black n.d.b) (Figure 6). Black's survey notes detail a large area of land consisting of cedar swamps interspersed with gentle swells of land and more abrupt ridges (Black 1822). Additionally, numerous areas of land partially cleared by windfall were also noted. Settlement of both Amaranth and Melancthon Townships began in earnest in the 1840s following construction of the Toronto-Syndenham Road (Toronto Line).

Late 19th century township maps can be found in the 1877 *Illustrated Historical Atlas of the County of Wellington* (Walker and Miles 1877) and the 1880 *Grey County Supplement to the Illustrated Atlas of the Dominion of Canada* (H. Belden and Company 1880). While notable structures such as schoolhouses, sawmills, post offices and other buildings are noted on these maps, only the subscribers to the atlases had their houses and names included on the relevant properties. Two structures of particular note are illustrated on the historic atlas maps within the limits of the study area (Figure 7). On the 1880 map of the Melancthon Township a church is located on Lot 295, Concession 2 South of Toronto-Sydenham Road. Additionally, a saw or grist mill is noted on the 1877 map of Amaranth Township, located on Lot 28, Concession 4. Other important structures such as halls, churches, and schools are illustrated on nearby lots.

Amaranth Township was famous in the late 19th century by the discovery of mastodon bones by John Jelly in 1887. It is not known for certain where Jelly found the bones as it is only known that he found the remains on one of his relatives' farms; unfortunately many relatives of Jelly lived in the area at this time on various lots (Mersten n.d.). The mastodon bones toured all over the country for several years, including a showing at the Shelburne Fair in 1889 (Plate 1). Unfortunately the bones were put into storage when Jelly took ill, and it is not known for certain what became of them, though rumours have persisted they eventually wound up at the Royal Ontario Museum (Mersten n.d.).

The original surveyor's notes and maps from the Melancthon Township survey of 1825 by Hugh Black give an overview of the vegetation present in the area prior to the Euro-Canadian occupation of the area (Black 1825). The forest cover noted along the concession and side roads running through the study area was almost exclusively maple, beech, and basswood, with the occasional notation of elm. This description is mirrored in Black's survey notes from Amaranth Township (Black 1822). A good description of the physiography specific to the historic land use of the study area is found in Sawden's *History of Dufferin County*:

> *The physical features…are…somewhat rolling and hilly, with deep ravines between the ridges. While in some of the hills there may be vast beds of gravel and sand (which is necessary for building purposes), the soil is fertile and well adapted to raising wheat, corn and other cereals. In pioneer days various kinds of wild fruits grew in abundance on the hills and in the shady valleys and now, since much of the wood has disappeared, the farmers grow their own cultivated fruits.*

Sawden 1952: 38

Agriculture continues to be considered a key component Dufferin County's economy (Dillon Consulting 2009).

The study area is located just west of the Town of Shelburne. Shelburne was settled in the 1860s, after William Jelly established the British Canadian Hotel in 1865. Shortly after the hotel was built a post office was established named Shelburne, after the Earl of Shelburne. In 1872 Jelly and his brother John ordered the survey of a village plot in anticipation of the arrival of the Toronto Grey and Bruce Railway. Rapid economic growth followed and the population increased from 70 in 1869 to 750 in 1877 (Town of Shelburne 2006). Plate 2 shows a view of the main street of Shelburne in 1899. Shelburne continued to expand into the 20th and 21st centuries as evidenced by the current project being undertaken for future groundwater well expansion to increase the water supply for the Town.

2.0 ANALYSIS AND CONCLUSIONS

2.1 Assessing Archaeological Potential

Archaeological potential is established by determining the likelihood that archaeological resources may be present on a subject property. In accordance with the Ministry of Tourism, Culture and Sport's 2011 *Standards and Guidelines for Consultant Archaeologists* the following are features or characteristics that indicate archaeological potential:

- Previously identified archaeological sites;
- Water sources:
  - Primary water sources (lakes, rivers, streams, creeks),
  - Secondary water sources (intermittent streams and creeks; springs; marshes; swamps),
  - Features indicating past water sources (e.g. glacial lake shorelines indicated by the presence of raised gravel, sand, or beach ridges; relic river or stream channels indicated by clear dip or swale in the topography; shorelines of drained lakes or marshes; and cobble beaches) ,
  - Accessible or inaccessible shoreline (e.g. high bluffs, swamps or marsh fields by the edge of a lake; sandbars stretching into marsh);
- Elevated topography (eskers, drumlins, large knolls, plateaux);
- Pockets of well drained sandy soil, especially near areas of heavy soil or rocky ground;
- Distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases (there may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings);
- Resource areas including:
  - Food or medicinal plants,
  - Scarce raw minerals (e.g. quartz, copper, ochre or outcrops of chert),
  - Early Euro-Canadian industry (fur trade, mining, logging);
- Areas of Euro-Canadian settlement;
- Early historical transportation routes.

In recommending a Stage 2 property survey based on determining archaeological potential for a study area, the Ministry of Tourism, Culture and Sport stipulates the following:

- No areas within 300 metres of a previously identified site; water sources; areas of early Euro-Canadian Settlement; or locations identified through local knowledge or informants can be recommended for exemption from further assessment;

- No areas within 100 metres of early transportation routes can be recommended for exemption from further assessment;
- No areas within the property containing an elevated topography; pockets of well-drained sandy soil; distinctive land formations; or resource areas can be recommended for exemption from further assessment.

2.2 Potential for Pre- and Post-contact Aboriginal Archaeological Sites

Archaeological potential is established by determining the likelihood that archaeological resources may be present within a study area. Archaeological potential criteria commonly used by the Ministry of Tourism, Culture and Sport (Government of Ontario 1997) were applied to determine areas of archaeological potential within the study area. These variables include: distance to various types of water sources, soil texture and drainage, glacial geomorphology, and the general topographic variability of the area.

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. Finally, extensive land disturbance can eradicate archaeological potential (Wilson and Horne 1995).

In archaeological potential modeling, a distance to water criterion of 300 metres is generally employed for primary water courses, including lakeshores, rivers and large creeks, as well as secondary water sources, including intermittent streams and creeks; springs; marshes; swamps. A substantial marsh area runs north-south through the central part of the study area (Figure 1). This marsh area drains in the Grand River watershed; the Grand River watershed and it major tributaries drain an area of over 6800 km2.

Soil texture can be an important determinant of past settlement, usually in combination with other factors such as topography. The predominant soil types within the study area are Honeywood Silt Loam, Bennington Fine Sand Loam and Parkhill Loam (Figure 2). As shown in Figure 2, a band of muck soil runs north-south through the central part of the study area. With respect to soil texture, Aboriginal groups preferred well drained lighter (sandy) soils to heavier soils. Portions of the study area that consist of soils that exhibit good natural drainage would have been suitable for pre-contact Aboriginal agricultural practices.

Although no archaeological sites have been registered within two kilometres of the study area, the absence of previously identified archaeological sites may not accurately reflect the archaeological potential of the area (Stantec 2005; TMHC 2007). Given the documentation of water sources within the study area and the presence of pockets of well-drained soil the potential for the recovery of pre- and post-contact Aboriginal archaeological resources was judged to be moderate. This potential is negated for areas within the study area that have been subject to previous disturbance or are poorly drained; however these areas would have to be confirmed during a field survey. Areas of archaeological potential are illustrated in Figure 8.

Due to the large size of the study area a detailed review of existing conditions was not conducted. The evaluation of archaeological potential presented in this report is primarily map based. As a result, areas described in this report as having archaeological potential may be found to have low potential during subsequent field surveys.

2.3 Potential for Historic Archaeological Sites

The criteria used by the Ministry of Tourism, Culture and Sport to determine potential for historic archaeological sites include the presence of: 1) particular, resource-specific features that would have attracted past subsistence or extractive uses; 2) areas of initial, non-Aboriginal settlement; 3) early historic transportation routes; and 4) properties designated under the Ontario Heritage Act (Government of Ontario 2011).

The study area was surveyed by Hugh Black in 1822 (Amaranth Township), by Black in 1825 ("Old Survey" of Melancthon Township), and by David Gibson in 1853 ("New Survey" of Melancthon Township). The original survey, known as the "old survey", of the first four concessions of Melancthon Township was made by Hugh Black in 1825 (Black 1825) but it was resurveyed in 1830 by Charles Rankin. The subsequent "new survey" was aligned to the Toronto-Syndenham Road, surveyed in 1848, which accounts for the unusual township configuration. Settlement of both townships became wide spread after the Toronto-Syndenham Road was surveyed.

The study area is located in close proximity of the study area to the Town of Shelburne and consists of parts of Amaranth and Melancthon Townships, both of which experiences wide spread settlement during the mid 19th century. Within the study area two community and commercial structures are illustrated on late 19th century historic maps. On the 1880 map of the Melancthon Township a church is located on Lot 295, Concession 2 South of Toronto-Sydenham Road. Additionally, a saw or grist mill is noted on the 1877 map of Amaranth Township, located on Lot 28, Concession 4. Other important structures such as halls, churches, and schools are illustrated on nearby lots. Given this the study area exhibits moderate potential for the recovery of historic cultural material. This potential is negated for areas within the study that have been subject to previous disturbance or are poorly drained. Areas of archaeological potential are illustrated in Figure 8.

3.0 RECOMMENDATIONS

Golder was retained by the Town of Shelburne to conduct a Stage 1 archaeological assessment to satisfy the requirements of a Class "B" Municipal Class Environmental Assessment governed by Ontario's *Environmental Assessment Act* as outlined in the *Municipal Class Environmental Assessment* guidance document (Municipal Engineers Association 2007).

The Stage 1 assessment has resulted in the determination that archaeological potential for the recovery of pre- and post-contact Aboriginal cultural material and Euro-Canadian historic cultural material exists within the study area. This potential is negated in areas within the site that have been impacted by previous disturbance or found to be poorly drained; these areas can be identified during a field survey. Any areas that have not been subject to previous disturbance retain their archaeological potential. **Stage 2 archaeological assessment is recommended for areas determined to have archaeological potential prior to ground disturbance activities.** These areas are illustrated in Figure 8.

The Ontario Ministry of Tourism, Culture and Sport is asked to review the results presented and to accept this report into the Ontario Public Register of Archaeological Reports. Additional archaeological assessment is still required; hence the archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48(1) of the *Ontario Heritage Act* and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence.

4.0 ADVICE ON COMPLIANCE WITH LEGISLATION

This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. 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 Tourism, Culture and Sport a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* 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 Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

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*. 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*.

The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

5.0 IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Golder has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the archaeological profession currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

This report has been prepared for the specific site, design objective, developments and purpose described to Golder by the Town of Shelburne. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the Client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's report or other work products.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project.

Special risks occur whenever archaeological investigations are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain archaeological resources. The sampling strategies incorporated in this study comply with those identified in the Ministry of Tourism, Culture and Sport's *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011).

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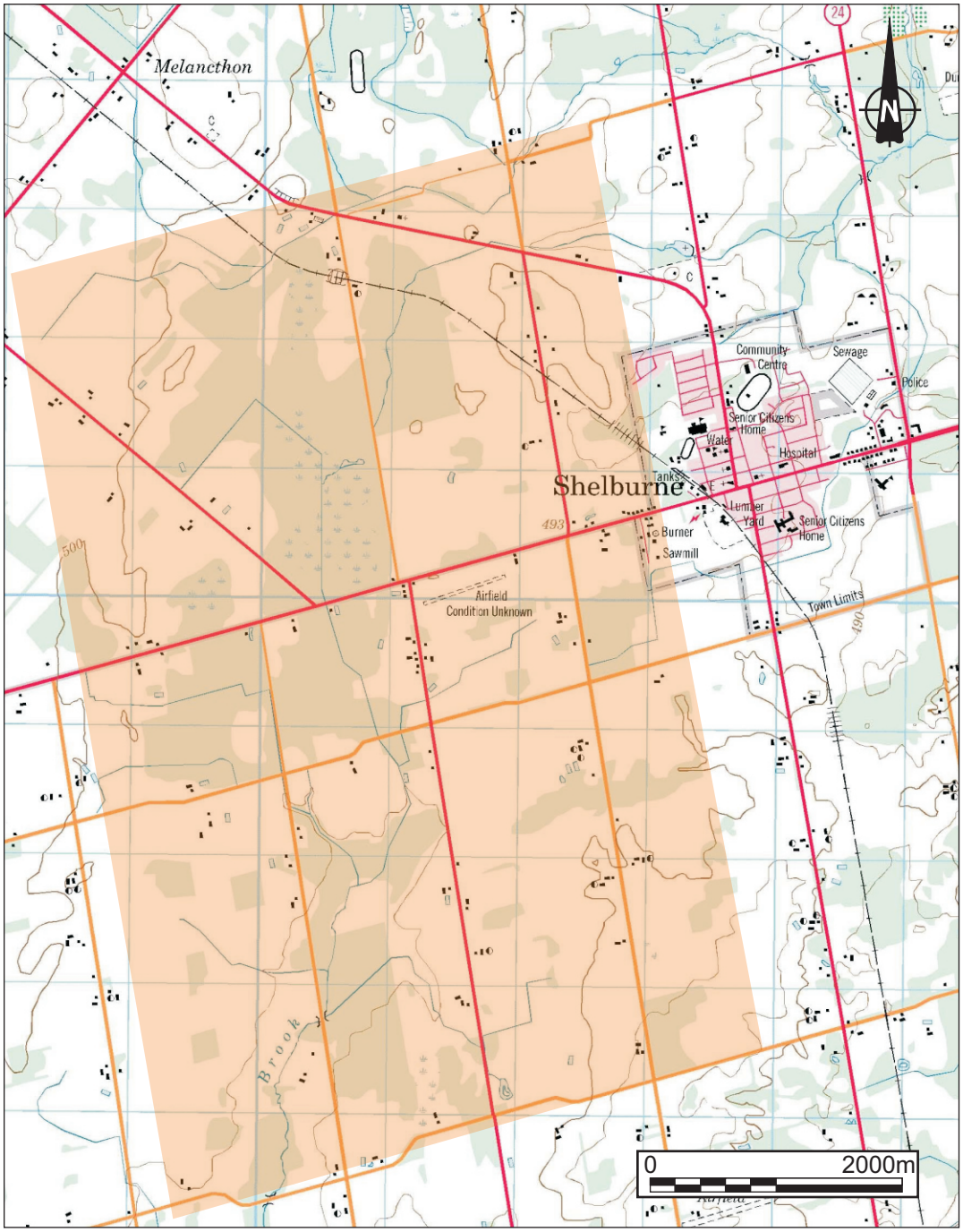
7.0 IMAGES

Image 1: The Amaranth Mastodon, Shelburne Fair, 1889 (Town of Shelburne)

Image 2: View of the main street of Shelburne facing east, 1899 (Town of Shelburne)

8.0 MAPS

All mapping will follow on succeeding pages.



LEGEND

Location of Study Area

REFERENCE

DRAWING BASED ON
Government of Canada
1999 *Topographic Map Sheet 41A/1: Dundalk* (Edition 5). Centre for Topographic Information, Natural Resources Canada, Ottawa.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

Stage 1 Archaeological Assessment
Town of Shelburne Additional Water Supply
Townships of Amaranth and Melancthon, ON

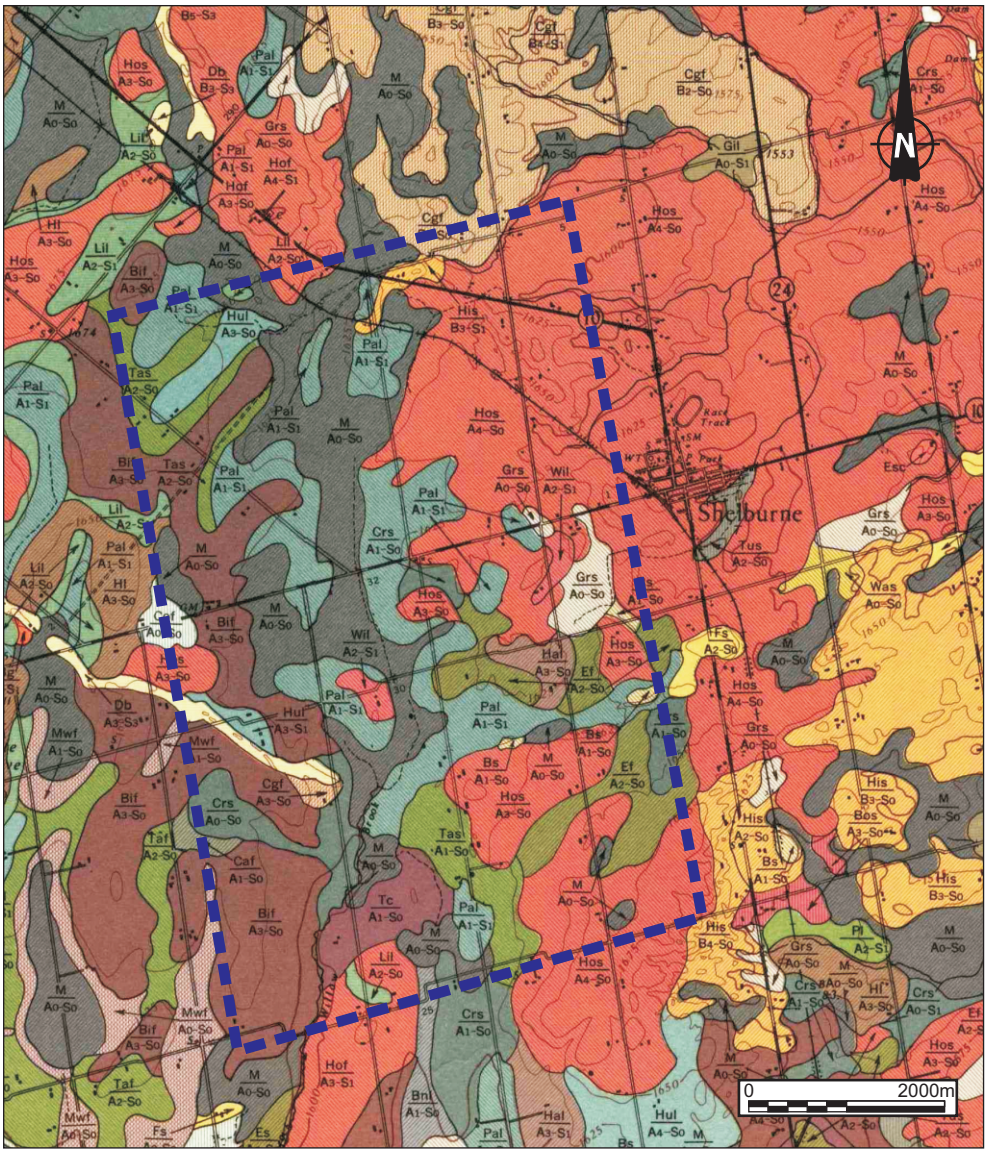
TITLE

Location of Study Area

Golder Associates

PROJECT No.		09-1112-6007-3000	FILE No.	0911126007-3000-R01001
			SCALE	1:50,000 REV.
CADD	JM	FEB 28/11		
CHECK				

FIGURE 1



LEGEND

Bif	Bennington Fine Sandy Loam	Crs	Crombie Silt Loam	Hos	Honeywood Silt Loam
Bs	Brady Sandy Loam	Db	Donnybrook Sandy Loam	Hul	Huron Loam
Caf	Camilla Fine Sandy Loam	Ef	Embro Fine Sandy Loam	M	Muck
Cgf	Caledon Fine Sandy Loam	Grs	Granby Sandy Loam	Pal	Parkhill Loam
Cof	Colwood Fine Sandy Loam	Hal	Harkaway Loam Till	Tas	Tavistock Silt Loam
	Location of Study Area	His	Hillsburgh Sandy Loam	Wil	Wiarton Loam

REFERENCE

DRAWING BASED ON
Hoffman, D.W., B.C. Matthews, and R.E. Wicklund
1964 *Soil Survey of Dufferin County, Ontario*. Report No. 38 of the Ontario Soil Survey. Research Branch, Canadian Department of Agriculture and the Ontario Agriculture College, Guelph.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

Stage 1 Archaeological Assessment
Town of Shelburne Additional Water Supply
Townships of Amaranth and Melancthon, ON

TITLE

Soils of the Study Area

Golder Associates

PROJECT No.		09-1112-6007-3000	FILE No.	0911126007-3000-R01002
			SCALE	AS SHOWN REV.
CADD	JLD	Nov. 1/11		
CHECK			**FIGURE 2**	

LEGEND

Treaty Boundary

Treaty No. 381, Volume 3 (May 9th, 1781): Mississauga and Chippewa
Crawford's Purchase (Oct. 9th, 1783): Algonquin and Iroquois
Crawford's Purchase (Oct. 9th, 1783): Mississauga
Crawford's Purchases (1784, 1787, 1788): Mississauga
John Collins' Purchase (1785): Chippewa
Treaty No. 2 (May 19th, 1790): Odawa, Chippewa, Pottawatomi, and Huron
Treaty No. 3 (Dec. 2nd, 1792): Mississauga
Haldimand Tract: from the Crown to the Mohawk (1793)
Tyendinaga: from the Crown to the Mohawk (1793)
Treaty No. 3¾ (Oct. 24th, 1795): from the Crown to Joseph Brant
Treaty No. 5 (May 22nd, 1798): Chippewa
Treaty No. 6 (Sep. 7th, 1796): Chippewa
Treaty No. 7 (Sep. 7th, 1796): Chippewa
Treaty No. 13 (Aug. 1st, 1805): Mississauga
Treaty No. 13A (Aug. 2nd, 1805): Mississauga
Treaty No. 16 (Nov. 18th, 1815): Chippewa
Treaty No. 18 (Oct. 17th, 1818): Chippewa
Treaty No. 19 (Oct. 28th, 1818): Chippewa
Treaty No. 20 (Nov. 5th, 1818): Chippewa
Treaty No. 21 (Mar. 9th, 1819): Chippewa
Treaty No. 27 (May 31st, 1819): Mississauga
Treaty No. 27½ (Apr. 25th, 1825): Ojibwa and Chippewa
Treaty No. 35 (Aug. 13th, 1833): Wyandot or Huron
Treaty No. 45 (Aug. 9th, 1836): Chippewa and Odawa
Treaty No. 45½ (Aug. 9th, 1836): Saugeen
Treaty No. 57 (Jun. 1st, 1847): Iroquois of St. Regis
Treaty No. 61, Robinson Treaty (Sep. 9th, 1850): Ojibwa
Treaty No. 72 (Oct. 30th, 1854): Chippewa
Treaty No. 82 (Feb. 9th, 1857): Chippewa
Williams Treaty (Oct. 31st and Nov. 15th, 1923): Chippewa and Mississauga
Williams Treaty (Oct. 31st, 1923): Chippewa

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.
ALL LOCATIONS ARE APPROXIMATE.

REFERENCE

1. Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
2. Treaty Boundary - Approximate Treaty Boundary was created by Golder Associates Ltd. Jan. 2009.
MORRIS, J.L. 1943. Indians Of Ontario. Reprinted 1964. Department Of Lands And Forests, Toronto.
Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2008

PROJECT

Stage 1 Archaeological Assessment Town of Shelburne Additional Water Supply ownships of Amaranth and Melancthon, ON

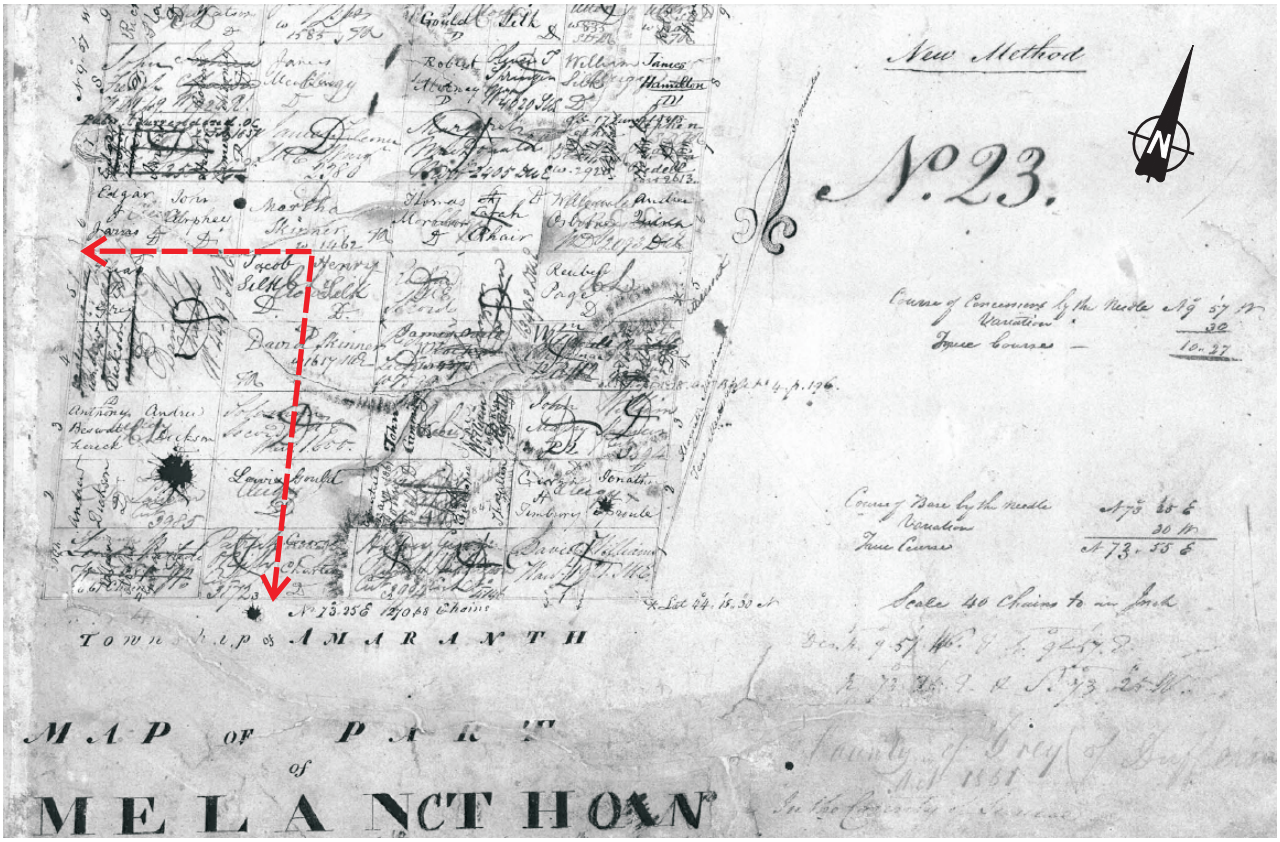
TITLE

Treaty Boundaries Based on Morris 1943

Golder Associates

PROJECT No.		09-1112-6007	FILE No.	0911126007-3000-R01003
GIS	JMC	Jan. 23/09	SCALE	1:2,500,000 REV.
CADD	JLD	Nov 4/11		
CHECK				

Figure 3



LEGEND

Location of Study Area

REFERENCE

DRAWING BASED ON *Map of Part of Melancthon*.
Surveyed by Hugh Black, Deputy Surveyor, 24th August 1825

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

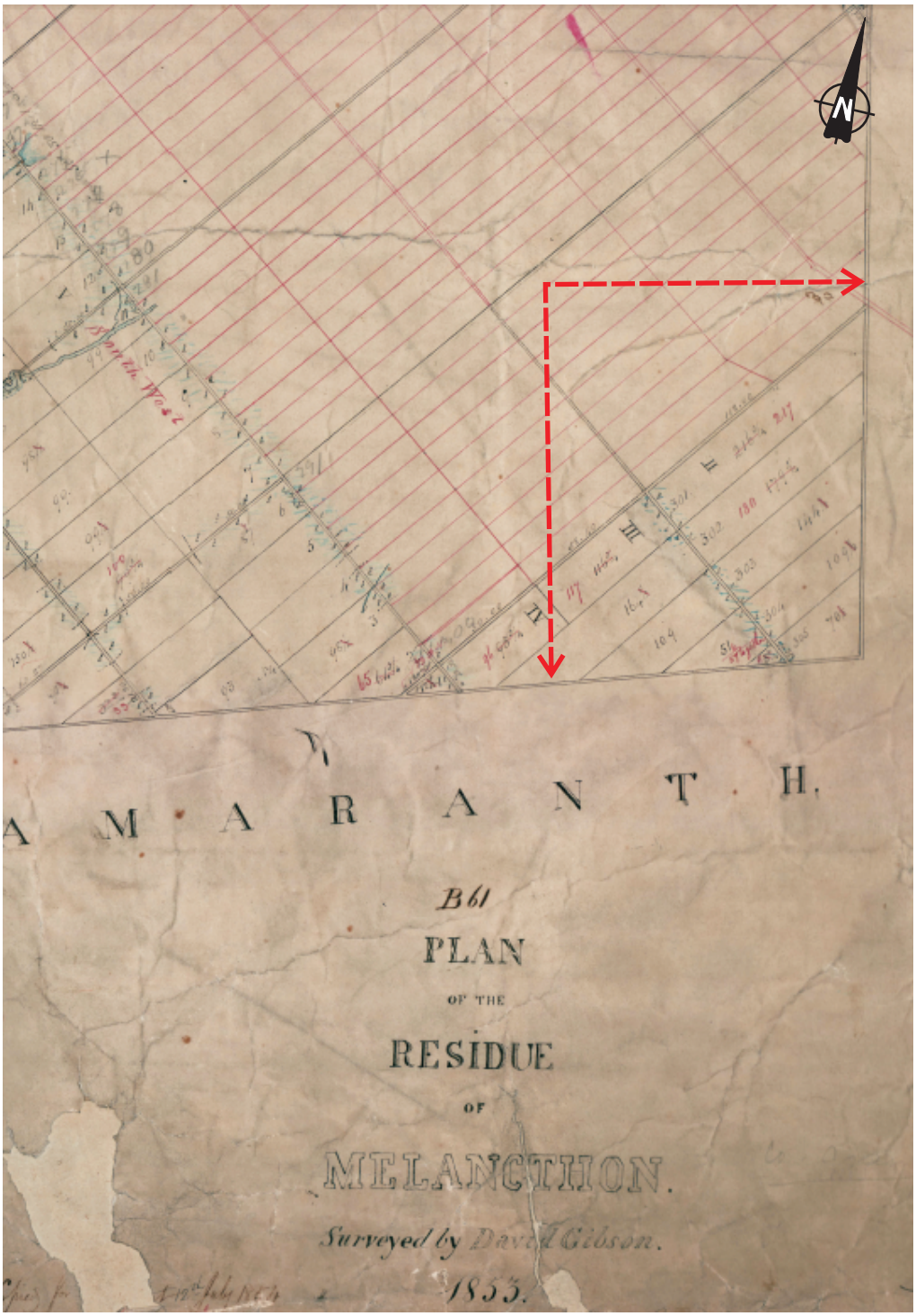
Stage 1 Archaeological Assessment
Town of Shelburne Additional Water Supply
Townships of Amaranth and Melancthon, ON

TITLE

A Portion of Hugh Black's 1825 'Old Survey' Map of Melancthon Township

Golder Associates

PROJECT No.		09-1112-6007-3000	FILE No.	0911126007-3000-R01004
			SCALE	N/A REV.
CADD	JLD	Nov 4/11	**FIGURE 4**	
CHECK				



LEGEND

Location of Study Area

REFERENCE

DRAWING BASED ON *Plan of the Residue of Melancthon*. Surveyed by David Gibson, 1853

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

Stage 1 Archaeological Assessment
Town of Shelburne Additional Water Supply
Townships of Amaranth and Melancthon, ON

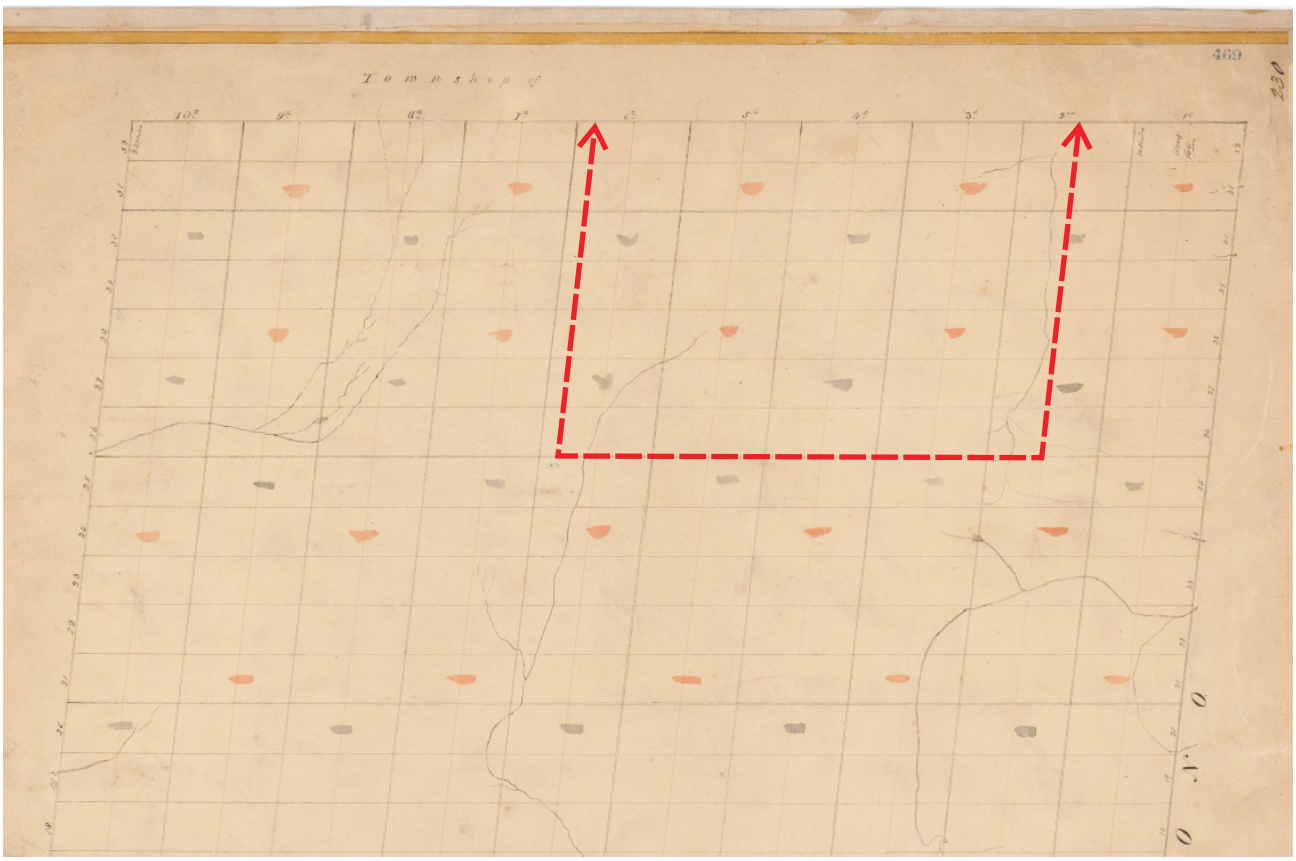
TITLE

A Portion of David Gibson's 1853 'New Survey' Map of Melancthon Township

Golder Associates

PROJECT No.		09-1112-6007-3000	FILE No.	0911126007-3000-R01005
			SCALE	N/A REV.
CADD	JLD	Nov 4/11		
CHECK				

FIGURE 5



LEGEND

Location of Study Area

REFERENCE

DRAWING BASED ON *Map of the Township of Amaranth*.
Surveyed by Hugh Black, Deputy Surveyor, 1823

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

Stage 1 Archaeological Assessment
Town of Shelburne Additional Water Supply
Townships of Amaranth and Melancthon, ON

TITLE

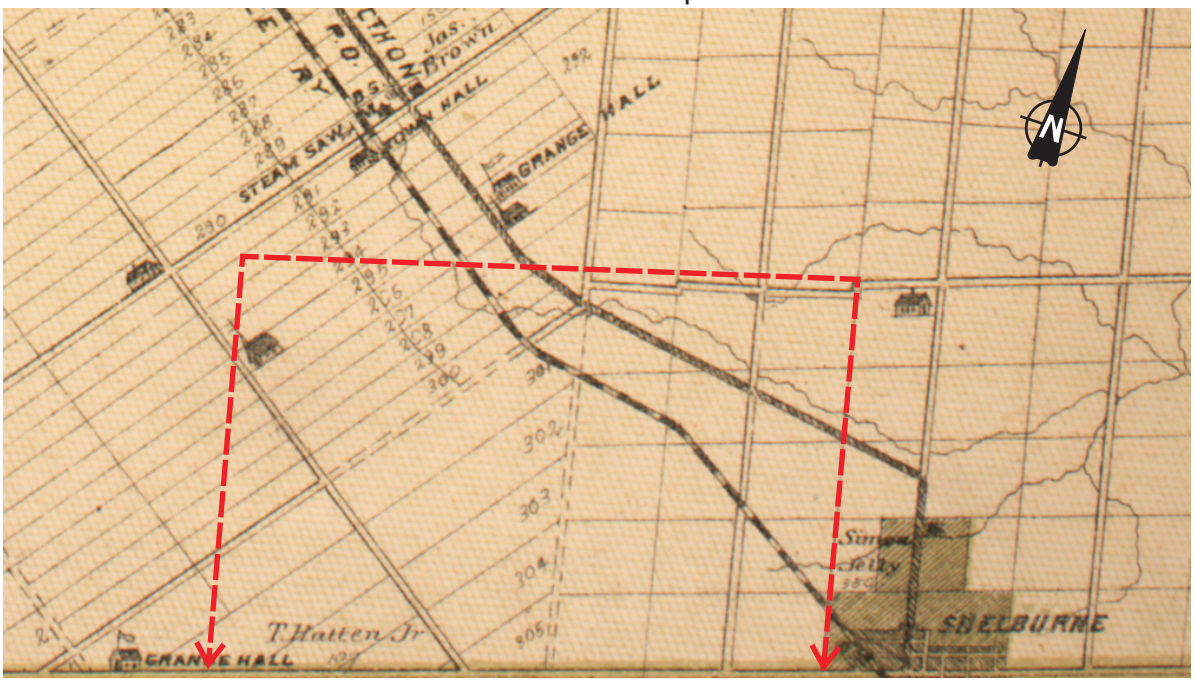
A Portion of Hugh Blacks's 1823 Survey Map of Amaranth Township

Golder Associates

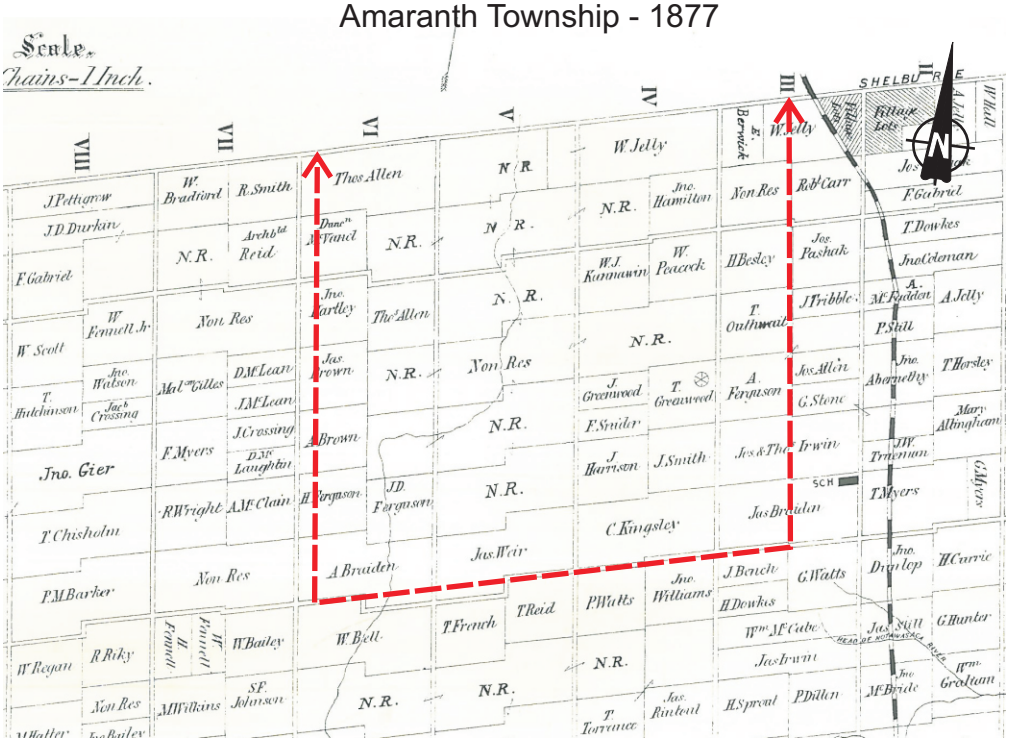
PROJECT No.		09-1112-6007-3000	FILE No.	0911126007-3000-R01006
			SCALE	N/A REV.
CADD	JLD	Nov 4/11		
CHECK				

FIGURE 6

Melancthon Township - 1880



Amaranth Township - 1877



LEGEND

Location of Study Area

REFERENCE

DRAWING BASED ON THE 1877 ILLUSTRATED HISTORICAL ATLASOF THE COUNTY OF WELLINGTON AND THE 1880 GREY COUNTY SUPPLEMENT TO THE ILLUSTRATED ATLAS OF THE DOMINION OF CANADA

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

Stage 1 Archaeological Assessment
Town of Shelburne Additional Water Supply
Townships of Amaranth and Melancthon, ON

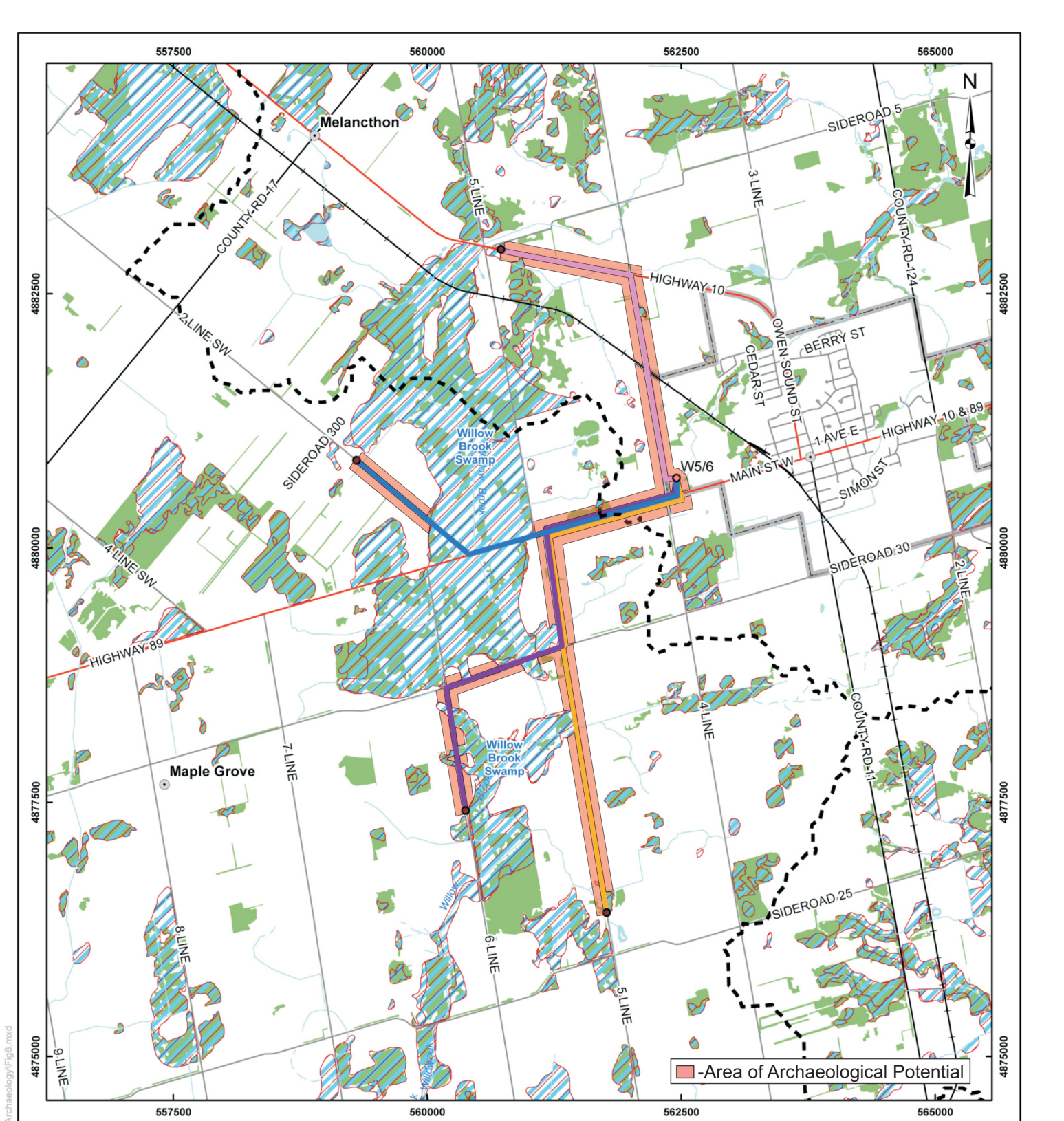
TITLE

Portions of the 1880 Map of Melancthon Township and the 1877 Map of Amaranth Township

Golder Associates

PROJECT No.		09-1112-6007-3000	FILE No.	0911126007-3000-R01007
			SCALE	N/A REV.
CADD	JLD	Nov 3/11		
CHECK				

FIGURE 7



LEGEND

- Potential Municipal Well Site
- Well House
- City / Town
- Railways
- Utility Line
- Highway
- Major Road
- Local Road
- Watercourse, Permanent
- Watercourse, Intermittent
- Alternative Watermain 4a
- Alternative Watermain 4b
- Alternative Watermain 4c
- Alternative Watermain 4d
- Waterbody
- LIO Wetland
- Town Boundary
- Wooded Areas
- Watershed Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2008.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

500 250 0 500 1,000 1,500
SCALE 1:50,000 METRES

PROJECT
STAGE 1 ARCHAEOLOGICAL ASSESSMENT
TOWN OF SHELBURNE
ADDITIONAL WATER SUPPLY PROJECT

TITLE
ARCHAEOLOGICAL POTENTIAL

Golder Associates
Mississauga, Ontario

PROJECT NO. 09-1112-6007			SCALE AS SHOWN	REV. 0.0
DESIGN	RPM	17 Feb. 2011		
GIS	BC	17 Oct. 2011		
CHECK	AE	17 Oct. 2011		
REVIEW				

FIGURE: 8

G:\Projects\2009\09-1112-6007_Shelburne\GIS\MXDs\Draft\Archaeology\Fig8.mxd

Report Signature Page

GOLDER ASSOCIATES LTD.

Jamie Davidson, B.A.
Project Archaeologist

Carla Parslow, Ph.D.
Senior Archaeologist

JD/CAP/gf

\\golder.gds\gal\mississauga\active\2009\1112\09-1112-6007 town of shelburne - hydrogeological assessment\3000 class ea\draft\archaeology\draft report\formatted\0911126007-3000-r01 nov 4 11 - (finalised) st 1 arch town of shelburne.docx

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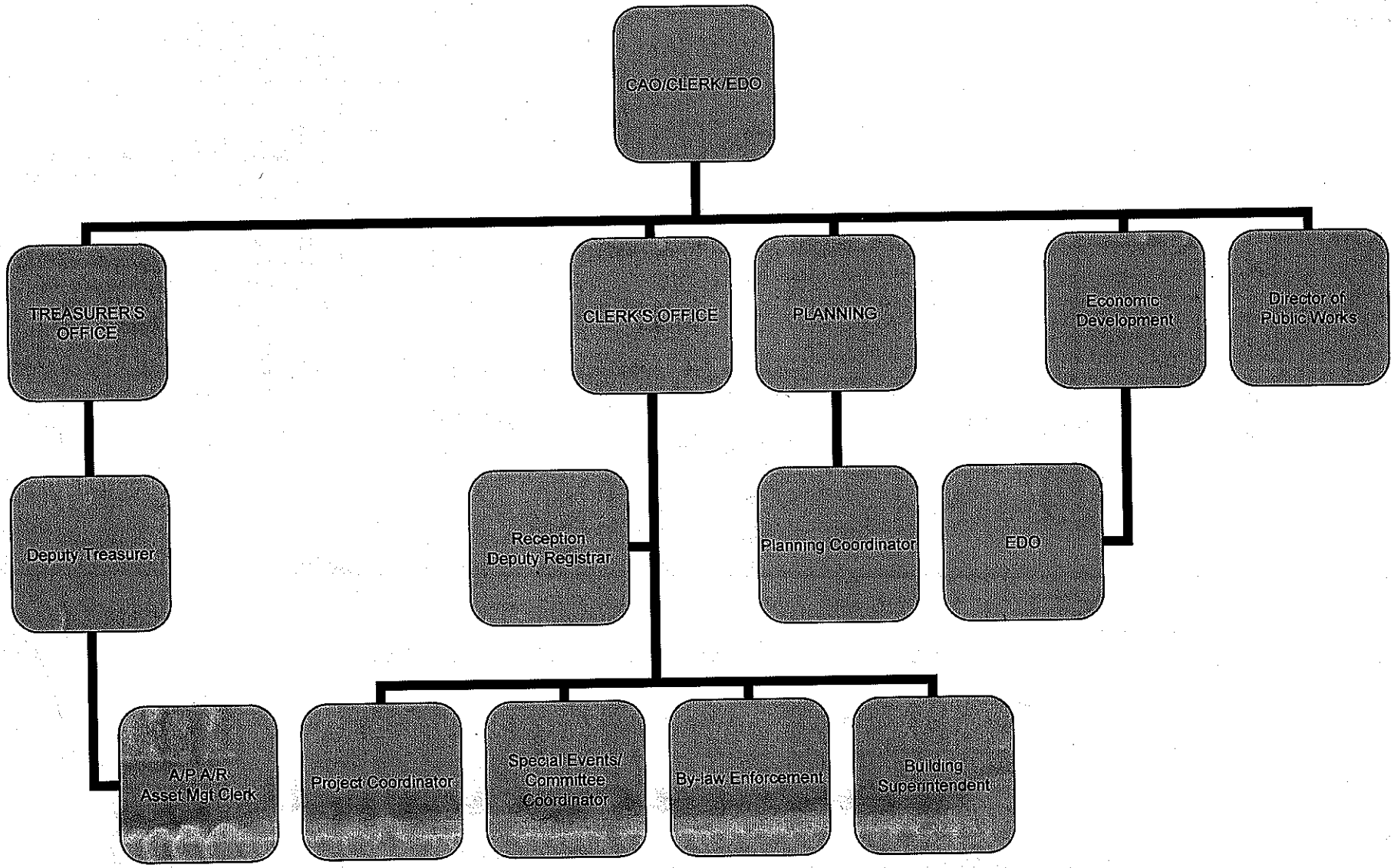
Golder Associates

APPENDIX E

Town of Shelburne Administrative Structure and Responsibilities

ADMINISTRATION STRUCTURE



The Corporation of
THE TOWN OF SHELBURNE
Municipal Offices:
203 Main Street East, Shelburne, Ont. L0N 1S0 - Telephone: (519) 925-2600 - Fax (519) 925-6134
e-mail: shelburne@townofshelburne.on.ca

Administration Structure and Responsibilities of the Town of Shelburne

The attached chart defines the organizational structure implemented within the Administration of the Town of Shelburne by the Town Council.

For the purpose of simplicity and clarity, the CAO/Clerk implements the decisions and policies as approved by the Town Council. It is the role of the CAO/Clerk to oversee the departmental heads and support staff to complete all essential services and projects as directed by Council to the CAO/Clerk.

For the purpose of this project and the grant supporting the project, the key areas that are involved in the project include as follows:

All hiring of consultants and drilling companies report to the CAO/Clerk and are administered on a day to day basis by the Project Coordinator. All parties are to follow Health and Safety policies as developed and implemented by the Town. All insurance requirements described in the individual RFP processes must be adhered to and sufficient to meet liability requirements. In addition, the Town provides a blanket notice of the commencement of the project to the Town's insurer.

Meetings are coordinated by the Town to ensure that all exploratory for potential sites, EA study processes and reporting to all agencies are both legislatively correct and in line with corporate policy to all departments affected by the water project. In this project, our Planner, Director of Public Works, Town Engineer, Project Consultants (Golder and Assoc), Project Manager (Bill Banks) work and report both by meetings and conference calls to all mentioned above and the CAO/Clerk. Periodically, the group will make presentation to the Town Council and also representation will meet with Federal and Provincial counterparts to discuss and update on the project.

I trust this gives an overview of the Process and Procedures required by the Town of Shelburne

Dated 10th January 2013 at the Town of Shelburne

John Telfer AMCT

CAO/Clerk