S. BURNETT & ASSOCIATES LIMITED
ENGINEERING & ENVIRONMENTAL

Appendix A

Wastewater Allocations and Reserves

TOWN OF SHELBURNE

WASTEWATER TREATMENT CALCULATION OF REMAINING SERVICING CAPACITY, CURRERNT ALLOCATIONS AND DEMANDS

Last Updated: 2022-03-09

						Flow Est. (m^3/day)	**Total Wastewater (m^3/day)**
Avg. Rated Wastewater Treatment Plant Capacity							**3420**
Subtract 3-Year Average Day Flow						2667	
Remaining Wastewater Capacity							**753**
Contingencies:							
Same Year Occupancies		148	Residential Units			117	
Existing Dwellings on Private Septic Systems		66	Residential Units			56	
Existing ICI on Private Septic Systems		0.08	ha of Gross Floor Area			2	
Stablization of Flows						150	
Total Contingencies						**325**	
Net Remaining Capacity After Contingencies							**428**

Service Allocated (Committed): - see Note 1	**Residential**			**ICI**		**Total Res. & ICI Flow Est. (m^3/day)**
	Residential Units	**Population Estimate**	**Flow Est. (m^3/day)**	**Gross Floor Area (ha)**	**Flow Est. (m^3/day)**	
STAGE 1 AREA	75	199	50	0.00	0	50
STAGE 2 AREA	73	223	56	1.56	89	145
STAGE 3 AREA	257	858	214	0.00	0	214
Total Allocated	405	1280	320	1.56	89	**409**
Net Remaining Capacity After Allocations						**19**
	18	Residential Units	AND	0.14	Ha of ICI Gross Floor Area	
Demands (Uncommittted): - see Notes 1, 2						
STAGE 1 AREA	86	158	39	1.77	150	189
STAGE 2 AREA	303	975	244	6.15	140	384
STAGE 3 AREA	59	164	41	0.00	0	41
STAGE 4/EXPANSION AREA	93	146	37	0.73	20	57
Total Demand	541	1443	361	8.65	310	**671**
Net Remaining Capacity After Demands						**-652**

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Appendix B

Environmental Compliance Approval #6413-ABLQQS

Content Copy Of Original

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 6413-ABLQQS
Issue Date: July 19, 2016

The Corporation of the Town of Shelburne
203 Main St East
Shelburne, Ontario
L9V 3K7

Site Location: Shelburne Wastewater Treatment Plant
300 Centennial Road
Shelburne Town, County Of Dufferin
L0N 1S4

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

municipal sewage works for the collection, transmission, treatment and disposal of sewage, having a Rated Capacity of 3,420 m 3 /d, as follows:

Proposed Works

Filtration

- two (2) cloth-filter treatment units (one standby) each having a Peak Flow Rate of 558 m 3 /h via one (1) 450 mm diameter inlet piping to a splitter box, 250 mm process pipings to the units and overflow over a weir;

Standby Power

- one (1) 650 kW standby power diesel generator and 9000 L diesel tank with double-walled containment;

Previous Works

Trunk Sanitary Sewers

- 82 m of 750 mm diameter, 594 m of 600 mm diameter and 14.5 m of 300 mm diameter trunk sanitary sewers complete with emergency overflow to adjacent creek and all necessary manholes, appurtenances and inter-connections to the sanitary collection system, commencing at a point approximately 100 m south and 13 m west of the intersection of Ella Street and Highway Nos. 10 and 89 following an easement 60 m east and then north across Highway Nos. 10 and 89 and then generally along the creek bank to a point approximately 40 m south, 15 m west of the pumping station then due north to the centre of Centennial Street (unopened extension) and then north and west 82 m to the Inlet Works at the sewage treatment plant;

Hauled Sewage Receiving Station

- one (1) hauled sewage transfer tank with a capacity of 24,000 L, located adjacent to the inlet works building;

Inlet Works

- one (1) automatic mechanical bar screen having a Peak Flow Rate of 13,000 m 3 /d, one (1) manually cleaned bar racks for emergency or maintenance bypass and one (1) bypass channel overflow weir;
- one (1) 7.50 m x 2.93 m x 5.40 m benched wet well equipped with two (2) submersible pumps, each with VFD and rated at 34.4 to 103.3 L/s at 10.2 to 12.0 m TDH;
- one (1) wet weather flow pump rated at 81.0 L/s, 8.53 m TDH, discharging to the wet weather flow holding ponds;
- one (1) additional wet weather flow pump rated at 152 L/s, 16 m TDH., discharging through the storm forcemain to the wet weather flow holding ponds;
- one (1) 2.1 m diameter vortex grit separator having a Peak Flow Rate of 9,504 m 3 /d and a grit classifier;
- three (3) 5.7 m x 0.6 x 1.0 m SWD grit channels having a Peak Flow Rate of 9,130 m 3 /d for back up to the vortex grit separator;

Wet Weather Flow Holding Ponds

- one (1) 19,900 m 3 Wet Weather Flow Holding Pond A and one (1) 16,800 m 3 Wet Weather Flow Holding Pond B, to be used under emergency situations for temporary storage of wet weather flow to be returned later to the Inlet Works for further treatment;

Aeration Tanks

- two (2) 40 m x 10 m x 4.6 m SWD aeration tanks, each with two longitudinal cells with the inlet pipes to distribute flows into each cell of each tank, equipped with fine bubble diffused aeration system and two (2) centrifugal air blowers (one duty and one standby), rated at 500 L/s and 250 L/s respectively;

Secondary Clarifiers

- one (1) 14.0 m diameter x 2.8 m SWD secondary clarifiers equipped with sludge and scum removal mechanisms and cold weather cover;
- one (1) 14.0 m diameter x 3.65 m SWD secondary clarifiers equipped with sludge and scum removal mechanisms and cold weather cover;

Clarifier Effluent Pump System

- two (2) 2.9 m x 2.1 m x 2.0 m SWD clarified effluent tanks;
- three (3) VFD controlled dry pit filter feed pumps each rated at 17.2 to 51.7 L/s at 9.9 to 11.3 m T.D.H. discharging to either the filters or to the wet weather flow holding ponds;

Filtration

- one (1) 3.43 m x 8.91 m x 3.96 m four compartment dual media gravity filter, complete with air scour and self-contained backwash storage tank, scour air supplied by one (1) air blower providing 188 L/s at 27.5 kPa, discharging to the UV disinfection channel; (to be decommissioned upon completion of Proposed Works)

Ultraviolet (UV) Disinfection

- a 8.0 m x 0.61 m x 1.067 m deep channel equipped with a low pressure mercury vapour ultraviolet irradiation lamp system having a Peak Flow Rate of 8,921 m 3 /d and with a weighted lever gate on the outlet to the Parshall flume to maintain the liquid level in the channel at a depth of 460 mm;

Outfall Sewer

- approximately 60 m of 450 mm x 740 mm effluent outfall pipe discharging from the Parshall flume to a minor tributary of Boyne River;

Activated Sludge Pumping System

- three (3) VFD controlled sludge pumps, each rated at 8.6 to 34.4 L/s at 3.2 to 7.6 m T.D.H., complete with valving and piping to permit withdrawal from either the secondary clarifier sludge sump or the scum hopper and returning to either the aeration tanks or to wasting to the sludge digesters;

Phosphorus Removal

- one (1) 24.1 m 3 capacity chemical storage tank and four (4) chemical metering pumps (two with capacity of 23 L/h to the secondary clarifiers and two with capacity of 108 L/h to the tertiary filters) for phosphorus removal;

Sludge Digestion

- a two stage aerobic sludge digestion system with one (1) 450 m 3 stage 1 digester and one (1) 170 m 3 stage 2 digester, both equipped with coarse bubble aeration system and supernatant decanting facility;
- two (2) air blowers (one standby shared with the aeration tanks) rated at 1,800 m 3 /h supplying air to the digesters;
- two (2) replacement digested sludge transfer pumps (one standby) each rated at 20 L/s at 19 m TDH;

Biosolids Storage Tank

- one (1) 4,300 m 3 biosolids storage tank with mixing nozzles and two (2) mixing pumps;

Effluent Flow Measurement

- one (1) 305 mm Parshall flume measuring quantity of effluent discharged from the plant located downstream of the UV disinfection system;

Standby Power

- one (1) 750 kW diesel generator set; (to be decommissioned and replaced by Proposed Works)

including all other controls, electrical equipment, instrumentation, piping, pumps, valves and appurtenances essential for the proper operation of the aforementioned sewage works,

all in accordance with the submitted supporting documents listed in Schedule A.

For the purpose of this environmental compliance approval, the following definitions apply:

"Approval" means this entire document and any schedules attached to it, and the application;

"Average Daily Flow" means the cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year;

"BOD5" (also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand;

"By-pass" means diversion of sewage around one or more unit processes within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final Effluent sampling location, and discharging to the environment through the Sewage Treatment Plant outfall;

"CBOD5" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

"Daily Concentration" means the concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required;

"Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

"EPA" means the *Environmental Protection Act , R.S.O. 1990, c.E.19* , as amended;

" *E. coli* " refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius;

"Emergency Situation" means a structural, mechanical or electrical failure that causes a temporary reduction in the capacity of the Sewage Treatment Plant or an unforeseen flow condition that may result in:

a) danger to the health or safety of any person; or,
b) injury or damage to any property, or serious risk of injury or damage to any property; or
c) treatment process biomass washout.

"Equivalent Equipment" means a substituted equipment or like-for-like equipment that meets the required quality and performance standards of a named equipment;

"Event" means an action or occurrence, at a given location within the Sewage Treatment Plant that causes a Plant Bypass or Plant Overflow. An Event ends when there is no recurrence of a Bypass or Overflow in the 12-hour period following the last Bypass or Overflow. Two Events are separated by at least 12 hours during which there has been no recurrence of a Bypass or Overflow;

"Final Effluent" means sewage discharge via the Sewage Treatment Plant outfall after undergoing the full train of unit processes as listed in the Approval;

"Geometric Mean Density" is the nth root of the product of multiplication of the results of n number of samples over the period specified;

"Limited Operational Flexibility" (LOF) means any modifications that the Owner is permitted to make to the Works under this Approval;

"Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

"Monthly Average Concentration" means the arithmetic mean of all Daily Concentrations of a

contaminant in the effluent sampled or measured, or both, during a calendar month;

"Monthly Average Daily Flow" means the cumulative total sewage flow to the sewage works during a calendar month divided by the number of days during which sewage was flowing to the sewage works that month;

"Monthly Average Loading" means the value obtained by multiplying the Monthly Average Concentration of a contaminant by the Monthly Average Daily Flow over the same calendar month:

"Notice of Modifications" means the form entitled "Notice of Modifications to Sewage Works";

"Owner" means The Corporation of the Town of Shelburne and its successors and assignees;

"OWRA" means the *Ontario Water Resources Act , R.S.O. 1990, c. O.40* , as amended;

"Peak Flow Rate" means the maximum rate of sewage flow for which the plant or process unit was designed;

"Plant Overflow" means a discharge to the environment from the Sewage Treatment Plant at a location other than the plant outfall or into the plant outfall downstream of the Final Effluent sampling location;

"Previous Works" means those portions of the sewage works previously constructed and approved under an Approval;

"Proposed Works" means the sewage works described in the Owner’s application, this Approval, to the extent approved by this Approval;

"Rated Capacity" means the Average Daily Flow for which the Works are approved to handle;

"Regional Water Compliance Manager" means the Regional Water Compliance Manager of the West - Central Region of the Ministry;

"Sewage Treatment Plant" means the entire sewage treatment and effluent discharge facility;

"Substantial Completion" has the same meaning as "substantial performance" in the *Construction Lien Act* ;

"Water Supervisor" means the Water Supervisor for the Guelph, Hamilton, and Niagara offices of the Ministry; and

"Works" means the sewage works described in the Owner's application, and this Approval, and includes Proposed Works, Previous Works, and modifications made under Limited Operational Flexibility.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures

to ensure any such person complies with the same.

(2) Except as otherwise provided by these conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.

(3) Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the Conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.

(4) Where there is a conflict between the documents listed in the Schedule A, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

(5) The Conditions of this Approval are severable. If any Condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

2. EXPIRY OF APPROVAL

This Approval will cease to apply to those parts of the Works which have not been constructed within five (5) years of the date of this Approval.

3. CHANGE OF OWNER

(1) The Owner shall notify the Water Supervisor and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of Owner;

(b) change of address of the Owner;

(c) change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act , R.S.O. 1990, c.B17* shall be included in the notification to the Water Supervisor;

(d) change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act , R.S.O. 1990, c. C39* shall be included in the notification to the Water Supervisor;

(2) In the event of any change in ownership of the Works, other than a change to a successor municipality, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the Water Supervisor and the Director.

4. UPON THE SUBSTANTIAL COMPLETION OF THE WORKS

(1) Upon the Substantial Completion of the Works, the Owner shall prepare a statement, certified by a Professional Engineer, that the Works are constructed in accordance with this Approval, and upon request, shall make the written statement available for inspection by Ministry personnel.

(2) Within six (6) months of the Substantial Completion of the Proposed Works, a set of as-built drawings showing the works “as constructed” shall be prepared. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be retained at the Works for the operational life of the Works.

5. BY-PASSES

(1) Any By-pass or Plant Overflow is prohibited, except:

(a) in an Emergency Situation;

(b) where the By-pass / Plant Overflow is a direct and unavoidable result of a planned maintenance procedure, the Owner notified the Water Supervisor 15 days prior to the By-pass and the Water Supervisor has given written consent of the By-pass; and

(c) where the By-pass / Plant Overflow is planned for research or training purposes, the discharger notified the Water Supervisor 15 days prior to the By-pass / Plant Overflow and the Water Supervisor has given written consent of the By-pass / Plant Overflow.

(2) The Owner shall forthwith notify the Spills Action Centre (SAC) and the Medical Officer of Health of all By-pass and Plant Overflow Events. This notice shall include, at a minimum, the following information:

(a) the date, time, and duration of the Event;

(b) the location of the Event;

(c) the measured or estimated volume of the Event (unless the Event is ongoing);

(d) the reason for the Event; and

(e) the level of treatment the By-pass(es) and/or Plant Overflow(s) received and disinfection status of same.

(3) The Owner shall submit By-pass and Plant Overflow Event Reports to the Ministry's local office on a quarterly basis, no later than each of the following dates for each calendar year: February 14, May 15, August 14, and November 15. Event Reports shall be in an electronic format specified by the Ministry. In each Event Report the Owner shall include, at a minimum, the following information on any Events that occurred during the preceding quarter:

(a) the date of the Event(s);

(b) the measured or estimated volume of the Event(s);

(c) the duration of the Event(s);

(d) the location of the Event(s);

(e) the reason for the Event(s); and

(f) the level of treatment the By-pass(es) and/or Plant Overflow(s) received and disinfection status of same .

(4) The Owner shall use best efforts to collect a representative sample consisting of a minimum of two (2) grab samples of the By-pass / Plant Overflow and have it analyzed for parameters outlined in the Effluent Limits Condition using the protocols specified in the Monitoring and Recording Condition, one at the beginning of the Event and the second approximately near the end of the Event, to best reflect the effluent quality of such By-pass or Plant Overflow.

(5) The Owner shall maintain a logbook of all Plant By-passes and Plant Overflows, which shall contain, at a minimum, the types of information set out in subsection 2 (a) to 2(e) in respect of each By-pass and Plant Overflow.

6. EFFLUENT OBJECTIVES

(1) The Owner shall use best efforts to design, construct and operate the Works with the objective that the concentrations of the materials named below as effluent parameters are not exceeded in the effluent from the Works.

Table 1 - Effluent Objectives

Effluent Parameter	**Concentration Objective** (milligrams per litre unless otherwise indicated)
CBOD5	4.0
Total Suspended Solids	4.0
Total Phosphorus	0.12
Total Ammonia Nitrogen	0.5 (June 1 - Sept 30) 2.0 (Oct 1 - May 31)

(2) The Owner shall use best efforts to:

(a) operate and maintain the Works such that the pH of the effluent from the Works within the range of 6.5 to 8.5, inclusive, at all times;

(b) operate and maintain the Works such that the effluent is continuously disinfected year-round so that the monthly Geometric Mean Density of *E.coli* does not exceed 150 organisms per 100 millilitres of effluent discharged from the Works;

(c) operate the works within the Rated Capacity of the Works;

(d) ensure that the effluent from the Works is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters.

(3) The Owner shall include in all reports submitted in accordance with Reporting Condition a summary of the efforts made and results achieved under this Condition.

7. EFFLUENT LIMITS

(1) The Owner shall operate and maintain the Works such that the concentrations and waste loadings of the materials named below as effluent parameters are not exceeded in the effluent from the Works.

Table 2 - Effluent Limits		
Effluent Parameter	**Average Concentration** (milligrams per litre unless otherwise indicated)	**Average Waste Loading** (kilograms per day unless otherwise indicated)
Column 1	Column 2	Column 3
CBOD5	5.0	17.1
Total Suspended Solids	5.0	17.1
Total Phosphorus	0.25	0.86
Total Ammonia Nitrogen	0.8 (Jun 1 - Sep 30) 2.4 (Oct 1 - May 31)	2.7 (Jun 1 - Sep 30) 8.2 (Oct 1 - May 31)

(2) For the purposes of determining compliance with and enforcing subsection (1):

(a) The Monthly Average Concentration of a parameter named in Column 1 shall not exceed the corresponding maximum concentration set out in Column 2 of Table 2.

(b) The Monthly Average Loading of a parameter named in Column 1 shall not exceed the corresponding maximum waste loading set out in Column 3 of Table 2.

(3) The Owner shall operate and maintain the Works such that the effluent is continuously disinfected so that the monthly Geometric Mean Density of *E. coli* does not exceed 200 organisms per 100 millilitres of effluent discharged from the Works.

(4) The Owner shall operate and maintain the Works such that pH of the Final Effluent from the Works is within the range of 6.0 to 9.5, inclusive, at all times.

(5) The effluent limits set out in subsection (1) and (3) shall apply upon the issuance of this Approval.

8. OPERATION AND MAINTENANCE

(1) The Owner shall exercise due diligence in ensuring that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this Approval and the OWRAand regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the Works.

(2) The Owner shall prepare an operations manual within six (6) months of Substantial Completion of the Proposed Works, that includes, but not necessarily limited to, the following information:

(a) operating procedures for routine operation of the Works;

(b) inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;

(c) repair and maintenance programs, including the frequency of repair and maintenance for the Works;

(d) procedures for the inspection and calibration of monitoring equipment;

(e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the Water Supervisor; and

(f) procedures for receiving, responding and recording public complaints, including recording any followup actions taken.

(3) The Owner shall maintain the operations manual current and retain a copy at the location of the Works for the operational life of the Works.Upon request, the Owner shall make the manual available to Ministry staff.

(4) The Owner shall provide for the overall operation of the Works with an operator who holds a licence that is applicable to that type of facility and that is of the same class as or higher than the class of the facility in accordance with Ontario Regulation 129/04.

9. MONITORING AND RECORDING

The Owner shall, upon commencement of operation of the Works, carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this Approval are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

(2) For the purposes of this condition, the following definitions apply:

(a) Weekly means once each week;
(b) Monthly means once every month.

(3) Samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

Table 3 - Hauled Sewage Monitoring
(Sampling point at the hauled sewage receiving station)

Parameters	Sample Type	Frequency
BOD5	Grab	Monthly
Total Suspended Solids	Grab	Monthly
Total Phosphorus	Grab	Monthly
Total Kjeldahl Nitrogen	Grab	Monthly

Table 4 - Raw Sewage Monitoring

Parameters	Sample Type	Frequency
BOD5	Composite	Monthly
Total Suspended Solids	Composite	Monthly
Total Phosphorus	Composite	Monthly
Total Kjeldahl Nitrogen	Composite	Monthly

Table 5 - Final Effluent Monitoring		
Parameters	**Sample Type**	**Frequency**
CBOD5	Composite	Weekly
Total Suspended Solids	Composite	Weekly
Total Phosphorus	Composite	Weekly
Total Ammonia Nitrogen	Composite	Weekly
E. coli	Grab	Weekly
pH	Grab/Probe	Weekly
Temperature	Grab/Probe	Weekly

(4) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions;

(5) The temperature and pH of the effluent from the Works shall be determined in the field at the time of sampling for Total Ammonia Nitrogen. The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended, for ammonia (un-ionized).

(6) The Owner shall install and maintain (a) continuous flow measuring device(s), to measure the flow rate of the effluent from the Works with an accuracy to within plus or minus 15 per cent (+/- 15%) of the actual flowrate for the entire design range of the flow measuring device, and record the flowrate at a daily frequency.

(7) The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.

10. REPORTING

(1) One (1) week prior to the start up of the operation of the Proposed Works, the Owner shall notify the Water Supervisor (in writing) of the pending start up date.

(2) Fifteen (15) days prior to the date of a planned By-pass being conducted pursuant to Bypass Condition and as soon as possible for an unplanned By-pass,the Owner shall notify the Water Supervisor (in writing) of the pending start date, in addition to an assessment of the potential adverse effects on the environment and the duration of the By-pass.

(3) The Owner shall report to the Water Supervisor or designate, any exceedence of any parameter specified in Effluent Limits Condition orally, as soon as reasonably possible, and in writing within seven (7) days of the exceedence.

(4) In addition to the obligations under Part X of the *Environmental Protection Act* , the Owner shall, within ten (10) working days of the occurrence of any reportable spill as defined in Ontario Regulation 675/98, bypass or loss of any product, by-product, intermediate product, oil, solvent, waste material or any other polluting substance into the environment, submit a full written report of the occurrence to the Water Supervisor describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.

(5) The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff. .

(6) The Owner shall prepare and submit a performance report to the Water Supervisor on an annual basis, within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the commencement of operation of the Works and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:

(a) a summary and interpretation of all monitoring data and a comparison to the effluent limits outlined in Effluent Limits of Condition 7, including an overview of the success and adequacy of the Works;

(b) a description of any operating problems encountered and corrective actions taken;

(c) a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works;

(d) a summary of any effluent quality assurance or control measures undertaken in the reporting period;

(e) a summary of the calibration and maintenance carried out on all effluent monitoring equipment;

(f) a description of efforts made and results achieved in meeting the Effluent Objectives of Condition 6;

(g) a tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed;

(h) a summary of any complaints received during the reporting period and any steps taken to address the complaints;

(i) a summary of all By-pass, spill or abnormal discharge events;

(j) a copy of all Notice of Modifications submitted to the Water Supervisor as a result of Schedule B, Section 1, with a status report on the implementation of each modification;

(k) a report summarizing all modifications completed as a result of Schedule B, Section 3; and

(l) any other information the Water Supervisor requires from time to time.

(7) The Owner shall, within thirty (30) calendar days of issuance of this Approval, submit a Municipal and Local Services Board Wastewater System Profile Information Form, and shall resubmit the updated document every time a notification is provided to the Water Supervisor in compliance with requirements of change of ownership under this Approval.

11. LIMITED OPERATIONAL FLEXIBILITY

(1) The Owner may make modifications to the Works in accordance with the Terms and Conditions of this Approval and subject to the Ministry's "Limited Operational Flexibility Criteria for Modifications to Sewage Works ", included under Schedule B of this Approval, as amended.

(2) Sewage works proposed under Limited Operational Flexibility shall adhere to the design guidelines contained within the Ministry's publication "Design Guidelines for Sewage Works 2008", as amended.

(3) The Owner shall ensure at all times, that the Works, related equipment and appurtenances which are installed or used to achieve compliance are operated in accordance with all Terms and Conditions of this Approval.

(4) For greater certainty, the following are not permitted as part of Limited Operational Flexibility:

(a) Modifications to the Works that result in an increase of the Rated Capacity of the Works;

(b) Modifications to the Works that may adversely affect the approved effluent quality criteria or the location of the discharge/outfall;

(c) Modifications to the treatment process technology of the Works, or modifications that involve construction of new reactors (tanks) or alter the treatment train process design;

(d) Modifications to the Works approved under s.9 of the EPA, and

(e) Modifications to the Works pursuant to an order issued by the Ministry.

(5) Implementation of Limited Operational Flexibility is not intended to be used for piecemeal measures that result in major alterations or expansions.

(6) If the implementation of Limited Operational Flexibility requires changes to be made to the Emergency Response, Spill Reporting and Contingency Plan, the Owner shall, as deemed necessary in consultation with the Water Supervisor, provide a revised copy of this plan for approval to the local fire services authority prior to implementing Limited Operational Flexibility.

(7) For greater certainty, any modification made under the Limited Operational Flexibility may only be carried out after other legal obligations have been complied with, including those arising from the *Environmental Protection Act, Niagara Escarpment Planning and Development Act, Oak Ridges Moraine Conservation Act, Lake Simcoe Protection Act* and *Greenbelt Act.*

(8) Prior to implementing Limited Operational Flexibility, the Owner shall complete a Notice of Modifications describing any proposed modifications to the Works and submit it to the Water Supervisor.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the Works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the Owners their responsibility to notify any person they authorized to carry out work pursuant to this Approval the existence of this Approval.

2. Condition 2 is included to ensure that the Works are constructed in a timely manner so that standards applicable at the time of Approval of the Works are still applicable at the time of construction, to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to the approved works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.

4. Condition 4 is included to ensure that the Works are constructed in accordance with the approval and that record drawings of the Works “as constructed” are maintained for future references.

5. Condition 5 is included to indicate that By-pass / Plant Overflows of untreated or partially treated sewage to the receiving watercourse is prohibited, save in certain limited circumstances where the failure to By-pass / Plant Overflow could result in greater injury to the public interest than the Bypass itself where a By-pass / Plant Overflow will not violate the approved effluent requirements, or where the By-pass / Plant Overflow can be limited or otherwise mitigated by handling it in accordance with an approved contingency plan. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of By-pass / Plant Overflow events.

6. Condition 6 is imposed to establish non-enforceable effluent quality objectives which the Owner is obligated to use best efforts to strive towards on an ongoing basis. These objectives are to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs and before the compliance limits of Condition 7 are exceeded.

7. Condition 7 is imposed to ensure that the effluent discharged from the Works to the Boyne River meets the Ministry's effluent quality requirements thus minimizing environmental impact on the receiver and to protect water quality, fish and other aquatic life in the receiving water body.

8. Condition 8 is included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the Owner and made available to the Ministry. Such a manual is an integral part of the operation of the Works. Its compilation and use should assist the Owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the Owner's operation of the Works.

9. Condition 9 is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives and effluent limits specified in the Approval and that the Works does not cause any impairment to the receiving watercourse.

10. Condition 10 is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this Approval, so that the Ministry can work with the Owner in resolving any

problems in a timely manner.

11. Condition 11 is included to ensure that the Works are operated in accordance with the application and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider. These Conditions are also included to ensure that a Professional Engineer has reviewed the proposed modifications and attests that the modifications are in line with that of Limited Operational Flexibility, and provide assurance that the proposed modifications comply with the Ministry's requirements stipulated in the Terms and Conditions of this Approval, MOE policies, guidelines, and industry engineering standards and best management practices.
Schedule 'A' forms part of this Approval and contains a list of supporting documentation/information received, reviewed and relied upon in the issuance of this Approval.

Schedule A

1. Class Environmental Report dated July 1996, design brief, final plans and specifications for Phase 2 prepared by R.J. Burnside & Associates Limited;
2. Application for Approval of Municipal and Private Sewage Works submitted by the Corporation of the Town of Shelburne dated July 26, 2005, including design brief and drawings prepared by R.J.Burnside & Associates Limited, and subsequent revised letter design brief dated September 01, 2005 and revised drawings;
3. Application for Approval of Municipal and Private Sewage Works submitted by Larry McGregor of the Corporation of the Town of Shelburne dated June 20, 2006 under a cover letter from R.J.Burnside & Associates Limited dated June 19, 2006 and final plans and specifications prepared by Knox Martin Kretch Limited;
4. Application for Approval of Municipal and Private Sewage Works submitted by Rui DeCarvalho of R.J.Burnside & Associates Limited dated May 15, 2008, including Environmental Study Report, Design Brief Report, final plans and specifications.
5. Application for Approval of Municipal and Private Sewage Works submitted by Stephen Burnett of S.Burnett & Associates Limited dated April 18, 2016, including Design Brief Report, site plans, hydraulic profiles and engineering drawings, and all other supporting documents and correspondence.

Schedule B

Limited Operational Flexibility Criteria for Modifications to Municipal Sewage Works

1. The modifications to sewage works approved under an Environmental Compliance Approval (Approval) that are permitted under the Limited Operational Flexibility (LOF), are outlined below and are subject to the LOF conditions in the Approval, and require the submission of the Notice of Modifications. If there is a conflict between the sewage works listed below and the Terms and Conditions in the Approval, the Terms and Conditions in the Approval shall take precedence.

1.1 Sewage Pumping Stations

a. Alter pumping capacity by adding or replacing equipment where new equipment is located within an existing sewage treatment plant site or an existing sewage pumping station site, provided that the modifications do not result in an increase of the sewage treatment plant Rated Capacity and the existing flow process and/or treatment train are maintained, as applicable.

b. Forcemain relining and replacement with similar pipe size where the nominal diameter is not greater than 1,200mm

1.2 Sewage Treatment Process

a. Installing additional chemical dosage equipment including replacing with alternative chemicals for

pH adjustment or coagulants (non-toxic polymers) provided that there are no modifications of treatment processes or other modifications that may alter the intent of operations and may have negative impacts on the effluent quantity and quality.

b. Expanding the buffer zone between a sanitary sewage lagoon facility or land treatment area and adjacent uses provided that the buffer zone is entirely on the proponent's land.

c. Optimizing existing sanitary sewage lagoons with the purpose to increase efficiency of treatment operations provided that existing sewage treatment plant rated capacity is not exceeded and where no land acquisition is required.

d. Optimizing existing sewage treatment plant equipment with the purpose to increase the efficiency of the existing treatment operations, provided that there are no modifications to the works that result in an increase of the approved Rated Capacity, and may have adverse effects to the effluent quality or location of the discharge.

e. Replacement, refurbishment of previously approved equipment in whole or in part with Equivalent Equipment, like-for-like of different make and model, provided that the firm capacity, reliability, performance standard, level of quality and redundancy of the group of equipment is kept the same or exceeded. For clarity purposes, the following equipment can be considered under this provision: pumps, screens, grit separators, blowers, aeration equipment, sludge thickeners, dewatering equipment, UV systems, chlorine contact equipment, bio-disks, and sludge digester systems.

1.3 Sewage Treatment Plant Outfall

a. Replacement of discharge pipe with similar pipe size or diffusers provided that the outfall location is not changed.

1.4 Sanitary Sewers

a. Pipe relining and replacement with similar pipe size within the Sewage Treatment Plant site, where the nominal diameter is not greater than 1,200mm.

1.5 Pilot Systems

a. Installation of pilot systems for new or existing technologies provided that:

i. any effluent from the pilot system is discharged to the inlet of the sewage treatment plant or hauled off-site for proper disposal,
ii. any effluent from the pilot system discharged to the inlet of the sewage treatment plant or sewage conveyance system does not significantly alter the composition/concentration of the influent sewage to be treated in the downstream process; and that it does not add any inhibiting substances to the downstream process, and
iii.the pilot system's duration does not exceed a maximum of two years; and a report with results is submitted to the Director and Water Supervisor three months after completion of the pilot project.

2. Sewage works that are exempt from section 53 of the OWRA by O. Reg. 525/98 continue to be exempt and are not required to follow the notification process under this Limited Operational Flexibility.

3. Normal or emergency operational modifications, such as repairs, reconstructions, or other improvements that are part of maintenance activities, including cleaning, renovations to existing approved sewage works equipment, provided that the modification is made with Equivalent Equipment, are considered pre-approved.

4. The modifications noted in section (3) above are not required to follow the notification protocols under Limited Operational Flexibility, provided that the number of pieces and description of the equipment as described in the Approval does not change.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 9972-7FYJUB issued on August 12, 2008.

In accordance with Section 139 of the Environmental Protection Act, 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 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval 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.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change

135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 19th day of July, 2016

Fariha Pannu, P.Eng.
Director
appointed for the purposes of Part II.1 of
the *Environmental Protection Act*

SW/
c: DWMD Supervisor, MOECC Guelph
Rekha Chetlur, Registration and Compliance Section, MOECC Drinking Water Programs Branch – IMBS
Stephen Burnett, S. Burnett & Associates Limited

S. BURNETT & ASSOCIATES LIMITED
ENGINEERING & ENVIRONMENTAL

Appendix C

Consultation Materials

Proudly Pink – Students in Solidarity against bullying

BY MARNI WALSH

February 22 was Stop Bullying Day, or Pink Shirt Day in Ontario, a day of solidarity that stemmed from a 2007 event involving a Grade Nine Maritime student who was bullied when he wore a pink shirt on his first day of school.

News of the harassment led to two other boys distributing pink dollar-store shirts to other boys at the school in order to stop the bullying. They were successful, and in 2012 the idea was picked up by the United Nations and proclaimed internationally.

At Centre Dufferin District High School (CDDHS,) Vice Principal Wendy McIntosh says, "Our February 22 Anti-Bullying day is just part of a bigger picture of what we are trying to achieve at CDDHS."

"The Social Equity Club at the school promoted the day, asking staff and students to wear pink in support of anti-bullying and students were able to silk screen their own anti-bullying t-shirts on Wednesday," she says.

"One voice – One team!" This is the message that staff at Centre Dufferin District High School tries to impart to students, says Vice Principal McIntosh. "We ask them to think about what they want our school to look like and who we want to be," she says.

CDDHS has several programs running throughout the year to combat bullying and promote equity.

"Our staff is also very committed to making CDDHS a safe and inclusive school," says Ms. McIntosh.

Last week the students had the privilege of listening to motivational speaker Orlando Bowen, a former CFL liner backer for the Toronto Argonauts.

His presentation focused on "empowering youth to develop resilience and use their talents to make a difference."

From that assembly, Ms. McIntosh says, "90 students stepped forward to be part of a project that will benefit the community."



In the Pink! A few of the students and staff who wore Pink on February 22 in support of "Stop Bullying Day." This included kids from Grades 9 to 12, many of them part of the Social Equity Committee, and the Student Council, as well as Safe Schools and Multicultural Celebrations Committees. Staff in the photo include Ms. Godbold, Head of Student Development (left in pink wig,) Ms. McIntosh, V.P. (centre,) and, on the far right, back row Ms. Trowel from Guidance, Ms. Rose, French teacher and Head of Social Equity, and teacher and Student Council Staff Advisor Mr. Rush.

PHOTO MARNI WALSH

Students and staff are currently putting their heads together to develop ideas for the project.

First Line for Syria seeks sponsors for refugee family

BY MARNI WALSH

In the summer of 2015, a small band of neighbours on the First Line of Mono Township launched a campaign to sponsor a Syrian refugee family.

First Line for Syria's fundraising efforts brought the Huseyin Alos family out of a refugee camp in Turkey to begin a new life in Shelburne.

A year later, young Helin and her parents Kahleel and Sabah have become active and treasured members of the community.

The Huseyin Alos were the first of two families, including a family of nine in Shelburne, which were, and continue to be, guided by First Line for Syria with the help and support of the community and Primrose United Church.

Now, stretched to the limit, First Line for Syria is reaching out to the community seeking new sponsors for another refugee family in need.

Before the war, Inaam Alabed was a professional woman, a wife and mother of two young sons, working in a managerial position in Syria. Her full and happy life was robbed from her in a single night. Her husband was killed when the mosque where he was praying was bombed by Syrian war planes and, in the same attack, her nine story condominium was razed to the ground, killing her young sons and leaving her permanently debilitated.

Inaan came to Canada a year ago.

She has no family here and deals with constant physical pain and depression as she faces her life alone.

First Line for Syria and the Dufferin Sponsorship group from Orangeville learned of her plight through common connections with their own sponsored families.

Some of the sponsorship group members have visited Inaan in Toronto. She is holding on to the hope that her niece and husband might join her in Canada. Together they could support each other as a single family.

However, the niece and husband need sponsors to help to bring them to Canada and unite them with Inaan.

"We are hoping that another group will step forward possibly and take this woman's cause on for themselves and sponsor her niece and her husband," says Jeff Cottam, a First Line for Syria member. "This would bring hope and a little light to the end of [the] very dark tunnel she finds herself in, through no fault of her own.

"It need not be a recognized group or organization. It could simply be a group of like-minded individuals getting together to make a difference, just like First Line for Syria was formed just over a year ago."

Jeff spoke warmly of the rewards of the heart that his group has received as sponsors,

"Our Syrian family have transformed our lives too - it is not a one way situation when you help people in need."

With over 25,000 refugees arriving in Canada last year, the Muslim community has been drained of its resources.

Dufferin sponsorship groups have been able to give Inaam some financial help, but Mr. Cottam says it is just a "stop gap measure."

"It is sponsorship for her niece and husband that is key," he says "and why we are seeking support from elsewhere as we are all strained to the limit too."

Anyone interested in helping, may contact Jeff Cottam and First Line for Syria and they will facilitate meetings with Inaam and give sponsorship advice. Jeffrey Cottam may be reached at 519-378-5704 or www.aromatica.ca.

Notice of Study Commencement

Increased Capacity of the Town of Shelburne's Water Pollution Control Plant (WPCP)
Schedule 'C' Municipal Class Environmental Assessment

THE STUDY
The Town of Shelburne has initiated a Schedule "C" Municipal Class Environmental Assessment to increase the rated capacity of the Town's existing Water Pollution Control Plant (WPCP) as the current rated capacity of the existing facility is not sufficient to meet the Town's long-term needs. A number of alternatives will be examined as part of this study, and an assessment will be completed to identify the most cost-effective, environmentally sound, and sustainable approach to increasing the capacity of the existing facility. Please see the map below for the project location.

THE PROCESS
The study will be undertaken as a Schedule "C" project in accordance with the requirements of the Municipal Class Environmental Assessment process (Municipal Engineers Association, October 2000, as amended in 2007, 2011, and 2015).

PUBLIC CONSULTATION
Public input and comments are an important component of the Class EA process. Two (2) Public Information Centres (PICs) will be held during the course of the study to present and receive comments on the project, alternative solutions, and the preferred alternative for increased capacity at the WPCP. Notices for each PIC will be advertised in advance of the public meetings.

Upon completion of the study, the Report will be made available for public review and comment. Another advertisement will be published at that time, indicating where the report can be viewed.

CONTACT INFORMATION
Further information may be obtained from the Town's consultant for this project:

Stephen Burnett, P. Eng., Principal
S. Burnett & Associates Limited
210 Broadway, Unit 203
Orangeville, ON L9W 5G4
T: 519-941-2949
F: 519-941-2036



Information will be collected in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

This Notice first issued February 16th, 2017 in the Shelburne Free Press.



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Georgian College to mark 10 years in permanent home

Written By **MIKE PICKFORD**

Georgian College will celebrate a major milestone in Orangeville this year, with the post-secondary institution on the cusp of marking its 10th anniversary in its permanent home.

Georgian's Orangeville Campus was established in leased quarters back in 1988, but it wasn't until 2007 that it purchased a permanent location on Centennial Road. The local campus has been on a steady rise, with enrolment figures and the number of programs offered at the facility both on the up.

Starting out as a self-described "modest" operation in Orangeville, Georgian has evolved from an institution that initially offered a sprinkling of business and health-related programs on a part-time basis to one that today boasts 170 full-time students spread across six programs.

Speaking to the Citizen last week, Catherine Drea, Vice President of Academic and Student Engagement at the campus, noted that Georgian College has witnessed "substantial growth" in the community over the past few years.

"Our program base has seen incredible growth since we initially launched our permanent campus in Orangeville back in 2007 – we've gone from having less than 100 students spread over a few part-time programs to over 600 full-time and part-time students enrolled in roughly 18 programs here in the community," Ms. Drea said.

Much of that growth can be attributed to the college's "excellent" track record when it comes to communicating with the public and community businesses regarding the programs it offers out of the Orangeville campus.

"The biggest growth area for us over the past number of years has definitely been in our full-time programming," Ms. Drea said. "We always encourage discussions focusing on bringing more full-time programs to Orangeville. We look very carefully at what the program advisory committee, as well as the community in general and local employers in the area are asking for. There have been several instances where we've added a program as a direct result of communication with the public."

The most recent addition to the curriculum in Orangeville has been a full-time bookkeeping course, which will launch this fall.

"The whole reason we're rolling out the bookkeeping program is because we've had an indication from the local business sector that there is a need in the area for graduates in that field," Ms. Drea said. "As I said before, we keep a close eye on and keep in constant communication with local employers regarding programs we may potentially offer."

Alongside bookkeeping, Georgian College's Orangeville campus currently offers full-time programs in both general and health services office administration, personal support worker, practical nursing and a pre-health sciences pathway to advanced diplomas and degrees. Its campus boasts a state-of-the-art computer lab, six-bed nursing lab, student resource centre and videoconferencing classroom. The institution also operates a career, employment and community services facility at the nearby Edelbrock Centre.

According to Ms. Drea, the local facility prides itself on being more than just a post-secondary institution, with Georgian College committed to participating in a wide variety of different programs for people of all ages.

"I think one of the things people may not necessarily know about Georgian College is that we have a number of other pathways open at the Orangeville campus for different levels of academic and career preparation," Ms. Drea said. "We offer academic upgrading, we enjoy a number of duel-credit partnerships with our secondary school colleagues and we offer programs for students to get college credits and work towards their development."



FILE PHOTO

GEORGIAN COLLEGE'S Orangeville campus, located on Centennial Road, is celebrating it's 10th anniversary in the community this year.

She added, "We really like to think of our operation here in Orangeville as a full-service campus."

While there are currently no official plans to add to the college's curriculum beyond the full-time bookkeeping course in the near future, Ms. Drea noted the institution would continue its "open dialogue" with local businesses to ensure it keeps on top of public demand.

"It is extremely important to Georgian College that we continue to meet student and employer needs in the community. We are the largest co-op college in Ontario and we enjoy a very, very strong relationship with all of our local employers and communities," Ms. Drea said. "We will continue to build on those relationships here in Orangeville to ensure that we've providing the very best learning opportunities for all of our students."

For more information on Georgian College, visit www.georgiancollege.ca.

Family Transition Place hosting International Women's Day event

Written By **JASEN OBERMEYER**

Family Transition Place (FTP) will be hosting a luncheon on Wednesday, March 8, International Women's Day, celebrating the challenges and accomplishments of women around the world.

Every year on March 8, women around the world celebrate their economic, social, and political achievements. This year's theme is #BeBoldForChange, which according to the International Women's Day's website, is designed to "Call on the masses or call on yourself to help forge a better working world – a more gender-inclusive world."

The luncheon, now in its seventh year of celebration, will take place from 12:00 noon to 1:30 p.m. at Best Western PLUS Orangeville Inn & Suites. Tickets are still available for purchase on the website, www.familytransitionplace.ca. Before and after the luncheon there will be a women's vendor marketplace, where people can buy local businesses' products and services.

Stacey Tarrant, Family Transition Place's manager of development and community relations, says all the money from the vendor, ticket sales, and sponsorship "comes right back to Family Transition Place, to support the delivery of our programs and services."

This year's keynote speaker will be Lindsay Whisen. The FTP website says she "will share her journey from the pit of depression to a much happier place," and "enlighten us on the challenges, choices and changes that need to happen in today's society for women to succeed."

Norah Kennedy, FTP executive director, says it's a great way to celebrate women's rights, look at women's rights in history, where they've come and where they need to go, but also to celebrate Family Transition Place and what it does.

"It's one of the days of the year where we like to be able to celebrate some of our accomplishments as well."



Tim Hortons Community Calendar

This ad space is provided by Tim Hortons Orangeville and is intended for use by non-profit organizations

For information on how to include your community event in this calendar, please call 519-941-2230

Sat. Feb. 25th 9am-5pm
FREE Soccer Coaching Clinic
Fundamentals- aimed at volunteers who coach age 6-10 players. Call OMSC office for more info- 519-941-2517

Tues. Feb. 28th 5-7pm
United Church Pancake Supper
Westminster United Church Adults $10, Children (5-12) $4, Children under 5 FREE. Tickets available at WUC office.

Tues. Feb. 28th 5-6:30pm
St. John's Pancake Sausage Supper
Real Maple syrup, variety of pancakes and dessert and pie auction! Adults $10, Under 12-$5, Family $25. St John's Anglican Church. 3907 Hwy 9 (2km. E of Hwy 10).

On Until to March 25
Orangeville Winter Market
The Orangeville Winter Farmers Market resumes on Jan. 14th from 8am to 1pm every second Saturday inside the Town Hall.

Now to March 8
I'M GIRL - Mill St Library
Family Transition Place & the Orangeville Public Library are working together to facilitate the I'M GIRL program. It was developed to help todays preteen & teenage girls better understand the issues they face during adolescence and help them make healthier choices. It is an 8 week program for girls in grade 6 to 8. Info:The Orangeville Public Library 519-941-0610 ext. 5230 or sabina@familytransitionplace.ca

March 16th 9:15-12pm
March Break VBS
What is Easter all about? Come for a free morning of stories, crafts & fun! Open for ages SK-GR 6. Adults are welcome to stay for an informal Bible Study. Orangeville Canadian Reformed Church 55 C-Line, Orangeville. orangevillechurch.ca or email Jenn: vbs@orangevillechurch.ca

4th Tuesday of every month
The Lord Dufferin Chapter IODE
holds their meetings at the Lord Dufferin Centre. We are looking for women who would like to help in the community. Call 519-941-1865

Divorce Hurts.
DivorceCare is a weekly seminar & support group
for people separated or divorced. Call 519-941-4790 or www.thisiscompass.com

Tuesday evenings from 7-9pm
Line Dance Lessons Hockley Seniors & Community Hall
Info: Hope or Robert Young at 519-925-1657 or hopeyoung21@hotmail.com



Notice of Study Commencement

Increased Capacity of the Town of Shelburne's Water Pollution Control Plant (WPCP)
Schedule 'C' Municipal Class Environmental Assessment

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210 Broadway, Unit 203
Orangeville, ON L9W 5G4
T: 519-941-2949
F: 519-941-2036



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This Notice first issued February 23rd, 2017 in the Orangeville Citizen.

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Notice of Schedule 'C' Municipal Class Environmental Assessment Public Information Center No. 1

Increased Capacity of the Town of Shelburne's Water Pollution Control Plant (WPCP)

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PUBLIC INFORMATION CENTER #1

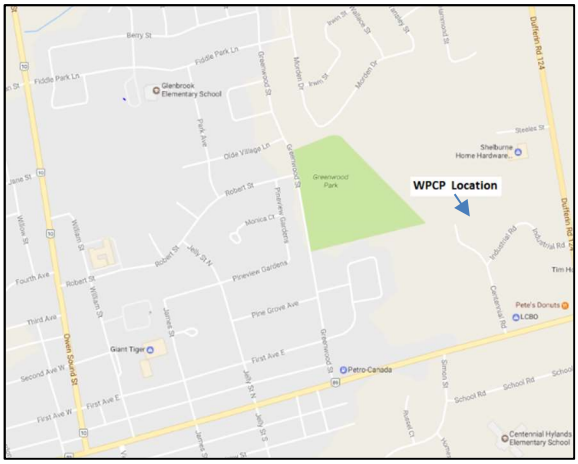
Phase one of the EA has identified problems and opportunities regarding the capacity of the existing WPCP. Phase two of the EA has identified alternative solutions. Public consultation is important to this study. The first Public Information Center to review information gathered in phases one and two of the EA will be held:

4:00 pm -7:00 pm
Monday June 4th, 2018
Town Hall, 203 Main St. E, Shelburne

CONTACT INFORMATION

Further information may be obtained from the Town's consultant for this project:

Stephen Burnett, P. Eng., Principal
S. Burnett & Associates Limited
210 Broadway, Unit 203
Orangeville, ON L9W 5G4
T: 519-941-2949
F: 519-941-2036



Information will be collected in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

This Notice first issued May 5th, 2018 in the Shelburne Free Press.

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Schedule 'C' Municipal Class Environmental Assessment for Increased Capacity of the Water Pollution Control Plant (WPCP)

Town of Shelburne

A People Place, A Change of Pace
SHELBURNE
ONTARIO, CANADA

Welcome to the First Public Information Centre!

June 4th, 2018

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Background









- Shelburne has experienced a continued rapid rate of population growth over the last 5+ years.
- The rapid growth has largely been attributed to the Town's relatively close proximity to major centers, relative affordability, and small town feel.
- Increased wastewater infrastructure is required to support continued population growth and to support the Town's current build-out areas.
- Shelburne's build-out population is the population anticipated to fill all approved and potential future residential units (including planned urban boundary changes) within the current Town boundaries.
- The Town has initiated a Schedule 'C' Municipal Class Environmental Assessment (EA) to assess alternatives that will increase the rated capacity of the Town's Water Pollution Control Plant (WPCP).
- The EA will identify the most cost-effective, environmentally sound, and sustainable approach to meeting future wastewater capacity requirements. It will also include a comprehensive analysis of alternatives and estimated costing for future expenses.

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Municipal Class EA Process

Phase 1

- Identify problems or opportunities

Phase 2

- Identify alternative solutions to address the problems or opportunities
- Consideration of technical, environmental, economical and social impacts
- Consult review agencies and the public ← We are here
- Select preferred solution to address problems or opportunities

Phase 3

- Identify alternative design concepts for preferred solution
- Evaluation of alternative designs
- Identify recommended design
- Consult review agencies and the public
- Select preferred design

Phase 4

- Complete Environmental Study Report
- Issue Notice of Completion (30-day public review period)

Phase 5

- Proceed to detailed design and construction

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WPCP History

Original System

- Built in 1968
- 5.5 ha (13.5 acre) Sewage Lagoons

Original Plant

- Commissioned in 1981
- Extended Aeration WWTP
- Average Day Capacity = 2,045 m^3/d

Phase One Expansion

- First WPCP expansion in 1999
- New Average Day Capacity = 2,300 m^3/d
- Capacity Increase = 255 m^3
- Approximate 1999 Total Cost = $ 2.5 Million
- (2018 Cost= $ 3.6 Million)

Phase Two Expansion

- Second WPCP Expansion in 2006
- New Average Day Capacity =2,971 m^3/d
- Capacity Increase = 671 m^3
- Approximate 2005 Total Cost = $3.8 Million
- (2018 Cost= $4.7 Million)

Phase Three Expansion

- Third WPCP Expansion in 2010
- New Average Day Capacity = 3,420 m^3/d
- Capacity Increase = 449 m^3
- Approximate 2008 Total Cost = $3.6 Million
- (2018 Cost = $ 3.9 Million)

Tertiary Filter System

- Tertiary Filters Replacement Upgrade in 2016
- Approximate Total Cost = $2.34 Million

Regulatory Requirements

- The WPCP has an Environmental Compliance Approval (ECA) which is authorization from the Ministry of the Environment and Climate Change (MOECC) for regulated discharges to the natural environment. The ECA regulates how the plant must operate.
- Increasing WPCP capacity requires approval from the MOECC because it increases discharge from the plant.

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Existing WPCP



Aerial View of WPCP and Sewage Lagoons
(Approximate Site Area 8.8 Ha or 22 acres)

- The WPCP is a Class III extended aeration treatment plant with tertiary filtration and ultraviolet disinfection.
- Peak flows are managed through the use of the stormwater ponds for temporary storage.
- Plant effluent discharges to the Beasley Drain, a minor tributary of the Boyne River. The Boyne River is a tributary of the Nottawasaga River.
- Plant Performance Reports indicate the plant is performing well with effluent meeting concentration and loading, limits and objectives. No recorded bypasses over the last 10 years.
- Current Rated Average Day Capacity = 3,420 m^3/d
- Current Rated Peak Day Capacity = 8,921 m^3/d
- A 2016 Assimilative Capacity Study (ACS) submitted by WSP proposed raising the Average Day Capacity to 4,400 m^3/d based on new effluent compliance limits (MOECC Approval of the ACS is Required).

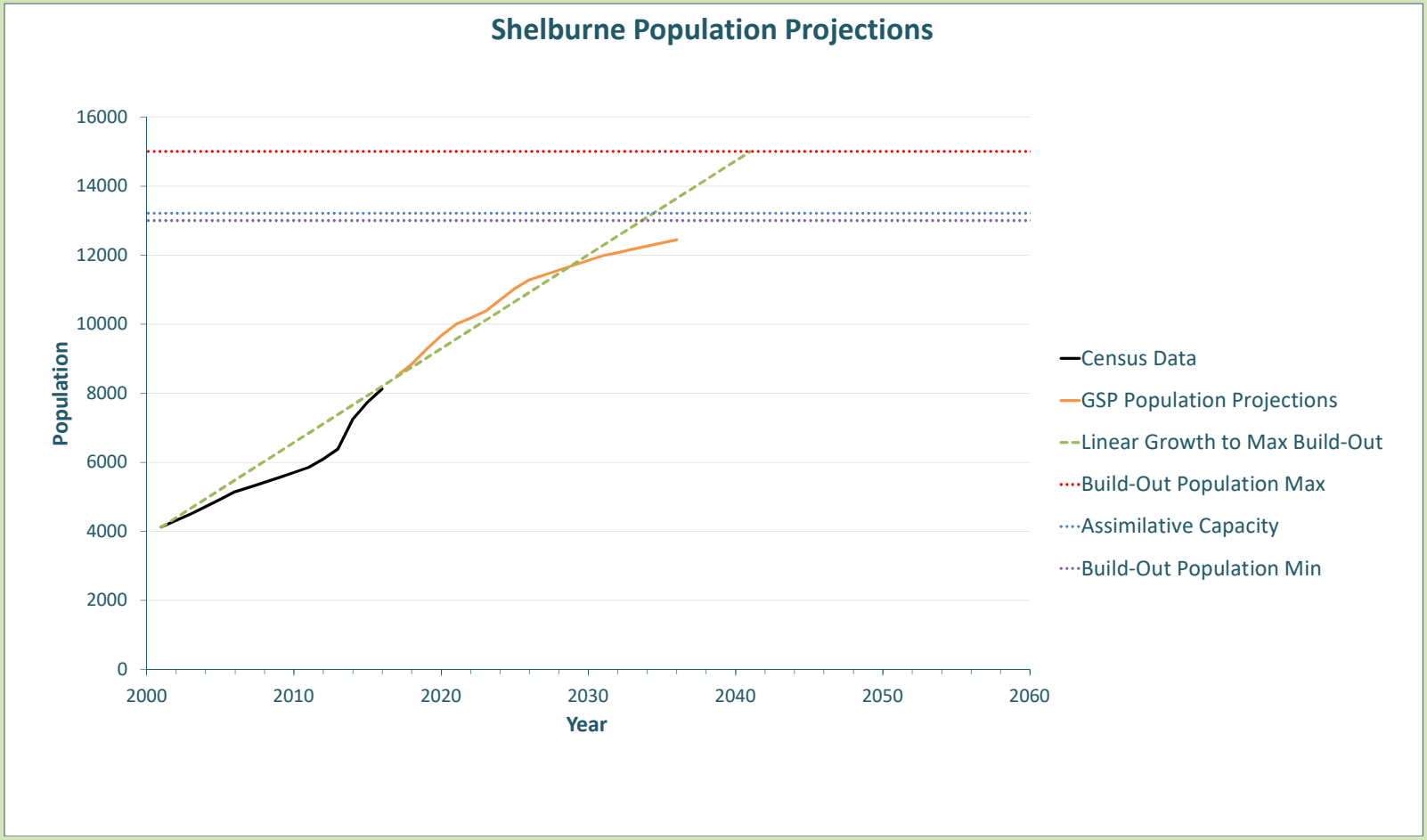
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Development Plan



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Population



*Build-out population estimated to occur between 13,000 and 15,000 in 2041
*Assimilative Capacity of 4,400 m3/day estimated to occur at approximately 13,000 people

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Future Wastewater Demands

Parameter	2021 Projection (Base Year)	2022 Projection (ECA Capacity Exceeded)	Assimilative Capacity (4,400m³/d) (Requires Approval)	2041 20-Projection (Max Build-Out Population)	Existing WPCP Capabilities
Population	9,993	10,374	12,941	15,000	N/A
Per Capita Demand (L/cap/d)	340	340	340	340	N/A
Average Day Flow (m^3/d)	3,398	3,459	4,400	5,100	3,420
Peak Day Flow (m^3/d)	6,897	7,021	8,932	10,353	8,921

*Per capita demand = 11-year average residential per capita demand use of 266 L/cap/d + 25 % for industrial, commercial and institutional flows.

Existing system does not have adequate capacity to accommodate future flows

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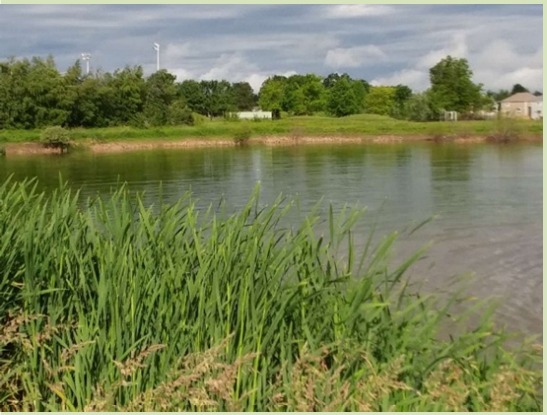
Alternatives

Alternative	Description
Alternative 1: Do Nothing	To assess the implications if no action is taken to address the problem statement.
Alternative 2: Increased Water Efficiency / Extraneous Flow Reduction	To assess the implications of increased water efficiency and reduced extraneous flows on treatment capacity requirements.
Alternative 3: Expand / Upgrade Existing WPCP • **3a: Expand to Assimilative Capacity** **OR** • **3b: Expand to Build-Out Capacity**	To assess if the existing WPCP can be expanded or upgraded to increase the treatment capacity.
Alternative 4: New Second WPCP for Additional Flow	To assess the implications of building a new WPCP and maintaining the current plant to increase treatment capacity.
Alternative 5: New Replacement WPCP	To assess the implications of building a new WPCP and abandoning the current plant to increase treatment capacity.
Alternative 6: Pipeline Connection to Neighbouring Municipal System	To assess if Shelburne could be connected to the Adjala-Tosorontio, Alliston, Grand Valley or Orangeville wastewater systems for additional treatment capacity.

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Criteria for Evaluation







1. Technical Feasibility

- Ability to Meet Effluent Requirements
- System Reliability and Efficiency
- Ease of Operation and Maintenance
- Suitability to Connect to Existing System
- System Specific Requirements

2. Environmental Impact

- Compliance with Environmental Regulations
- Terrestrial and Aquatic Impacts
- Mitigation of Impacts

3. Economic Feasibility

- Capital Cost
- Operation and Maintenance Cost
- Life Cycle Cost Analysis
- Economic Sustainability
- Site Specific Costs

4. Social Impact

- Financial Implications for Residents
- Conformity to Local Planning Provisions
- Impacts on Quality of Life
- Implementation Timeline
- Longer term Planning Considerations

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1. Do Nothing

1. No changes made to increase existing wastewater capacity.

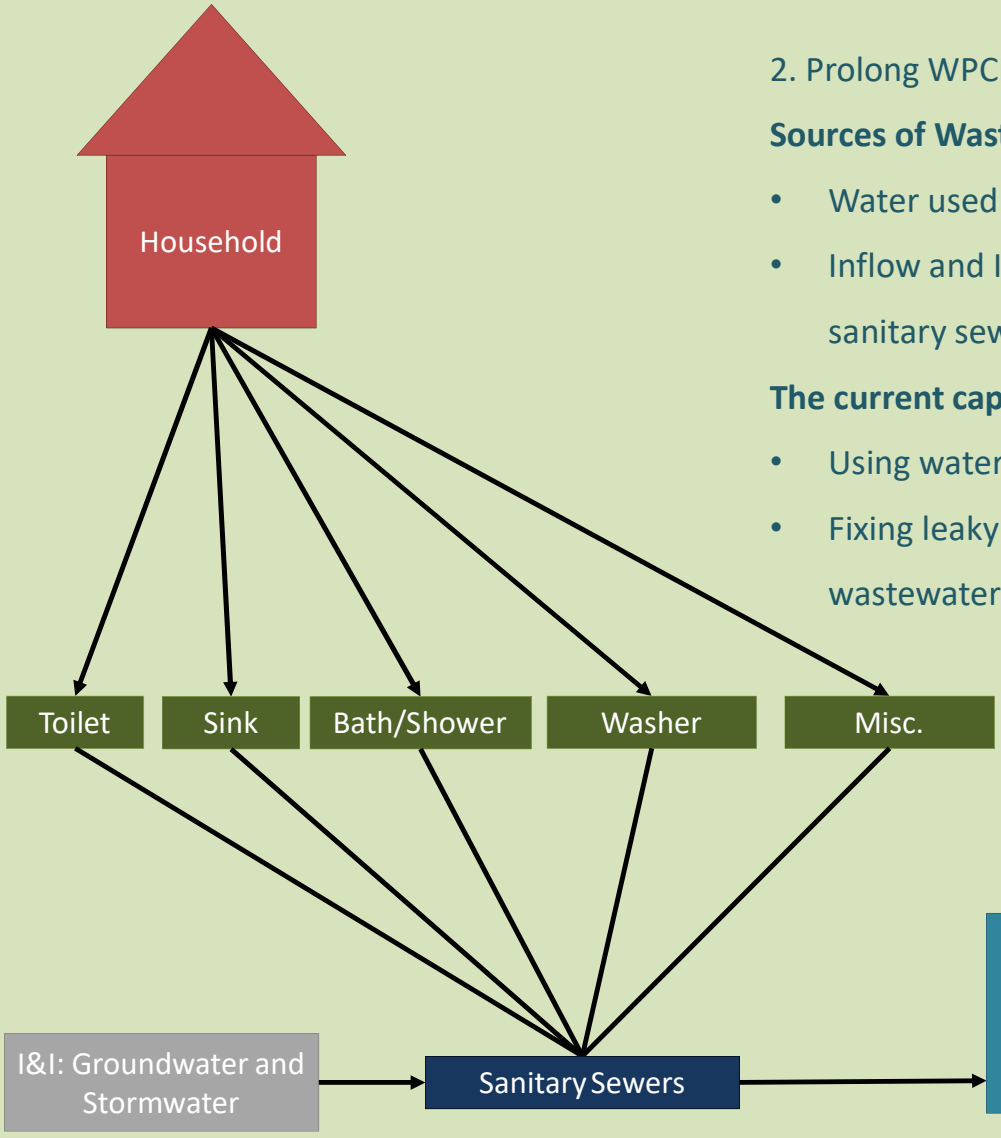
Advantages	Disadvantages
• Less capital investment	• Wastewater treatment capacity remains unchanged and does not provide sufficient capacity for future demand projections or build-out • Further development limited by wastewater treatment capacity • Existing bottlenecks and equipment that have reached there life expectancy will still require upgrade • Future capital investments borne 100% by existing residents






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2. Increased Water Efficiency / Extraneous Flow Reductions



2. Prolong WPCP Capacity by reducing wastewater inputs

Sources of Wastewater include:

- Water used in toilets, sinks, baths, drains, etc.
- Inflow and Infiltration (I&I): groundwater and stormwater entering the sanitary sewers

The current capacity of the WPCP can be prolonged by:

- Using water more efficiently to reduce flows to the WPCP
- Fixing leaky sewer pipes to reduce the amount of I&I entering the wastewater plant

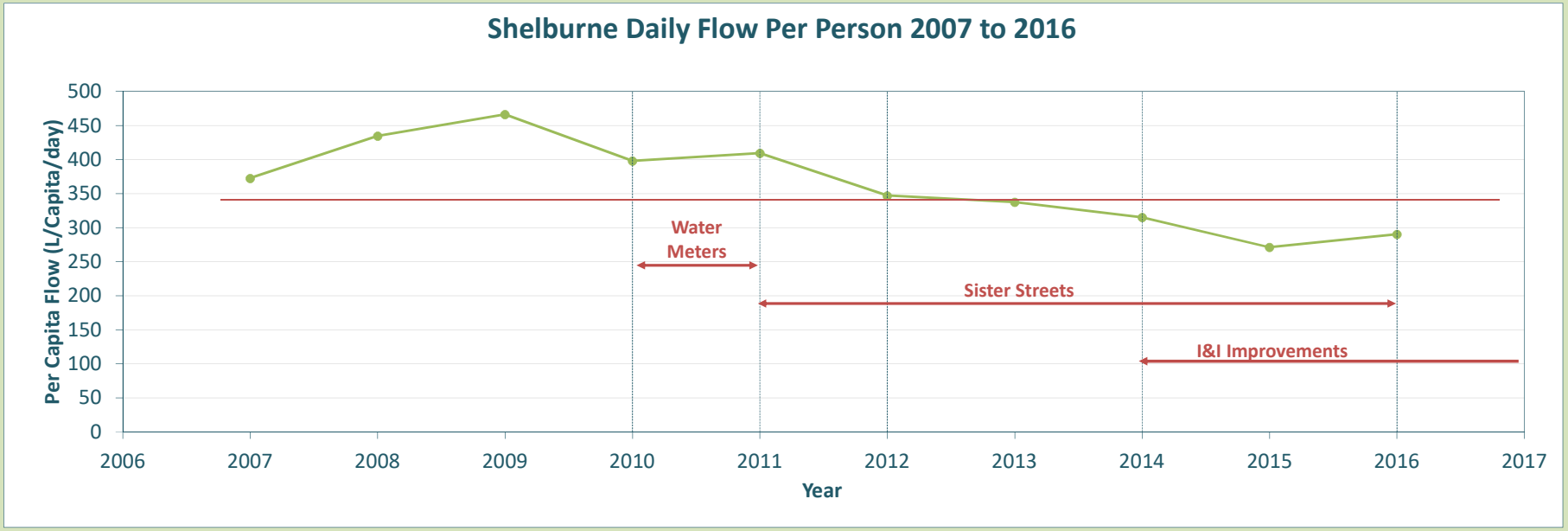
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2. Increased Water Efficiency / Extraneous Flow Reductions

Residential per capita flow rate has generally decreased since 2012 largely due to the following initiatives:

1. Universal water metering completed in July 2011.
   - Approximate Capital Investment of $1.3 Million
2. Sewer refurbishment program initiated in 2011 on “Sister Streets” (Jane and Marie) in Shelburne.
   - Approximately $2 Million invested for each Reconstruction Project
3. System wide identification and repair of infiltration leaks or inputs.
   - Annual Maintenance Budget of between $100,000 to $200,000 per year.

These programs have effectively reduced flow rates and should be continued but reductions and optimizations alone are not sufficient to provide the required capacity for future growth.



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3a. Upgrade / Expand WPCP

3a. WPCP components requiring upgrade or expansion to meet the tentative assimilative capacity flows include:

Assimilative Capacity (Population=12,941) (4,400 m^3/d)

Headworks
- Raw Sewage Pumps

Secondary Treatment
- Aeration Tank Capacity
- Aeration Blowers
- Activated Sludge Pumps
- Alum Storage Tanks

Secondary Settling
- Clarifiers

Tertiary Treatment
- N/A

Disinfection
- UV Banks

Sludge Treatment
- Aerobic Digesters
- Biosolids Storage

Advantages

- Upgrade / Expansion would be designed to accommodate future flows and service planned development
- Utilizes existing infrastructure
- Optimizes existing system

Disadvantages

- Technical complexity is dependent on detailed design of upgrades
- Construction timeline could delay housing developments

Capital Cost

$9,000,000 to $11,000,000

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3b. Upgrade / Expand WPCP

3b. WPCP components requiring upgrade or expansion to meet the theoretical max built-out flows include:

2041 Max Build-Out
(Population= 15,000)
(5,100 m^3/d)

Headworks
- Degritter Vortex
- Grit Channels
- Raw Sewage Pumps

Secondary Treatment
- Aeration Tank Capacity
- Aeration Blowers
- Activated Sludge Pumps
- Alum Storage Tanks

Secondary Settling
- Clarifiers
- Clarified Effluent Pumps

Tertiary Treatment
- N/A

Disinfection
- UV Banks

Sludge Treatment
- Aerobic Digesters
- Biosolids Storage

Advantages

- Upgrade / Expansion would be designed to accommodate future flows and service planned development
- Utilizes existing infrastructure
- Optimizes existing system

Disadvantages

- Technical complexity is dependent on detailed design of upgrades
- Construction timeline could delay housing developments

Capital Cost

$12,000,000 to $14,000,000

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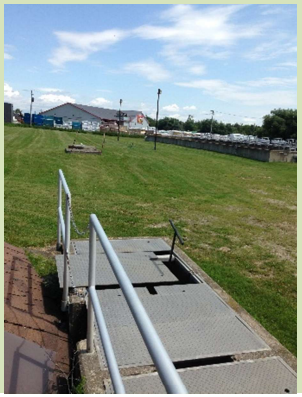
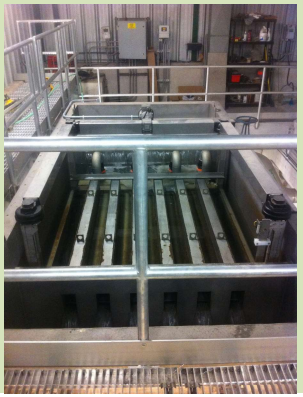
4. New Second WPCP for Additional Flow

4. Construct a new WPCP to treat additional flow of 980 m^3/d and maintain existing treatment plant.

Advantages	Disadvantages
• Addition would be designed to accommodate future flows and service planned development • Utilizes existing infrastructure • Non-retrofit reduces construction complexity • Selection of more strategic location due to limitations of the receiving waters	• Added technical complexity of operating multiple plants • Increased operations and maintenance costs for two plants • Construction timeline could delay housing developments • New land required • Requires approval of new receiving body

New WPCP Capital Cost	**$ 12,200,000**
New Sanitary Trunk Sewers Cost	**$ 1,000,000**
Land Cost	**$ 2,000,000**
Total Cost	**$ 15,200,000**



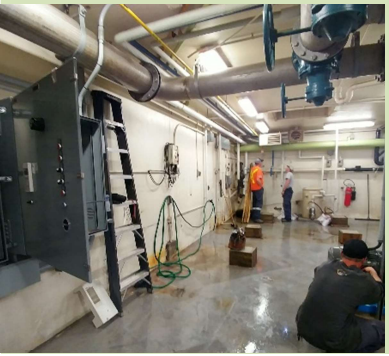

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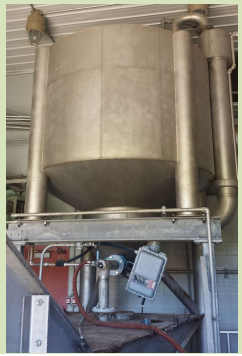
5. New Replacement WPCP

5. Construct a new WPCP to treat all current and future flow up to 4,400 m^3/d and close and decommission existing treatment plant.

Advantages	Disadvantages
•Replacement would be designed to accommodate future flows and service planned development •Non-retrofit reduces construction complexity •All modern equipment with potential to optimize efficiency •Selection of more strategic location due to limitations of the receiving waters	•Does not utilize existing infrastructure •Technical complexity is dependent on detailed design of replacement plant •Construction timeline could delay housing developments •Costs associated with decommissioning of existing plant •New land required •Requires approval of new receiving body

New WPCP Capital Cost	**$ 23,800,000**
Decommission Existing WPCP Cost	**$ 2,000,000**
New Sanitary Trunk Sewers Cost	**$ 1,000,000**
Land Cost	**$ 4,000,000**
Total Cost	**$ 30,800,000**

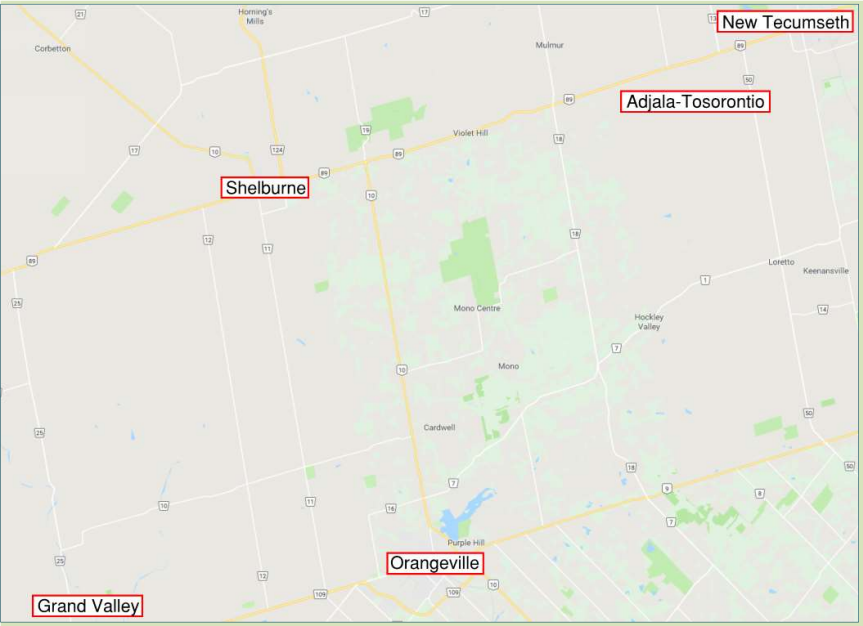






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6. Pipeline



Pipeline connection to:

- **Orangeville**
  Construct a forcemain approximately 30 km to connect to Orangeville System.
- **Grand Valley**
  Construct a forcemain approximately 30 km to connect to Grand Valley System.
- **New Tecumseth (Alliston)**
  Construct a forcemain approximately 30 km to connect to Alliston System.
- **Adjala-Tosorontio**
  Construct a forcemain approximately 25 km to connect to Adjala-Tosorontio System.

Advantages	Disadvantages
• Additional capacity achieved without addition of a second WPCP	• Inefficient and costly due to distance between Shelburne and Orangeville / Grand Valley/ Alliston • Adjala-Tosorontio, Alliston and Grand Valley do not have adequate treatment capacity to accommodate future flows • Orangeville does not have adequate assimilative or treatment capacity • Increased overall complexity resulting from integration with a second municipal system • All options would require watershed basin transfer to discharge effluent, as such this alternative is not feasible
Cost	**$ 50,000,000**

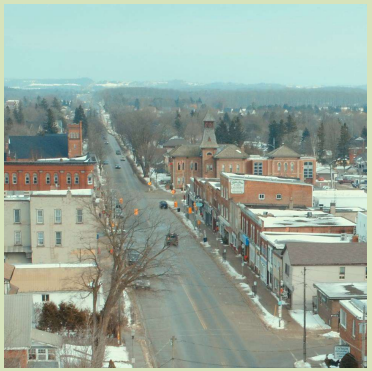
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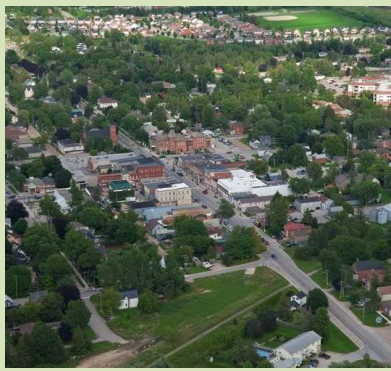
Funding

The majority of funding is anticipated to come from development charges. To address the remaining costs, all available funding mechanisms will be pursued. These include but are not limited to :

- Clean Water and Wastewater Fund (CWWF)
- Ontario Community Infrastructure Fund (OCIF)
- Small Community Fund (SCF)
- Other government & Infrastructure programs as available







Next Steps

1. Update Class EA based on feedback received during this session
2. Consider any additional alternatives suggested
3. Evaluate alternative servicing strategies
4. Continued exchanges with Review Agencies and Stakeholders
5. Recommend preferred alternative
6. Host next Public Information Centre

Thank you for attending!

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PUBLIC INFORMATION CENTER (PIC) #1, TOWN OF SHELBURNE: SCHEDULE 'C' MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT OF THE WATER POLLUTION CONTROL PLANT (WPCP)

SIGN IN SHEET— JUNE 4TH, 2018

NAME(S)	ADDRESS	TELEPHONE NUMBER	EMAIL ADDRESS

Notice of Schedule 'C' Municipal Class Environmental Assessment - Public Information Center No. 2

Increased Capacity of the Water Pollution Control Plant (WPCP)

THE STUDY

The Town of Shelburne is conducting a Schedule "C" Municipal Class Environmental Assessment (EA) to increase water treatment capacity as current WPCP capacity cannot meet the Town's long-term needs.

THE PROCESS

The Schedule "C" assessment will be conducted in accordance with the Municipal Class EA process (Municipal Engineers Association, October 2000, as amended in 2007, 2011, and 2015).

PUBLIC INFORMATION CENTER #2

Further to the COVID-19 Pandemic and the Province's order restricting public gatherings, we are offering the opportunity to learn about studies completed to date and to provide feedback, electronically through Zoom video conferencing.

Please contact the Clerk at jwilloughby@shelburne.ca to register no later than 12 pm Friday June 19, 2020. To ensure your questions, comments or concerns are addressed during the public meeting, please submit them in advance by email by 12 pm June 19, 2020. A live stream of the meeting on the Town's YouTube channel will be made available at https://www.youtube.com/channel/UCsar-MwF8CXrgPbe2EVxh-w.

6:30 pm -7:30 pm
Wednesday June 24th, 2020
Zoom Video Conference

CONTACT INFORMATION

Further information can also be obtained from the Town's consultant for this project:

Ian Callum, M.Sc., PMP
S. Burnett & Associates Limited
210 Broadway, Unit 203
Orangeville, ON L9W 5G4
T: 519-941-2949 ext. 240



Information will be collected in accordance with the Freedom of Information and Protection of Privacy Act. Except for personal information, all comments will become part of the public record.

This Notice first issued May 28th, 2020 in the Shelburne Free Press.

May 28, 2020

To whom it may concern,

Re: Town of Shelburne, Schedule 'C' Municipal Class Environmental Assessment for Increased Capacity of the Water Pollution Control Plant
SBA File No: M16018

The Town of Shelburne (Town) is undertaking a Schedule 'C' Class Environmental Assessment (Class EA) to increase the rated capacity of the Town's existing Water Pollution Control Plant (WCPC), as the current rated capacity is not sufficient to meet the Town's long-term needs. Under the Class EA process, the Town will evaluate alternative means of increasing the rated capacity, and each alternative will be evaluated in terms of environmental, social, technical and cost considerations to arrive a preferred solution.

Further to the COVID-19 Pandemic and the Province's order restricting public gatherings, we are offering the opportunity to learn about studies completed to date and to provide feedback electronically through Zoom video conferencing.

Please contact Jennifer Willboughby, Clerk at jwilloughby@shelburne.ca to register no later than 12 pm Friday, June 19, 2020. To ensure your questions, comments or concerns are addressed during the public meeting, please submit them in advance by email by 12 pm Friday, June 19, 2020. A live stream of the meeting on the Town's YouTube channel will be made available at: https://www.youtube.com/channel/UCsar-MwF8CXrgPbe2EVxh-w.

Please let me know if you would like to be kept informed or consulted as part of the Class EA.

Yours truly,

Ian Callum, PMP, M.Sc.
Senior Environmental Project Manager
S. Burnett & Associates Limited
ian.callum@sbaengineering.com

S. Burnett & Associates Limited, 210 Broadway, Unit 203, Orangeville, ON, L9W 5G4 T: (519) 941-2949 F: (519) 941-2036
www.sbaengineering.com

Name	Title	Company	Address	City	Province	Postal Code	Email	Email Sent	Comments	Read Receipt Received
Municipalities										
~~Christine Gervais~~	~~Director of Planning~~	~~East Garafraxa~~	~~Administration Office, 065371 Dufferin County Road 3, Unit 2~~	~~East Garafraxa~~	~~ON~~	~~L9W 7J8~~	cgervais@eastgarafraxa.ca	Y	email error corrected / no longer works for Amaranth	Y
~~Susan Stone~~	~~CAO/Clerk-Treasurer~~	~~East Garafraxa~~	~~Administration Office, 065371 Dufferin County Road 3, Unit 2~~	~~East Garafraxa~~	~~ON~~	~~L9W 7J8~~	sstone@eastgarafraxa.ca	Y	email error corrected / no longer works for Amaranth	Y
Township of Amaranth	Planning Department	Township of Amaranth	374028 6 Line	Amaranth	ON	L0N 1L0	planner@amaranth.ca		sent as cc by Christine Gervais, East Gary	
Bob Currie	Mayor	Township of Amaranth	374028 6 Line	Amaranth	ON	L0N 1L0	bcurrie@amaranth.ca	Y		
Chris Gerrits	Deputy Mayor	Township of Amaranth	374028 6 Line	Amaranth	ON	L0N 1L0	cgerrits@dufferincounty.ca	Y		Y
Nicole Martin	Interim Clerk	Township of Amaranth	374028 6 Line	East Garafraxa	ON	L0N 1L0	nmartin@amaranth.ca	Y	added as per Chris Gerrits	
Fazal Quadri	Treasurer	Township of Amaranth	374028 6 Line	East Garafraxa	ON	L0N 1L0	fquadri@amaranth.ca	Y	added as per Susan Stone, East Gary	
Heather Foster	Councillor	Township of Amaranth	374028 6 Line	East Garafraxa	ON	L0N 1L0	hfoster@amaranth.ca	Y		Y
Mark Tijssen	Councillor	Township of Amaranth	374028 6 Line	East Garafraxa	ON	L0N 1L0	mtijssen@amaranth.ca	Y		Y
Gail Little	Councillor	Township of Amaranth	374028 6 Line	East Garafraxa	ON	L0N 1L0	glittle@amaranth.ca	Y		Y
Denise B. Holmes, AMCT	CAO/Clerk	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	dholmes@melancthontownship.ca	Y		
Craig Micks	Public Works Superintendent	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	roads@melancthontownship.ca	Y		Y
Darren White	Mayor	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	dwhite@melancthontownship.ca	Y		Y
David Besley	Deputy Mayor	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	dbesley@melancthontownship.ca	Y		Y
Wayne Hannon	Councillor	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	whannon@melancthontownship.ca	Y		
Margaret Mercer	Councillor	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	mmercer@melancthontownship.ca	Y		Y
David Trotman	Director of Planning	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	Planning@townofmono.com	Y	See Judy Kohne, Planning Assistant	Y
Mark Early	Chief Administrative Officer and Clerk	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	mark@townofmono.com	Y		
Laura Ryan	Mayor	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	laura.ryan@townofmono.com	Y		Y
Ralph Manktelow	Councillor	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	ralph.manktelow@townofmono.com	Y		Y
Fred Nix	Councillor	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	fred.nix@townofmono.com	Y		
Sharon Martin	Councillor	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	sharon.martin@townofmono.com	Y		Y
John Creelman	Deputy Mayor	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	john.creelman@townofmono.com	Y		Y
Judy Kohne	Planning Assistant	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	judy.kohne@townofmono.com		Email not sent to Judy directly, but read report sent	Y
Tracey Atkinson	CAO/Planner	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	tatkinson@mulmur.ca	Y		Y
Janet M. Horner	Mayor	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	jhorner@mulmur.ca	Y		Y
Earl Hawkins	Deputy Mayor	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	ehawkins@mulmur.ca	Y		
Shirley Boxem	Councillor	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	sboxem@mulmur.ca	Y		Y
Patricia Clark	Councillor	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	pclark@mulmur.ca	Y		Y
Ken Cufaro	Councillor	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	kcufaro@mulmur.ca	Y		
Scott Burns	Director of Public Works	Dufferin County	55 Zina Street	Orangeville	ON	L9W 1E5	sburns@dufferincounty.ca	Y		
First Nations and Métis										
Donna Big Canoe	Chief	Chippewas of Georgina Island	RR#2 Box N-13	Sutton West	ON	L0E1 R0	donna.bigcanoe@georginaisland.com	Y		Y
Lester Anoquot	Chief	Saugeen First Nation	6493 Highway 21, RR1	Southampton	ON	N0H 2L0	sfn@saugeen.org	Y	email error at lanoquot@saugeenfirstnation.ca	
Guy Monague	Chief	Beausoleil First Nation	11 O'Gemaa Miikaan	Christian Island	ON	L9M 0A9	bfnchief@chimnissing.ca	Y		
Greg Nadjiwon	Chief	Chippewas of Nawash Unceded First Nation	135 Lakeshore Boulevard	Neyaashiinigmiing	ON	N0H 2T0	chiefsdesk@nawash.ca	Y		
Rodney Noganosh	Chief	Chippewas of Rama First Nation	5884 Rama Road, Suite 200	Rama	ON	L3V 6H6	chief@ramafirstnation.ca	Y		
Kelly LaRocca	Chief	Mississaugas of Scugog Island First Nation	22521 Island Road	Port Perry	ON	L9L 1B6	klarocca@scugogfirstnation.com	Y		
Stacey Laforme	Chief	Mississaugas of the New Credit First Nation	2789 Mississauga Road, R.R. #6	Hagersville	ON	N0A 1H0	stacey.laforme@mncfn.ca	Y		
Jesse Fieldwebster	Manager, Lands, Resources and Consultations	Métis Nation of Ontario	P.O. Box 4, 355 Cranston Crescent	Midland	ON	L4R 4K6	consultations@metisnation.org	Y	email corrected from Jesse Fieldwebster <JesseF@metisnation.org>	Y
Mark Hill	Chief	Six Nations of the Grand River Territory	1695 Chiefswood Road, PO Box 5000	Oshweken	ON	N0A 1M0	markhill@sixnations.ca	Y		
Review Agencies										
Barbara Slattery	Environmental Resource Planner & EA Coordinator	Ministry of Environment, Conservation and Parks	Ellen Fairclough Building, 12th Floor, 119 King Street West	Hamilton	ON	L8P 4Y7	barbara.slattery@ontario.ca	Y		Y
	General EA notification email	Ministry of Environment, Conservation and Parks					eanotification.wcregion@ontario.ca	Y	All project notices	
	Director, Environmental Assessment and Permissions	Ministry of Environment, Conservation and Parks	135 St. Clair Avenue West, 1st Floor	Toronto	ON	M4V 1P5			Only Notice of Completion	
Grand River Conservation Authority		Grand River Conservation Authority	400 Clyde Road, PO Box 729	Cambridge	ON	N1R 5W6	grca@grandriver.ca	Y	Automatic message to forward to appropriate contact	Y
Nottawasaga Valley Conservation Authority		Nottawasaga Valley Conservation Authority	John Hix Conservation Administration Centre. 8195 8th Line	Utopia	ON	L0M 1T0	admin@nvca.on.ca	Y		Y
Mark Anderson, P. Eng.	Water Quality Engineer	Grand River Conservation Authority	400 Clyde Road, PO Box 729	Cambridge	ON	N1R 5W6	manderson@grandriver.ca		Was forwarded info, include in further info	

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Town of Shelburne

Schedule 'C' Municipal Class Environmental Assessment for Increased Capacity of the Water Pollution Control Plant (WPCP)

A People Place, A Change of Pace
SHELBURNE
ONTARIO, CANADA

Welcome to the Second Public Information Centre!

June 24, 2020

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Background









- Shelburne has experienced a continued rapid rate of population growth over the last 8+ years.
- The rapid growth has largely been attributed to the Town's relatively close proximity to major centers, relative affordability and small-town feel.
- There have been complaints of odour from residents living near the existing Water Pollution Control Plant (WPCP).
- The Town has initiated a Schedule 'C' Municipal Class Environmental Assessment (EA) to assess alternatives means of providing sufficient wastewater treatment capacity for the next 20 years.
- The EA will identify the most cost-effective, environmentally sound, and sustainable approach to meeting the Town's future wastewater treatment needs.

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Municipal Class EA Process

Phase 1	• Identify problems or opportunities
Phase 2	• Identify alternative solutions to address the problems or opportunities • Consideration of technical, environmental, economical and social impacts • Recommend an alternative solution • Consult review agencies and the public ← We are here • Select preferred solution to address problems or opportunities
Phase 3	• Identify alternative design concepts for preferred solution • Evaluation of alternative designs • Identify recommended design • Consult review agencies and the public • Select preferred design
Phase 4	• Complete Environmental Study Report • Issue Notice of Completion (30-day public review period)
Phase 5	• Proceed to detailed design and construction

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Existing WPCP

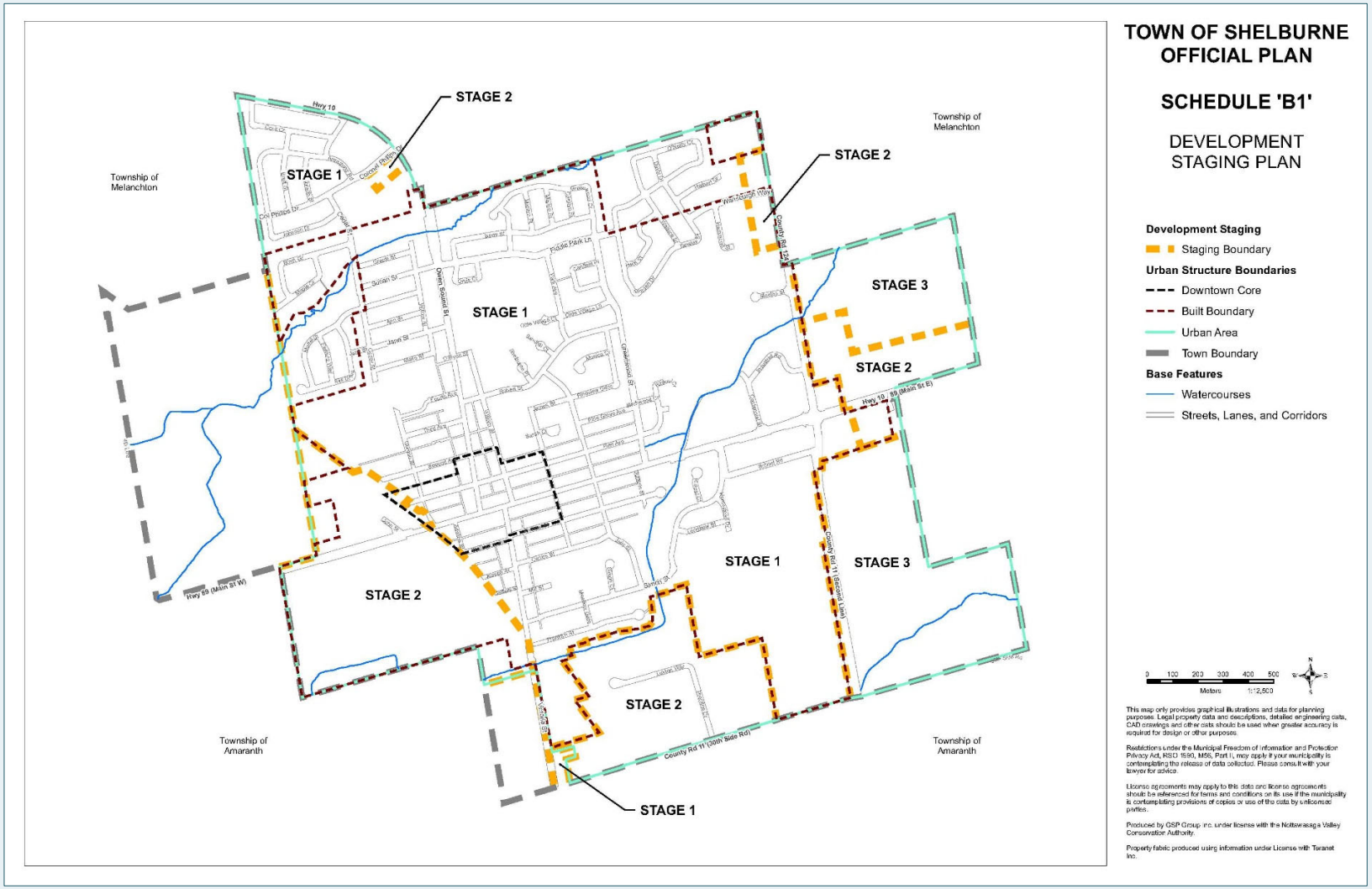


Aerial View of WPCP and Sewage Lagoons
(Approximate Site Area 8.8 Ha or 22 acres)

- The WPCP is a Class III extended aeration treatment plant with tertiary filtration and ultraviolet disinfection.
- Peak flows are managed through the use of stormwater ponds for temporary storage.
- Plant effluent discharges to the Beasley Drain, a minor tributary of the Boyne River. The Boyne River is a tributary of the Nottawasaga River.
- Plant Performance Reports indicate the plant is performing well with effluent meeting concentration and loading, limits and objectives. No recorded bypasses over the last 10 years.
- Current Rated Average Day Capacity = 3,420 m^3/d.
- Current Rated Peak Day Capacity = 8,921 m^3/d.
- The WPCP has an Environmental Compliance Approval (ECA) which is authorization from the Ministry of the Environment, Conservation and Parks (MECP) that sets limits on discharges to the natural environment.
- Increasing WPCP capacity requires approval from the MECP because it increases discharge from the plant.

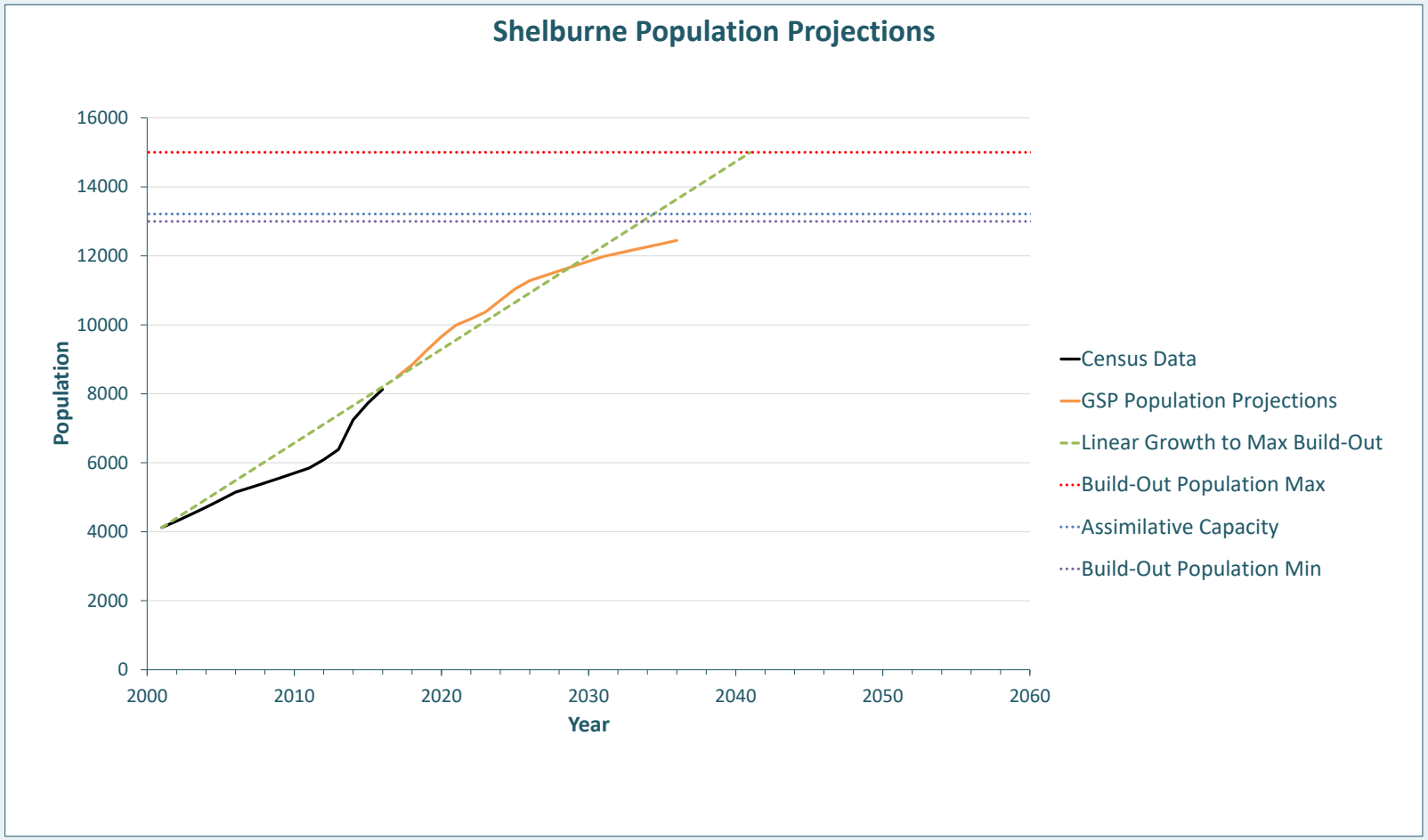
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Development Plan



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Population



*Build-out population estimated to occur between 13,000 and 15,000 in 2041

*5,100 m^3/day wastewater treatment capacity estimated to occur at approximately 15,000 people

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Future Wastewater Demands

Parameter	Existing WPCP Capabilities	2021 Projection (Base Year)	2022 Projection (ECA Capacity Exceeded)	2041 20-Projection (Max Build-Out Population)
Population	N/A	9,993	10,374	15,000
Per Capita Demand (L/cap/d)	N/A	340*	340*	340*
Average Day Flow (m^3/d)	3,420	3,398	3,459	5,100
Peak Day Flow (m^3/d)	8,921	6,897	7,021	10,353

*Per capita demand = 11-year average residential per capita demand use of 266 L/cap/d + 28 % for industrial, commercial and institutional flows.

Existing system does not have adequate capacity to accommodate future flows

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Alternatives

Alternative	Description
Do Nothing	If no action is taken to address the problem statement.
Increased Water Efficiency / Extraneous Flow Reduction	Increasing water efficiency and reducing extraneous flows on treatment capacity requirements.
Expand / Upgrade Existing WPCP • **Expand to Assimilative Capacity (4,400 m^3/day)** **OR** • **Expand to Build-Out Capacity (5,100 m^3/day)**	Expanding / upgrading the existing WPCP.
New Second WPCP for Additional Flow	Building a new WPCP and maintaining the current plant.
New Replacement WPCP	Building a new WPCP and abandoning the current plant.
Pipeline Connection to Neighbouring Municipal System	Connecting via pipeline to the Adjala-Tosorontio, Alliston, Grand Valley or Orangeville wastewater systems for additional treatment capacity.

Preliminary Screening of Alternatives

All Alternatives



Preliminary Screening

Feasible Alternatives to be Further Evaluated

Preliminary Alternative Screening Criteria

- Does it provide a viable solution to the problem?
- Are they proven technologies?
- Are they technically feasible?
- Are they consistent with planning objectives?
- Are they consistent with provincial government priority initiatives?
- Do they avoid potential impacts to sensitive environmental features?
- Are they practical, financially realistic, and economically viable?
- Are they within the ability of the Town to implement?

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Results of Preliminary Screening of Alternatives

All Alternatives



Screened-out Alternatives

Feasible Alternatives to be Further Evaluated

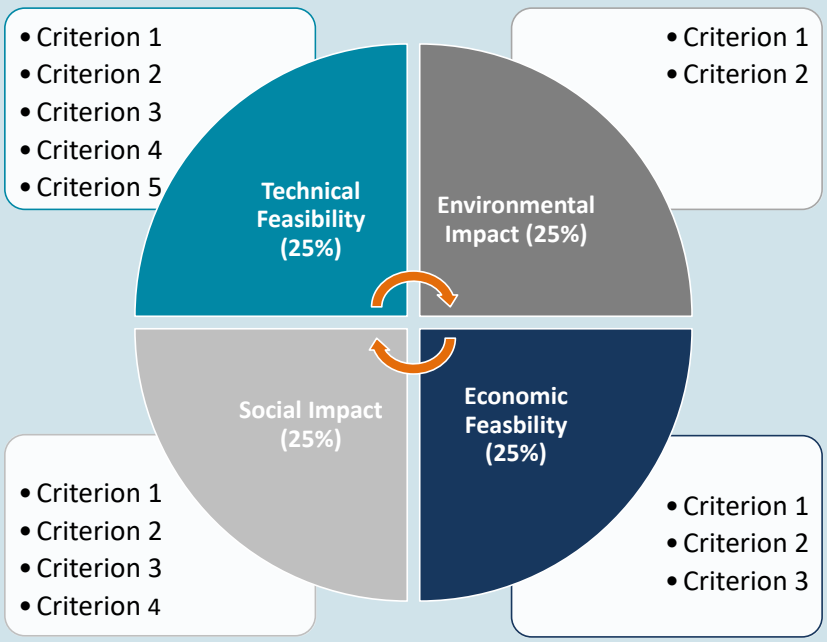
1. **The do-nothing option:** does not provide a viable solution to the problem and it does not meet future planning needs identified in the Official Plan.

2. **Increased Water Efficiency / Extraneous Flow Reduction:** has been effectively implemented over the past 5 to 7 years is no longer a viable option, as it will not provide enough capacity to meet future planning needs identified in the Official Plan.

3. **A new pipeline:** was not considered practical, financially realistic and economically viable, and was not considered within the Town's ability to implement.

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Assessment of Screened Alternative Solutions



Relative Criteria Category Weighting

Method for screening

- Feasible alternative solutions were further evaluated through a series of criteria divided into four categories.
- An example criterion would be “does the alternative solution comply with environmental regulations?”
- For each category, the most important criteria was determined and all other criteria received a comparative weighting as follows:
  - Is as important as the most important criteria;
  - Is slightly less important; or
  - Is significantly less important.
- Each alternative was then evaluated for each criteria and received a rank according to the following scheme:
  - Completely meets the criteria;
  - Somewhat meets the criteria;
  - Does not meet the criteria.

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Criteria for Evaluation







1. **Technical Feasibility**
   - Ability to Meet Effluent Requirements
   - System Reliability and Efficiency
   - Ease of Operation and Maintenance
   - Suitability to Connect to Existing System
   - System Specific Requirements

2. **Environmental Impact**
   - Compliance with Environmental Regulations
   - Terrestrial and Aquatic Impacts
   - Mitigation of Impacts

3. **Economic Feasibility**
   - Capital Cost
   - Operation and Maintenance Cost
   - Life Cycle Cost Analysis
   - Economic Sustainability
   - Site Specific Costs

4. **Social Impact**
   - Financial Implications for Residents
   - Conformity to Local Planning Provisions
   - Impacts on Quality of Life
   - Implementation Timeline
   - Longer term Planning Considerations

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Results of Assessment

Criteria Category Score Total	Criteria Relative Percentage (%)	Alternative Solutions (%)			
		Upgrade / Expand WPCP (4,400 m^3/day)	Upgrade / Expand WPCP (5,100 m^3/day)	New 2nd WPCP for Additional Flow	New Replacement WPCP
Technical	25	21.1	22.1	18.2	22
Environmental	25	24.0	24.0	18.8	18.8
Economic	25	25.0	19.8	7.3	4.2
Social	25	17.3	23.7	17.3	18.9
Totals	100	87.4	89.6	61.6	63.9

- Based on the assessment, upgrading / expanding the WPCP to a 5,100 m^3/day rated capacity is the recommended alternative solution.
- Print-outs showing the details of the assessment are available if you are interested.

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Assimilative Capacity Study



1. An Assimilative Capacity Study was undertaken in 2019 / 2020 to determine WPCP effluent limits that would protect aquatic habitat downstream in the Boyne River.
2. The QUAL2K model used and was calibrated using existing monitoring data.
3. Once calibrated, concentrations of nitrate, ammonia, phosphorous, and dissolved oxygen and carbonaceous biological oxygen demand were predicted using the model.
4. Based on model predictions, new effluent limits were set for the proposed maximum flow rate of 5,100 m^3/day.
5. The assimilative capacity study, including recommended effluent limits was accepted by the Ministry of the Environment, Conservation and Parks on April 30, 2020.

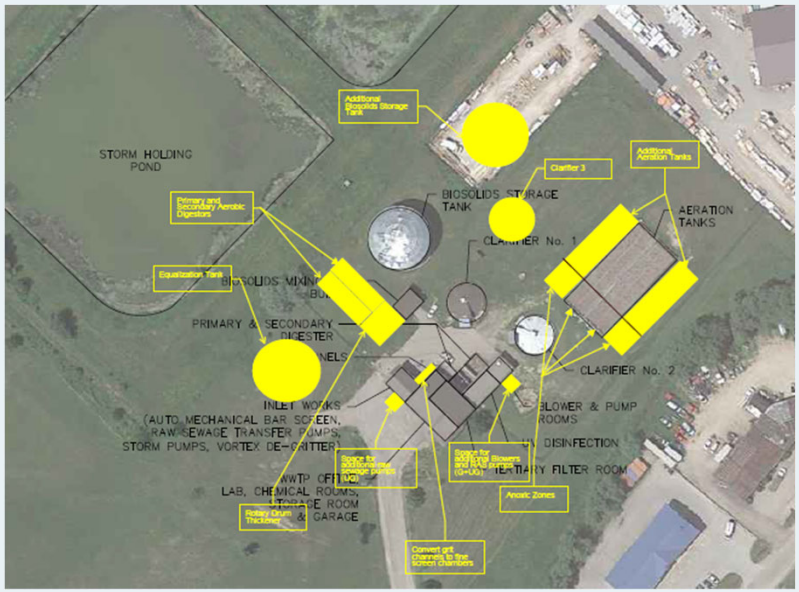
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Assimilative Capacity Study

Parameter	Current 3,420 m^3/Day Flow		Recommended Objective at 5,100 m^3/Day	
	Objective (mg/L)	Compliance Limit (mg/L)	Objective (mg/L)	Compliance Limit (mg/L)
$cBOD_5$	4	5.0	4	5.0
TP	0.12	0.25	0.09	0.12
NO3-N	—	—	10.0	13.0
Total Ammonia as N (Oct 1 – May 31)	2.0	2.4	1.1	1.2
Total Ammonia as N (June 1 to Sept 30)	0.5	0.8	0.35	0.4
Total Suspended Solids	4.0	5.0	4.0	5.0
pH	6.0-9.5	6.0-9.5	6.0-9.0	6.0-9.5
E. coli	100 organisms/100 mL	—	100 organisms/100 mL	—

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Design Concepts



1. The Project Team is in the process of evaluating "design concepts" for how best to upgrade/expand the existing WPCP to 5,100 m^3/day.
2. Based on the WPCP treatment requirements, the following main treatment options are currently being evaluated:
   - Option 1: Extended aeration with nitrification / denitrification
   - Option 2: Sequencing Batch Reactor (SBR) with nitrification / denitrification
   - Option 3: Membrane Biological Reactors (MBR) with nitrification / denitrification
3. Design concepts are also incorporating upgrades to existing equipment to address current operational challenges and to meet increased flow rates in future years.
4. One design concept under evaluation is to repurpose the stormwater ponds with a closed equalization tank to store raw wastewater. The stormwater holding ponds could be utilized as effluent polishing ponds in the future.

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Funding

The majority of funding is anticipated to come from development charges. To address the remaining costs, all available funding mechanisms will be pursued. These include but are not limited to :

- Clean Water and Wastewater Fund (CWWF)
- Ontario Community Infrastructure Fund (OCIF)
- Small Community Fund (SCF)
- Other government & Infrastructure programs as available.







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Next Steps



1. Confirm the recommended solution based on public and agency input.
2. Evaluate different “design concepts” for upgrading the WPCP (e.g., different treatment technologies).
3. Conduct another Public Information Centre to discuss the different design concepts and the recommended design concepts.
4. Select the design concept.

Thank you for attending!

Let us know what you think

- A link to a survey will be sent to within the next 30 minutes.
- The survey provides you the opportunity to provide feedback on tonight's meeting and the wastewater treatment options under consideration.

Thank you for attending!

Shelburne's Increased WPCP Capacity EA - Public Information Centre #2

Feedback Survey

Use of Survey Information

The information you provide in this survey will help inform project decisions. Survey responses will be summarized in the environmental assessment report. No personal information, including your name or email address will be included in the report nor circulated outside the project team.

General Questions

1. Did you have any technical issues participating in the video conference?

- ◯ Yes
- ◯ No

2. Please describe your technical issue.

Project-related questions

3. During the meeting, the alternative solution of upgrading/expanding the existing water pollution control plant to a capacity of 5,100 m3/day was presented as the "recommended solution". Do you have any concerns regarding this option, or disagree that it is the best option?

4. Do you have any other comments you would like to share?

Contact Information

5. Do you wish to be kept informed about the project going forward?

- ◯ Yes
- ◯ No

6. Please provide your name and email to receive future project updates. Your contact information will not be shared outside the project team nor linked with the feedback you provided in this survey.

This content is neither created nor endorsed by Microsoft. The data you submit will be sent to the form owner.

Microsoft Forms

Notice of Schedule 'C' Municipal Class Environmental Assessment - Public Information Center No. 3

Increased Capacity of the Water Pollution Control Plant (WPCP)

THE STUDY

The Town of Shelburne is conducting a Schedule "C" Municipal Class Environmental Assessment (EA) to increase water treatment capacity as current WPCP capacity cannot meet the Town's long-term needs.

THE PROCESS

This project is being planned as a **Schedule C** project under the **Municipal Class Environmental Assessment.**

PUBLIC INFORMATION CENTER #3

We are offering the opportunity to learn about studies completed to date and to provide feedback, electronically through Zoom video conferencing.

6:30 p.m. -7:30 p.m.
Thursday, May 5th, 2022
Zoom Video Conference

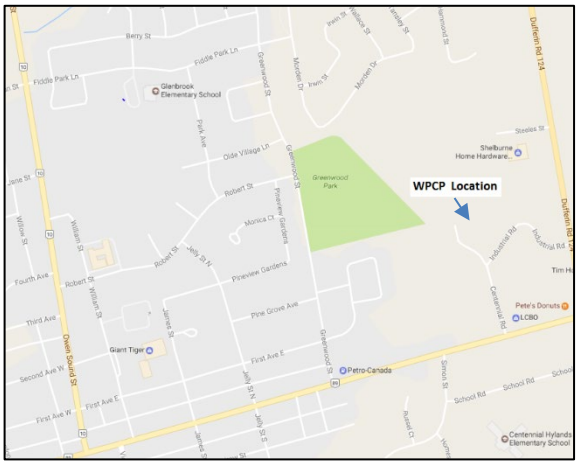
Please contact the Clerk at jwilloughby@shelburne.ca to register no later than 12:00 p.m. on Friday, April 29, 2022. To ensure your questions, comments or concerns are addressed during the public meeting, please submit them in advance by email by 12:00 p.m. April 29, 2022. A live stream of the meeting on the Town's YouTube channel will be made available at:

https://www.youtube.com/channel/UCsar-MwF8CXrgPbe2EVxh-w

CONTACT INFORMATION

Further information can also be obtained from the Town's consultant for this project:

Ian Callum, M.Sc., PMP
S. Burnett & Associates Limited
210 Broadway, Unit 203
Orangeville, ON L9W 5G4
T: 519-941-2949 ext. 240



Information will be collected in accordance with the Freedom of Information and Protection of Privacy Act. Except for personal information, all comments will become part of the public record.

This Notice first issued April 21, 2022 in the Orangeville Banner.

Notice of Schedule 'C' Municipal Class Environmental Assessment - Public Information Center No. 3

Increased Capacity of the Water Pollution Control Plant (WPCP)

THE STUDY

The Town of Shelburne is conducting a Schedule "C" Municipal Class Environmental Assessment (EA) to increase water treatment capacity as current WPCP capacity cannot meet the Town's long-term needs.

THE PROCESS

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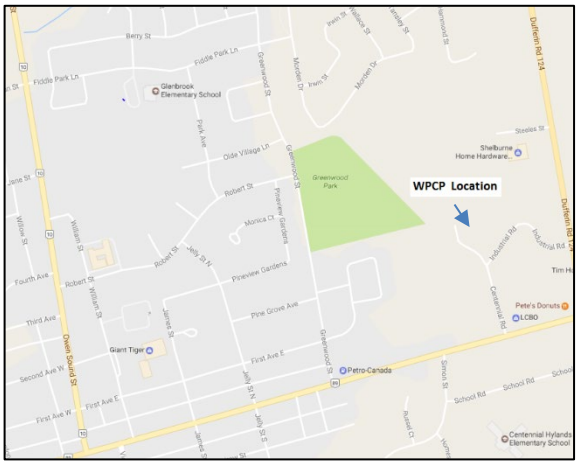
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This Notice first issued April 21, 2022 in the Shelburne Free Press.

S. BURNETT & ASSOCIATES LIMITED
ENGINEERING & ENVIRONMENTAL

April 1, 2022

Re: Town of Shelburne, Schedule 'C' Municipal Class Environmental Assessment for Increased Capacity of the Water Pollution Control Plant
SBA File No. M16018

To whom it may concern,

The Town of Shelburne (Town) is undertaking a Schedule 'C' Class Environmental Assessment (Class EA) to increase the rated capacity of the Town's existing Water Pollution Control Plant (WCPC), as the current rated capacity is not sufficient to meet the Town's long-term needs. Under the Class EA process, the Town will evaluate alternative means of increasing the rated capacity, and each alternative will be evaluated in terms of environmental, social, technical and cost considerations to arrive a preferred solution.

We are offering the opportunity to learn about studies completed to date and to provide feedback electronically through Zoom video conferencing. Details regarding the time of this Public Information Centre are provided in the attached Notice.

Following the Public Information Centre, further comments are invited for incorporation into the planning and design of the project and will be received until May 19th, 2022. Subject to comments received, the Town plans to instruct the Town Engineer to finalize the Environmental Study Report, which will be made available for public review for a minimum 30-day review period.

Please let me know if you would like to be kept informed or consulted as part of the Class EA.

Yours truly,

Ian Callum, PMP, M.Sc.
Senior Environmental Project Manager
S. Burnett & Associates Limited
ian.callum@sbaengineering.com

Incl.: Notice of Public Information Centre

M16018_WPCP PIC3 Stakeholders Ltr_FINAL_01Apr22

Notice of Schedule 'C' Municipal Class Environmental Assessment - Public Information Center No. 3

Increased Capacity of the Water Pollution Control Plant (WPCP)

THE STUDY

The Town of Shelburne is conducting a Schedule "C" Municipal Class Environmental Assessment (EA) to increase water treatment capacity as current WPCP capacity cannot meet the Town's long-term needs.

THE PROCESS

This project is being planned as a **Schedule C** project under the **Municipal Class Environmental Assessment.**

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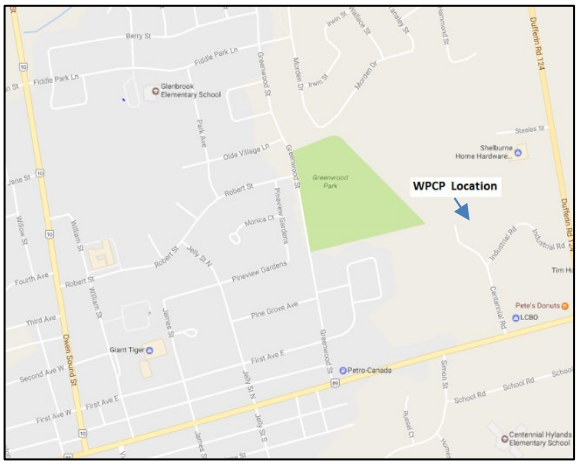
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Name	Title	Company	Address	City	Province	Postal Code	Email	Email Sent	Comments	Read Receipt Received
Municipalities										
~~Christine Gervais~~	~~Director of Planning~~	~~East Garafraxa~~	~~Administration Office, 065371 Dufferin County Road 3, U~~	~~East Garafraxa~~	~~ON~~	~~L9W 7J8~~	cgervais@eastgarafraxa.ca		email error corrected / no longer works for Amaranth	
~~Susan Stone~~	~~CAO/Clerk-Treasurer~~	~~East Garafraxa~~	~~Administration Office, 065371 Dufferin County Road 3, U~~	~~East Garafraxa~~	~~ON~~	~~L9W 7J8~~	sstone@eastgarafraxa.ca		email error corrected / no longer works for Amaranth	
Township of Amaranth	Planning Department	Township of Amaranth	374028 6 Line	Amaranth	ON	L0N 1L0	planner@amaranth.ca	Y	sent as cc by Christine Gervais, East Gary	Y
Bob Currie	Mayor	Township of Amaranth	374028 6 Line	Amaranth	ON	L0N 1L0	bcurrie@amaranth.ca	Y		Y
Chris Gerrits	Deputy Mayor	Township of Amaranth	374028 6 Line	Amaranth	ON	L0N 1L0	cgerrits@dufferincounty.ca	Y		Y
Nicole Martin	Interim Clerk	Township of Amaranth	374028 6 Line	East Garafraxa	ON	L0N 1L0	nmartin@amaranth.ca	Y	added as per Chris Gerrits	Y
~~Fazal Quadri~~	~~Treasurer~~	~~Township of Amaranth~~	~~374028 6 Line~~	~~East Garafraxa~~	~~ON~~	~~L0N 1L0~~	fquadri@amaranth.ca	Y	~~added as per Susan Stone, East Gary~~	Y
Heather Foster	Councillor	Township of Amaranth	374028 6 Line	East Garafraxa	ON	L0N 1L0	hfoster@amaranth.ca	Y		Y
~~Mark Tijssen~~	~~Councillor~~	~~Township of Amaranth~~	~~374028 6 Line~~	~~East Garafraxa~~	~~ON~~	~~L0N 1L0~~	mtijssen@amaranth.ca		~~email was not confirmed~~	
Gail Little	Councillor	Township of Amaranth	374028 6 Line	East Garafraxa	ON	L0N 1L0	glittle@amaranth.ca	Y		Y
Denise B. Holmes, AMCT	CAO/Clerk	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	dholmes@melancthontownship.ca	Y		Y
Craig Micks	Public Works Superintendent	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	roads@melancthontownship.ca	Y		Y
Darren White	Mayor	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	dwhite@melancthontownship.ca	Y		Y
David Besley	Deputy Mayor	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	dbesley@melancthontownship.ca	Y		Y
~~Wayne Hannon~~	~~Councillor~~	~~Melancthon Township~~	~~157101 Highway #10, RR#6~~	~~Melancthon~~	~~ON~~	~~L9V 2E6~~	~~whannon@melancthontownship.ca~~			
Margaret Mercer	Councillor	Melancthon Township	157101 Highway #10, RR#6	Melancthon	ON	L9V 2E6	mmercer@melancthontownship.c	Y		Y
David Trotman	Director of Planning	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	Planning@townofmono.com	Y	See Judy Kohne, Planning Assistant	Y
Mark Early	Chief Administrative Officer and Clerk	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	mark@townofmono.com	Y		Y
~~Laura Ryan~~	~~Mayor~~	~~Town of Mono~~	~~347209 Mono Centre Road, RR#1~~	~~Mono~~	~~ON~~	~~L9W 6S3~~	~~laura.ryan@townofmono.com~~			
Ralph Manktelow	Councillor	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	ralph.manktelow@townofmono.c	Y		Y
Fred Nix	Councillor	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	fred.nix@townofmono.com	Y		Y
Sharon Martin	Councillor	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	sharon.martin@townofmono.com	Y		Y
John Creelman	Deputy Mayor	Town of Mono	347209 Mono Centre Road, RR#1	Mono	ON	L9W 6S3	john.creelman@townofmono.com	Y		Y
~~Judy Kohne~~	~~Planning Assistant~~	~~Town of Mono~~	~~347209 Mono Centre Road, RR#1~~	~~Mono~~	~~ON~~	~~L9W 6S3~~	judy.kohne@townofmono.com		~~Email not sent to Judy directly, but read report sent~~	
Tracey Atkinson	CAO/Planner	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	tatkinson@mulmur.ca	Y		Y
Janet M. Horner	Mayor	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	jhorner@mulmur.ca	Y		Y
Earl Hawkins	Deputy Mayor	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	ehawkins@mulmur.ca	Y		Y
Shirley Boxem	Councillor	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	sboxem@mulmur.ca	Y		Y
Patricia Clark	Councillor	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	pclark@mulmur.ca	Y		Y
Ken Cufaro	Councillor	Township of Mulmur	758070 2nd Line East, RR#2	Mulmur	ON	L9V 0G8	kcufaro@mulmur.ca	Y		Y
Scott Burns	Director of Public Works	Dufferin County	55 Zina Street	Orangeville	ON	L9W 1E5	sburns@dufferincounty.ca	Y		Y
First Nations and Métis										
Donna Big Canoe	Chief	Chippewas of Georgina Island	RR#2 Box N-13	Sutton West	ON	L0E1 R0	donna.bigcanoe@georginaisland.c	Y		Y
Lester Anoquot	Chief	Saugeen First Nation	6493 Highway 21, RR1	Southampton	ON	N0H 2L0	sfn@saugeen.org	Y	email error at lanoquot@saugeenfirstnation.ca	Y
~~Guy Monague~~	~~Chief~~	~~Beausoleil First Nation~~	~~11 O'Gemaa Miikaan~~	~~Christian Islan~~	~~ON~~	~~L9M 0A9~~	~~bfnchief@chimnissing.ca~~			
~~Greg Nadjiwon~~	~~Chief~~	~~Chippewas of Nawash Unceded First Nation~~	~~135 Lakeshore Boulevard~~	~~Neyaashiinigm~~	~~ON~~	~~N0H 2T0~~	~~chiefsdesk@nawash.ca~~			
Rodney Noganosh	Chief	Chippewas of Rama First Nation	5884 Rama Road, Suite 200	Rama	ON	L3V 6H6	chief@ramafirstnation.ca	Y		Y
Kelly LaRocca	Chief	Mississaugas of Scugog Island First Nation	22521 Island Road	Port Perry	ON	L9L 1B6	klarocca@scugogfirstnation.com	Y		Y
Stacey Laforme	Chief	Mississaugas of the New Credit First Nation	2789 Mississauga Road, R.R. #6	Hagersville	ON	N0A 1H0	stacey.laforme@mncfn.ca	Y		Y
Jesse Fieldwebster	Manager, Lands, Resources and Consultations	Métis Nation of Ontario	P.O. Box 4, 355 Cranston Crescent	Midland	ON	L4R 4K6	consultations@metisnation.org	Y	email corrected from Jesse Fieldwebster <JesseF@metisnation.org>	Y
Mark Hill	Chief	Six Nations of the Grand River Territory	1695 Chiefswood Road, PO Box 5000	Oshweken	ON	N0A 1M0	markhill@sixnations.ca	Y		Y
Review Agencies										
	General EA notification email	Ministry of Environment, Conservation and Parks					eanotification.wcregion@ontario.c	Y	All project notices, need to attach form!!!	Y
	Director, Environmental Assessment and Permi	Ministry of Environment, Conservation and I	135 St. Clair Avenue West, 1st Floor	Toronto	ON	M4V 1P5			Only Notice of Completion	
Grand River Conservation Authority		Grand River Conservation Authority	400 Clyde Road, PO Box 729	Cambridge	ON	N1R 5W6	grca@grandriver.ca	Y	Automatic message to forward to appropriate cc	Y
Nottawasaga Valley Conservation Authority		Nottawasaga Valley Conservation Authority	John Hix Conservation Administration Centre. 8195 8th L	Utopia	ON	L0M 1T0	admin@nvca.on.ca	Y		Y
Mark Anderson, P. Eng.	Water Quality Engineer	Grand River Conservation Authority	400 Clyde Road, PO Box 729	Cambridge	ON	N1R 5W6	manderson@grandriver.ca	Y	Was forwarded info, include in further info	Y

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Shelburne WPCP Class EA

Design Alternatives Update

May 2022

WPCP EA Status

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- ✓ Notice of Commencement
- ✓ PIC #1 – Introducing the Project (June 2018)
- ✓ Evaluating/Selecting Preferred Alternative Solution (upgrade WPCP)
- ✓ PIC #2 – Feedback on Alternative Solution
- ✓ Evaluate Design Alternatives
- ✓ Select Preferred Design Alternative
- We are here → PIC #3 – Feedback on Preferred Design Alternative
- Finalize EA and Issue Notice of Completion

Alternative Design Steps

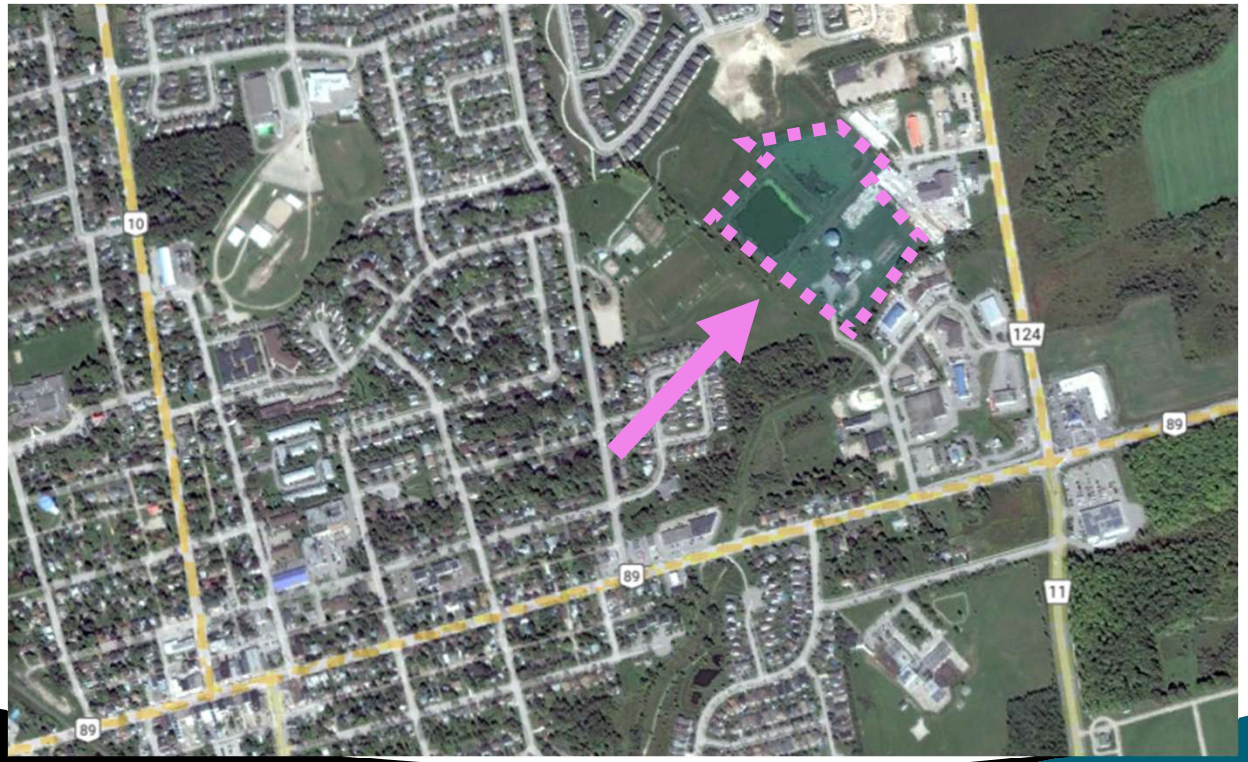
- Establish WPCP design criteria
- Establish environmental baseline
- Develop alternatives for each treatment process at the WPCP
- Compare alternative designs using relevant criteria (e.g., cost, redundancy, reliability, maintenance requirements, ease of operation, etc.)
- Select a recommended design alternative for each treatment process

WPCP Design Criteria

- Estimated Population 2041 – 15,000
- Wastewater Flow Basis [based on historical data] = 340 L/p/d
- Proposed Design:
  - Average Daily Flow (ADF) – 5,100 m3/d
  - Max Day Factor – 2.5
  - Max Daily Flow (MDF) – 12,750 m3/d
  - Equalization Storage – 2,550 m3

WPCP Location

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Summary of Estimated Cost for Preferred Design Option

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Treatment Component	Key upgrades	Capital Cost
Headworks	New equalization tank, new pumps, building expansion, new vortex degritter and bar screens, new fine screen system	$6.8 M
Secondary treatment	New membrane batch reactor (MBR) treatment system located in existing aeration tanks (modified)	$8.1 M
Tertiary treatment	New UV disinfection system	$0.3 M
Solids management	New pumps, thickener, primary and secondary digester tanks, new blowers and diffuser systems, new biosolids storage tank	$7.4 M
Misc. upgrades		$4 M
Engineering + Contingency		$6.6 M
	Total	**$33 M**

Addressing Historic Plant Odours

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Historic Odor Source	Planned Upgrade
Primary Sources	
Undersized primary and secondary sludge digestors	• Adding sludge thickening before digestors to reduce the amount of sludge requiring digestion • Construction of new properly-sized digestors • Construction of a new biosolids tank
Secondary Sources	
Use of ponds to store untreated wastewater during peak flow events	• Construction of a new equalization tank that will significantly reduce the frequency of usage of one of the ponds • The second pond will be used to store treated wastewater that does not meet effluent discharge limits in an emergency situation

Design Recommendations

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Process	Alternatives	Preferred Option	Rationale
Bar Screen	1. New screen (15,300 m3/d) + manual backup 2. Old screen (13,000 m3/d) + new screen (13,000 m3/d) 3. Two (2) new screens (15,300 m3/d)	**Option 3:** Two (2) new screens	• Ease of operation and maintenance
Raw Sewage Pumping	1. Two (2) new high capacity pumps (1 duty + 1 standby) 2. Three (3) new pumps (2 duty + 1 standby with VFD, 6,375 m3/d each)	**Option 2:** Three (3) new pumps	• Ease of operations (ADF – Pump 1 (ON) , MDF – Pump 1 + 2 (ON))
Wet Weather Management	1. Continued use of storm ponds 2. New 2,550 m3 storage tank (above or belowground) 3. New 5,100 m3 storage tank (above or belowground)	**Option 2:** Above ground 2,550 m3 storage tank with one storm pond as emergency backup	• Reduces use of storm ponds to emergency conditions only (2X per year max) while avoiding the cost of a larger tank that would be underutilized. • Above ground considerably less costly.
Vortex Degritter	1. New degritter 5,100 m3/d 2. New degritter 8,790 m3/d 3. New degritter 12,750 m3/d	**Option 3:** New degritter – 12,750 m3/d capacity	• Ease of operation and reliability (only option not requiring use of old degritter). Old vortex degritter maybe used when new one is down during maintenance.
Primary Treatment/Fine Screen	1. One (1) fine screen (12,750 m3/d) 2. Two (2) fine screens (6,375 m3/d)	**Option 2:** Two Fine Screens – 6,375 m3/day each	• Other option cannot be retrofitted in existing channel and there is no redundancy at ADF.

Recommendations (cont.)

Process	Alternatives	Preferred Option	Rationale
Secondary Treatment	1. Extended aeration (current) + nitrification/denitrification 2. Sequence batch reactor (SBR) + nitrification/denitrification 3. Membrane batch reactor (MBR) + nitrification/denitrification 4. Integrated Fixed Film Activated Sludge (IFAS) + nitrification/denitrification	**Option 3:** MBR with nitrification/denitrification	Given that the decision on secondary treatment has the greatest impact on cost, operations and effluent quality, the rationale is explained in detail on the following slide. Ease of construction • Lower space requirement allows for expansion • Best able to meet effluent limits • Shares lowest lifecycle cost with IFAS • Lowest capital costs since it uses the existing aeration channels.
Tertiary Treatment	1. Replace retired UV system with new	**Option 1:** New UV system	
Sludge Thickening	1. Gravity thickening 2. Gravity belt 3. Rotating drum	**Option 3:** Rotating drum thickener	• Lower odour potential • More thickening than gravity • Lower space requirement than gravity
Sludge Digestion	1. Aerobic digestion 2. Autothermal thermophilic aerobic digestion (ATAD)	**Option 1:** Aerobic Digestion	• Ease of operation • Lower cost
Sludge Storage	1. New biosolids storage tank 2. Offsite haulage	**Option 1:** New tank	• Lower lifecycle cost • Ease of operations

Secondary Treatment

- SBR was screened-out since this option provides similar effluent water quality as the extended aeration option and is comparatively difficult to operate.
- Alternatives were evaluated based on Technical, Environmental, Social and Cost criteria
- When comparing alternatives for each criterion:
  - ⊕ Symbolizes the best relative alternative for that criterion
  - ∅ Symbolizes the next best relative option for that criterion
  - ⊗ Symbolizes the least desirable relative option for that criterion

Secondary Treatment

Technical Criteria	Extended Air	MBR	IFAS
Maintenance requirement	⊕	⊗	∅
Ease of construction	⊗	⊕	∅
Operator familiarity	⊕	∅	⊗
Maintaining operation during construction	⊕	∅	∅
Space requirement/future expansion	⊗	⊕	∅
OVERALL	⊗	⊕	∅

Secondary Treatment

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Environmental Criteria	Extended Air	MBR	IFAS
Ability to meet effluent requirement	∅	⊕	∅
Social Criteria	**Extended Air**	**MBR**	**IFAS**
Impact to adjacent residents	⊕	⊕	⊕
Impacts to adjacent business	⊕	⊕	⊕

Economic Evaluation

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Economic Criteria	Extended Air	MBR	IFAS
Capital Cost	⊗ $46 million	⊕ $33 million	⊕ $38 million
Operation and Maintenance Costs	⊕ $1.58 million/yr	⊕ $1.85 million/yr	⊕ $1.62 million/yr
Lifecycle Cost (30-year present value)	⊕ $79 million	⊕ $71.5 million	⊕ $72 million
OVERALL	⊗	⊕	⊕

- Costs within 30% of each other were considered equal, as these are Class D cost estimates
- Considered around $ 1M for existing clarifier upgrades for the extended aeration and IFAS secondary treatment options
- Includes around $ 1M for stand-alone office building
- Cost are for the entire system, not just secondary treatment

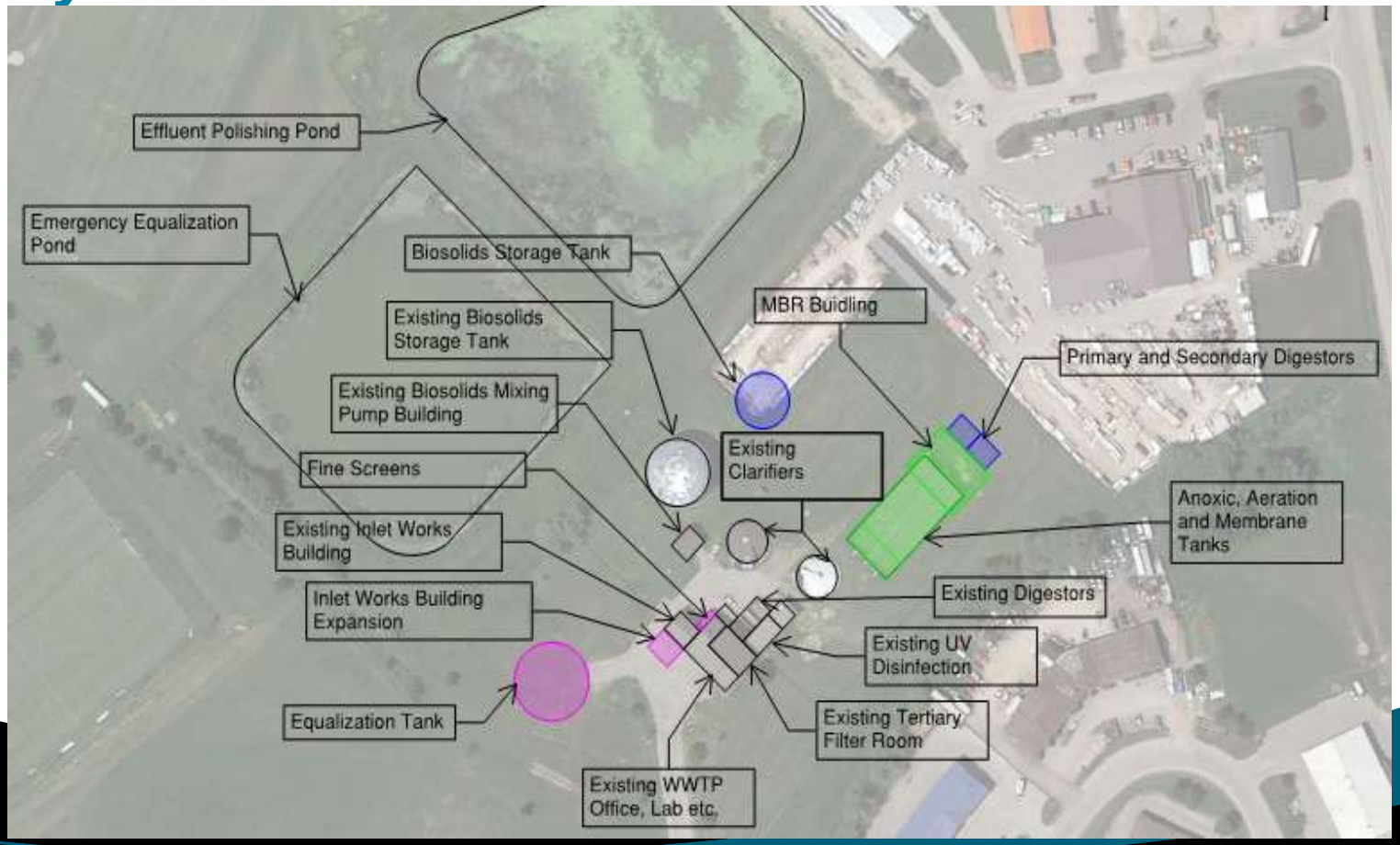
Overall Evaluation

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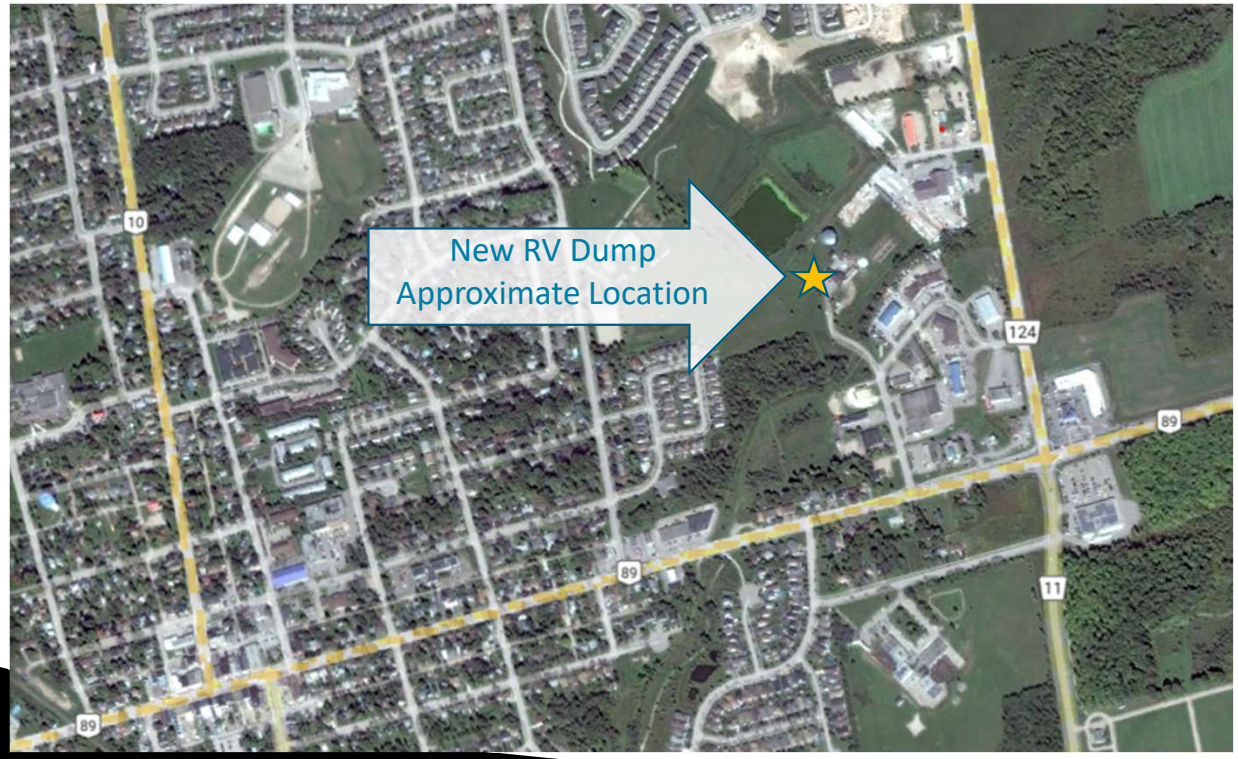
Evaluation Criteria	Extended Air	MBR	IFAS
Technical	⊗	⊕	∅
Environmental	∅	⊕	∅
Economic	⊗	⊕	⊕
Social	⊕	⊕	⊕
OVERALL	⊗	⊕	∅

Preliminary Overall Plant Layout for MBR Secondary Treatment

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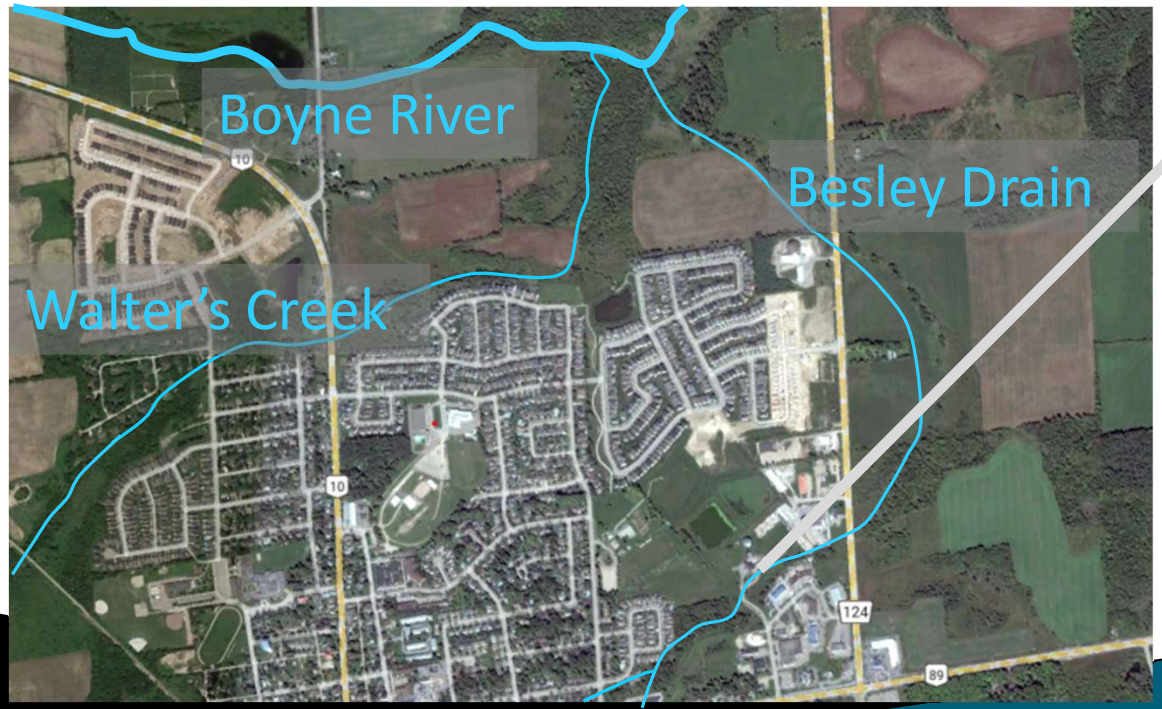
New Waste/RV Dump



- The RV Dump will be relocated from Fiddle Park
- This service will be offered at no cost to Shelburne residents and for a fee to visitors.
- Weekdays 8:30 a.m. - 4:30 pm

Shelburne Watercourses

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WPCP Discharge to Besley Drain

WPCP EA

Next Steps



- Finalize EA Report (early summer 2022)
- Notice of Completion (early summer 2022)
- Implement monitoring plan (initiated in spring 2022)
- Detailed design and tendering (2022-2023)
- Construction (2024-2026, contingent on funding)

Ian Callum

From: Ian Callum
Sent: September 14, 2023 9:24 AM
To: eanotification.wcregion@ontario.ca
Cc: Stephen Burnett; Nibhana Suvarna; jmoss@shelburne.ca; Terrance Gole; Denyse Morrissey; Carey Holmes; 'Jennifer Willoughby'; Joanne Marceau (jmarceau@shelburne.ca)
Subject: Increased Capacity of the Town of Shelburne's Water Pollution Control Plant - Schedule 'C' Draft Municipal Class EA - For Review
Attachments: M16018_WPCP EA_Report_MECP Draft_V1_13Sep23.pdf

Good morning,

On behalf of the Town of Shelburne, please find attached the Increased Capacity of the Town of Shelburne's Water Pollution Control Plant - Schedule 'C' Draft Municipal Class EA. My understanding is that the Ministry will conduct a technical review of this report within 30 days of receipt of this report. After working with the Ministry to resolve any comments, our intent is to file a Notice of Completion for this project to initiate the 30-day Public, Agency, First Nations, and Métis review period.

If you require any additional information or clarification during your review, please feel free to contact me.

Kind regards,

Ian

Ian Callum, M.Sc., PMP
Senior Environmental Project Manager

S. Burnett & Associates Limited
210 Broadway, Unit 203
Orangeville, ON L9W 5G4

T: 519.941.2949 ext. 240
C : 519-215-6893
F: 519.941.2036
W: www.sbaengineering.com

S. BURNETT & ASSOCIATES LIMITED
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December 18, 2023

Ministry of the Environment, Conservation and Parks
Environmental Assessment Branch
940 Watson Road South, RR 1
Puslinch, ON N0B 2J0

Attn: Mira Majerovich, Regional Environmental Planner

Re: Increased Capacity of the Town of Shelburne's Water Pollution Control Plant
Environmental Assessment Study Report
SBA File No. M16018

Dear Mira,

This letter includes a Comment Disposition Table that explains how Ministry of the Environment, Conservation and Parks comments from review of the Town of Shelburne's Water Pollution Control Plant were reflected in the updated report. This letter will be included with the revised report as part of the record of consultation.

#	Comment / Issue Identified	Resolution
1	Section 5.3.2.3 Archaeological Resources refers to The Ministry of Tourism, Culture and Sport (MTCS) as Ministry of Heritage, Sport, Tourism and Culture Industries. However, please note that the responsibility for administration of the Ontario Heritage Act and matters related to cultural heritage have been transferred from the Ministry of Tourism, Culture and Sport (MTCS) to the Ministry of Citizenship and Multiculturalism (MCM). Individual staff roles and contact information remain unchanged.	Statement amended to read "This was confirmed by the Ministry of Heritage, Sports, Tourism, and Culture Industries (now the Ministry of Citizenship and Multiculturalism (MCM)".
2	It appears that a section of the report on page ix, refers to "The Simcoe Water Supply Project". Please ensure that this information is correct and that the reference to a separate EA project is desired. If not, please make required changes.	This incorrect reference was corrected to read "Town of Shelburne Increased Capacity of the Town of Shelburne's Water Pollution Control Plant".

3	Appendices should be included in the final Environmental Study Report.	Appendices will be included in the final report.
4	The date for and a copy of the Notice of completion and any follow- up correspondence should be included in the final Environmental Study Report.	A new Section 10 "Notice of Completion" was added and includes the date of publication and information on Section 16 Orders that was previously provided in Section 9 "Project Implementation", which is now Section 10 and describes next steps after the 30-day public / agency review period is complete.
5	Please note this project is within West Central Region. Therefore, the Notice of Completion should be sent to eanotification.wcregion@ontario.ca	Noted
6	The MCEA section A.4.2 Environmental Study Report (Schedule C) Chapter 4 Alternative Designs provides additional details about documentation and extent of documentation for consultation processes. The final report should include a table of concerns expressed by the public and the measures taken by the proponent to address these concerns. Correspondence between all members of the public and discussions about project procedures should be documented in a designated appendix and included in the final ESR report.	No concerns or comments were received during or after of PIC1 and PIC3. How comments received during PIC2 were addressed in the ESR report is now reflected in Section 4.4, Table 10.
7	All correspondence with ministry staff should be documented in the ESR as per the last sentence of Section A.3.6 of the Municipal Class EA, 2015 document, "Review agency responses are to be documented in the Project File or the ESR." The ministry requests that the proponent include in the ESR documentation of all correspondence with ministry staff, including all email correspondence related to the development of effluent criteria, either in email format or as a summary in an Overview of Agency Comments table designated for stakeholder and agency consultation material.	Agency correspondence is provided in Appendix C. A new Section 9.0 "Draft Report Consultation" summarizes MECP's review of the draft report and relevant emails and this comments disposition table are included in Appendix C.
8	The draft Environmental Study Report does not include indigenous consultation records (emails, meeting minutes, phone call records). All correspondence and efforts to follow-up by the proponent should be documented in the	Our distribution list included First Nations and Métis communities and

	record of consultation that accompanies the Class EA documentation. Please include the Indigenous consultation records in the ESR in an Appendix.	correspondence is included in Appendix C.
9	In December 2019, the ministry released a new regulation under the Environmental Protection Act, titled On-Site and Excess Soil Management (O. Reg. 406/19) to support improved management of excess construction soil. The regulation is being phased in over time, with the first phase in effect on January 1, 2021. For more information, please visit www.ontario.ca/page/handling-excess-soil. The Report should reference that activities involving the management of excess soil should be completed in accordance with O. Reg. 406/19 and the ministry's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices" (2014). All waste generated during construction must be disposed of in accordance with ministry requirements.	Table 45. "Effects Assessment of the Preferred Design" now includes the following mitigation measure for contamination of soil through improper disposal: "All waste generated during construction will be disposed of in accordance with ministry requirements, including the *Environmental Protection Act* Regulation *On-Site and Excess Soil Management (O. Reg. 406/19)* and the guidance document Management of Excess Soil – A Guide for Best Management Practices."
10	MECP recommends that non-chloride dust-suppressants be applied. For a comprehensive list of fugitive dust prevention and control measures, refer to Cheminfo Services Inc. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities report prepared for Environment Canada. March 2005. This should be respectively mentioned in Table 45: Effects Assessment for Preferred Design.	Mitigation measures in Table 45 amended to read "Dust control measures to be employed based on comprehensive list of dust suppressants and considering best management practices listed in "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (Cheminfo Services Inc., 2005). Non-chloride dust suppressants to be applied."
11	Please advise whether the Town of Sherbourne [sic] is planning to reassess noise after construction. Noise control measures should be addressed in construction mitigation plans to mitigate adverse noise impacts to nearby residential land uses within the study area during construction activities. Expanding on ways in which the proponent will adhere to the town of Shelburne noise by-law No.45-2004 should be considered (Table 45).	Additional noise mitigation measures were added to Table 45, including: • Adherence to Town of Shelburne noise by-law No. 45-2004 by prohibiting construction noise between 23:00 and 7:00 the next day.

		• Provide advanced notification to adjacent residences and businesses advising of construction schedule and to provide a contact for any noise concerns. • Maintain construction equipment in proper working order
12	Climate change considerations have not been documented in the ESR. The document "Considering Climate Change in the Environmental Assessment Process" (Guide) (www.ontario.ca/page/considering-climate-change-environmental-assessment-process) is now a part of the EA program's Guides and Codes of Practice. The Guide sets out the ministry's expectation for considering climate change in the preparation, execution and documentation of environmental assessment studies and processes. The guide provides examples, approaches, resources, and references to assist proponents with consideration of climate change in EA. The proponent should review this Guide in detail. The ministry expects proponents of Class EA projects to: • Consider the project's expected production of greenhouse gas emissions and impacts on carbon sinks (climate change mitigation), as well as resilience or vulnerability of the undertaking to changing climatic conditions (climate change adaptation). • Include a discrete section in the ESR detailing how climate change was considered in the EA. How climate change is considered can be qualitative or quantitative in nature and should be scaled to the project's level of environmental effect. In all instances, both a project's impacts on climate change (mitigation) and impacts of climate change on a project (adaptation) should be considered.	A new climate change section has been added in Section 4.5.

13	The ministry recommends that the proponent include a section on source water protection in the main body of Report to clearly document how the proximity of the project to any delineated vulnerable areas, such as highly vulnerable aquifers and significant groundwater recharge areas, was considered and assessed through the Class EA process. i. In order to determine if this project is occurring within a vulnerable area, proponents can use this mapping tool: http://www.applications.ene.gov.on.ca/swp/en/index.php. Note that various layers (including WHPAs, WHPA-Q1 and WHPA-Q2, IPZs, HVAs, SGRAs, EBAs, ICAs) can be turned on through the "Map Legend" bar on the left. The mapping tool will also provide a link to the appropriate source protection plan to identify what policies may be applicable in the vulnerable area. ii. For further information about the source protection plan and assistance in identifying all applicable policies and their requirements, proponents should contact source protection program manager for the applicable source protection region (resources available online: https://conservationontario.ca/conservation-authorities/source-water-protection/source-protection-plans-and-resources/).	A new Source Water Protection Section has been added in Section 4.6, which includes source water protection mapping and a summary of consultation with the Nottawasaga Valley Conservation Authority.
14	The proposed effluent criteria with the new rated capacity of 5,100 m3/d are acceptable and are restated below with loadings of the respective parameters.	Noted.
15	Raw and final effluent shall continue to be monitored as is with a revised set of parameters described in the tables below.	Noted.
16	Annual performance reporting shall continue as is as specified in the current ECA.	Noted.
17	MECP recommends that the final ESR in addition to the information included in section 9 Project Implementation, if available should expand on information about the timing of project implementation, if available, such as a high-level Project Schedule indicating the anticipated timeline for detailed design, approvals / permits, and construction.	Additional detail is now included in the Section 11 Conclusion Section, which states "Upon completion of detailed design estimated for the end of 2024, a request to amend the existing Environmental Compliance Approval will be submitted to the Ministry of the Environmental, Conservation

		and Parks. Construction would then proceed for 2025 and 2026. It should be noted that this schedule is contingent on the Town's ability to secure funding".
18	There were some discrepancies noted in the subject Class EA document compared to the ones the ministry approved earlier. For example, the ministry approved both design objectives, limits, and corresponding loadings of various effluent parameters but in the Class EA only concentration limits were included, no objectives and loading information were provided in the report.	These discrepancies have been remedied in Tables 2 and 17.
19	It is recommended, that influent and effluent monitoring and annual reporting provision are included in the Class EA report.	The previous monitoring section is now separated into 7.1 Influent and Effluent Monitoring and 7.2 Downstream Monitoring.
20	The objective of pH values used in the report seem to be inaccurate. The ministry approved pH was 6.5-8.5 but the Class EA used 6.0-9.0. The limit the ministry approved 6.0-9.0 but the Class EA report used 6.0-9.5. Please ensure that all data used is cohesive and draws reference to respective regulations and legislations.	These discrepancies have been remedied in Tables 2 and 17.
21	The Limit for E. coli that the ministry approved is 200 CFU/100 mL. It is recommended that these standards and approvals relevant to discussed information should be included in the report.	This is now correctly reflected in Table 2 and 17.
22	The ESR confirmed a rated capacity of 5,100 m3/d is the preferred solution for the upgrade and expansion of the existing WPCP and established a maximum day flow of 12,750 m3/d. Please consider Section 5.2 for the preferred options for the ESR upgrades for each process including size information.	Noted. Design of the various process units was based on the 2008 and 2019 Ministry Sewage Works Design Guidelines
23	In the Section 5.2 of the draft ESR, it is unclear about what is design peak instantaneous flow and want [sic] is design peak hourly flow in the sizing of the process units.	Peak hourly flow is estimated to be 637.5 m3/hr (15,300 m3/day) (peak factor of 3) based on the MECP design guidelines. The peak factor of 3 was estimated based on a peak factor of 2.78 derived from using the Harmon formula and 2.9 using the Babbitt formula

		for a population of 15,000 people. Peak instantaneous and peak hourly flow could not be estimated using historical data since this information is not available for the plant.
24	We recommend including a reference to the Ministry Sewage Works Design Guidelines (2008) and review the ESR for sewage treatment process unit design. For design of the various process units or components of sewage treatment plants, please refer to Table 8-2 – Unit Process Design Basis and the chapters related to each of the process units. The Ministry Sewage Works Design Guidelines also provide details about reliability and redundancy of specific process trains, units, or equipment.	Design of the various process units is based on the 2008 and 2019 Ministry Sewage Works Design Guidelines. Reference to the Ministry Sewage Works Design Guidelines has been added. Design basis for grit removal and disinfection mentioned in Table 8.2 does not seem to be applicable to the Shelburne WPCP since the raw sewage pumping and equalization at the plant are prior to the grit vortex system (See attached process flow diagram for more details). There will be additional provision at the plant to transfer treated wastewater that does not meet the required limits post MBR to the storm pond and released back to the plant through the headworks during low flow periods. We have approached the Ministry's group that would be reviewing the design and approving the ECA for a pre-consultation meeting regarding redundancy required for specific process units or equipment.
25	Monitoring procedures are required for Schedule C Projects under MCEA. The draft ESR mentions the 'Boyne River Stewardship and Monitoring Plan' that was designed in a partnership between NVCA and the Town of Shelburne. A copy of this report and monitoring procedures and schedules should be published in the final report.	This report is now included as Appendix H.

If there is any aspect regarding how comments were addressed that could benefit from further discussion, I would be more than willing to do so on a call. Otherwise, please confirm whether MECP has any further comments before we issue our Notice of Completion.

Yours truly,



Ian Callum
Senior Environmental Project Manager
S. Burnett & Associates Limited

Incl. Revised Environmental Assessment Study Report

M16018_Shelburne WPCP EA_MECP Comments_V2_Final_18Dec23

Ian Callum

From: Ian Callum
Sent: January 23, 2024 4:52 PM
To: Del Villar Cuicas, Joan (MECP)
Cc: Stephen Burnett; Nibhana Suvarna; jmoss@shelburne.ca; Weber, Martha (MECP)
Subject: RE: Increased Capacity of the Town of Shelburne's Water Pollution Control Plant - Schedule 'C' Draft Municipal Class EA - For Review
Attachments: M16018_WPCP EA_Report_MECP Draft_Final_23Jan24.pdf

Good afternoon Joan and Happy New Year as well,

In response to the latest MECP comments, we have revised Tables 78 and 78 in Section 7 and have added a new discussion of Primary Treatment in Section 5.6. I have attached the revised EA report for your review, and once you've reviewed these changes, please confirm that they have addressed your concerns.

Kind regards,

Ian

From: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>
Sent: Wednesday, January 3, 2024 8:37 AM
To: Ian Callum <ian.callum@sbaengineering.com>
Cc: Stephen Burnett <stephen.burnett@sbaengineering.com>; Nibhana Suvarna <nibhana.suvarna@sbaengineering.com>; jmoss@shelburne.ca; Weber, Martha (MECP) <Martha.Weber@ontario.ca>
Subject: RE: Increased Capacity of the Town of Shelburne's Water Pollution Control Plant - Schedule 'C' Draft Municipal Class EA - For Review

Good morning Ian and Happy New Year,

We have reviewed The Town of Shelburne's revised ESR, dated December 19, 2023, for the Increased Capacity of the Town of Shelburne's Water Pollution Control Plant and the response's table. We would like to provide the following additional comments for your consideration:

- **Pg.79. Table 17.** The title of the Table reads, "Table 17: Current and Future WPCP Effluent Objectives and Limits" , but the Table contains only future effluent objectives and limits. The Table should be corrected incorporating current effluent objectives and limits.

- **Pg.133. Figure 32.**

Figure 32. Final Effluent Monitoring (Post Treatment before Discharging to the Environment).

Frequency	Once per month
Sample Type	24-hour composite
Parameters	BOD5, Total Suspended Solids, Total Phosphorus, Total Ammonia Nitrogen, Total Kjeldahl Nitrogen, pH and Temperature

Final effluent monitoring as stated in the table above (Figure 32) was not correct. The following was the final effluent monitoring agreed to by the ministry during ACS review (please see the ministry's email attached). It is suggested to replace Figure 32 with the following, where monitoring frequency is 'weekly' not 'monthly' and an expanded set of parameters should be monitored:

Final Effluent Monitoring (post treatment before discharging to the environment)	
Frequency	Weekly
Sample Type	24-hour composite
Parameters	pH, temperature, cBOD5, Total Suspended Solids, Total Phosphorus, Nitrate Nitrogen, Nitrite Nitrogen, Total Ammonia Nitrogen, Total Kjeldahl Nitrogen, Unionized Ammonia Nitrogen (calculated), E.coli and Alkalinity

- To reduce the chances of membrane damage, wastewater should undergo a high level of debris removal prior to the MBR. Primary treatment is often provided in larger installations, although not in most small to medium sized installations, and is not a requirement.

Please do not hesitate to contact me, if you have any questions.

Regards,

Joan Del Villar Cuicas (she/her)
Regional Environmental Planner
Project Review Unit | Environmental Assessment Branch
Ontario Ministry of the Environment, Conservation and Parks
Joan.delvillarcuicas@ontario.ca|Phone: 365-889-1180

From: Ian Callum <ian.callum@sbaengineering.com>
Sent: December 19, 2023 3:47 PM
To: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>
Cc: Battarino, Gavin (MECP) <Gavin.Battarino@ontario.ca>; Stephen Burnett <stephen.burnett@sbaengineering.com>; Nibhana Suvarna <nibhana.suvarna@sbaengineering.com>; jmoss@shelburne.ca; Weber, Martha (MECP) <Martha.Weber@ontario.ca>
Subject: RE: Increased Capacity of the Town of Shelburne's Water Pollution Control Plant - Schedule 'C' Draft Municipal Class EA - For Review

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good afternoon Joan,

The Town of Shelburne has revised its ESR for the Increased Capacity of the Town of Shelburne's Water Pollution Control Plan based on comments received from MECP. The revised report is accessible at the link below and the report is prefaced by a concordance table that explains how each comment received was addressed.

https://www.dropbox.com/scl/fi/uvoxrtu3qm6wcrwq9fu5y/M16018_Shelburne-WPCP-EA-Ltr_Report-MECP-Comments_V2_Final_19Dec23.pdf?rlkey=bi6vurbmrc4lspqqn93l09kl5&dl=0

Upon review of the concordance table and revised report, please lets us know if you have any further comments or concerns, as we would like to resolve all comments prior to issuing the Notice of Completion.

Kind regards and happy holidays,

Ian

From: Del Villar Cuicas, Joan (MECP) <Joan.DelVillarCuicas@ontario.ca>
Sent: Thursday, October 5, 2023 9:05 AM
To: Ian Callum <ian.callum@sbaengineering.com>
Cc: Battarino, Gavin (MECP) <Gavin.Battarino@ontario.ca>
Subject: RE: Increased Capacity of the Town of Shelburne's Water Pollution Control Plant - Schedule 'C' Draft Municipal Class EA - For Review

Good morning Ian,

Thank you for circulating the Town of Shelburne's draft ESR for the Increased Capacity of the Town of Shelburne's Water Pollution Control Plan. We have reviewed the draft ESR (not including appendices) and provided the attached comments for your consideration.

Please ensure future draft reports include all the appendices. Please do not hesitate to contact me, if you have any questions.

Regards,

Joan Del Villar Cuicas (she/her)
Regional Environmental Planner
Project Review Unit | Environmental Assessment Branch
Ontario Ministry of the Environment, Conservation and Parks
Joan.delvillarcuicas@ontario.ca | Phone: 365-889-1180

From: Ian Callum <ian.callum@sbaengineering.com>
Sent: September 14, 2023 9:24 AM
To: EA Notices to WCRegion (MECP) <eanotification.wcregion@ontario.ca>
Cc: Stephen Burnett <stephen.burnett@sbaengineering.com>; Nibhana Suvarna <nibhana.suvarna@sbaengineering.com>; jmoss@shelburne.ca; Terrance Gole <terrance.gole@sbaengineering.com>; Denyse Morrissey <dmorrissey@shelburne.ca>; Carey Holmes <cholmes@shelburne.ca>; Jennifer Willoughby <jwilloughby@shelburne.ca>; Joanne Marceau (jmarceau@shelburne.ca) <jmarceau@shelburne.ca>
Subject: Increased Capacity of the Town of Shelburne's Water Pollution Control Plant - Schedule 'C' Draft Municipal Class EA - For Review

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good morning,

On behalf of the Town of Shelburne, please find attached the Increased Capacity of the Town of Shelburne's Water Pollution Control Plant - Schedule 'C' Draft Municipal Class EA. My understanding is that the Ministry will conduct a

technical review of this report within 30 days of receipt of this report. After working with the Ministry to resolve any comments, our intent is to file a Notice of Completion for this project to initiate the 30-day Public, Agency, First Nations, and Métis review period.

If you require any additional information or clarification during your review, please feel free to contact me.

Kind regards,

Ian

Ian Callum, M.Sc., PMP
Senior Environmental Project Manager

S. Burnett & Associates Limited
210 Broadway, Unit 203
Orangeville, ON L9W 5G4

T: 519.941.2949 ext. 240
C : 519-215-6893
F: 519.941.2036
W: www.sbaengineering.com

S. BURNETT & ASSOCIATES LIMITED
ENGINEERING & ENVIRONMENTAL

Appendix D

WSP Draft Technical Memorandum for the Assimilative Capacity Study Review of Shelburne WPCP, August 15, 2016

Date:	August 15, 2016
To:	Town of Shelburne
Copies:	1
From:	Michelle Albert / Jianrong Liu / Negin Salamati
Subject:	Shelburne Water Pollution Control Plant - Receiving Water Assessment

1. Background Review

To ensure that the Town of Shelburne can effectively service its anticipated growth projections, the Shelburne Water Pollution Control Plant (WPCP) needs to be expanded. The current rated capacity of the plant is 3,420 m^3/d, which is equivalent to a population of 7,800. However, the population is expected to grow to 10,000 people over the next ten years. This is equivalent to an average daily flow of 4,400 m^3/d. Therefore, the capacity of the plant needs to be increased by 980 m^3/d. Growth in the Town of Shelburne is mandated by the Places to Grow Act.

The Shelburne WPCP discharges to the Besley Drain, which flows into the Boyne River. The Besley Drain is considered a dry ditch during summer period; however, anecdotal evidence indicates that the drain is never truly dry. For the purposes of this Receiving Water Assessment, it was assumed that the Besley Drain does not have any assimilative capacity and therefore the focus is on the Boyne River.

The assimilative capacity of a natural body of water is described as its ability to receive wastewaters (the effluent from a water pollution control plant) without causing harmful effects and damage or limiting the harmful effects to aquatic life. The level of allowable impacts within a waterbody should be in line with the Ministry of the Environment and Climate Change's (MOECC) water quality management policies.

The main objective of the ACS is to determine the effluent discharge requirements for the Shelburne WPCP at the future flow of 4,400 m^3/d. Effluent limits and objectives for the following parameters need to be established as part of the ACS:

- Biological Oxygen Demand
- Total Suspended Solids
- Total Phosphorus
- Total Ammonia

These effluent requirements are based on the health of the receiving stream and need to be clearly established before reviewing treatment technologies or developing long term treatment solutions. Among the above parameters, the total phosphorus requirement is the most stringent and challenging to attain.

On December 13, 2013, WSP, submitted a Draft Technical Memorandum for the Assimilative Capacity Study Review of Shelburne Water Pollution Control Plant. The report was reviewed by MOECC and additional data collection and analysis was requested. Following the MOECC directions, the objective of this Technical Memorandum is to update the previous ACS based on the most recent Shelburne WPCP and Boyne River monitoring data.

A history of the work that has been completed to date can be found in **Appendix A**.

1.1 Receiver to be assessed

Boyne River at the confluence of the Besley Drain is considered the discharge point of the treated wastewater from Shelburne WPCP without utilizing any dilution factor attained in the Besley Drain. The results of the receiving water assessment are therefore conservative as there is always flow in the Besley Drain.

1.2 WPCP Current Effluent Criteria

The operation of the Shelburne WPCP is regulated by the Ministry of the Environment and Climate Change (MOECC) under Certificate of Approval (C of A) No.9972-7FYJUB, issued in August 2008 (see **Appendix A**). The effluent discharge objectives and limits for the WPCP are presented in Table 1-1 and Table 1-2 below.

Table 1-1 Shelburne WPCP Effluent Objectives

Effluent Parameter	Average Concentration (mg/L)
BOD_5	4.0
Total Suspended Solids	4.0
Total Phosphorus	0.12
Total Ammonia Nitrogen	0.5 (Jun 1 – Sep 30) 2.0 (Oct 1 – May 31)
E.coli	100 organisms/100 mL

Table 1-2 Shelburne WPCP Effluent Limits

Effluent Parameter	Average Concentration (mg/L)	Average Loading (kg/day)
BOD_5	5.0	17.1
Total Suspended Solids	5.0	17.1
Total Phosphorus	0.25	0.86
Total Ammonia Nitrogen	0.8 (Jun 1 – Sep 30) 2.4 (Oct 1 – May 31)	2.7 (Jun 1 – Sep 30) 8.2 (Oct 1 – May 31)
pH of the effluent maintained between 6.0 to 9.5, inclusive, at all times		

1.3 WPCP Current Effluent Quality

WPCP's effluent water quality data was obtained from the WPCP Annual Operating Reports. For the purpose of this ACS, the effluent data from 2010 to August 2015 were analyzed and summarized in Table 1-3.

Table 1-3 Shelburne WPCP Effluent Quality Data (2010 – Aug 2015)

Parameter	2010	2011	2012	2013	2014	2015 (up to Aug)	Average	Compliance
BOD_5 (mg/L)	2.6	2.3	2.3	2.0	2.6	2.2	2.4	5
TSS (mg/L)	2.6	2.4	3	2.4	2.4	2.4	2.6	5
TAN (mg/L)	0.11	0.11	0.13	0.12	0.11	0.20	0.12	0.8
	0.12	0.15	0.48	0.11	0.22	0.10	0.22	2.4
TP (mg/L)	0.06	0.05	0.05	0.08	0.07	0.07	0.06	0.25
Average Flow (m^3/d)	2,267	2,388	2,076	2,154	2,282	2,157	2,234	3,420
TP Loading (kg/d)	0.14	0.12	0.13	0.17	0.15	0.15	0.14	0.86

During this period, the WPCP has operated within the ECA (previously known as the C of A) requirements for BOD_5, TSS, Total Phosphorus, and Total Ammonia-Nitrogen. The range of average total phosphorus concentration was between 0.05 – 0.08 mg/L, corresponding to an average daily flow of 2,076 to 2,388 m^3/day respectively. It is important to note that during this period, the plant was operating at 70% of its rated

capacity. It is expected that as the plant reaches its rated capacity, TP removal efficiency would decrease. The C of A and the Shelburne WPCP operational data can be found in **Appendix B**.

2. Background Water Receiver Assessment

The surface water quality management goal and policies in Ontario are fully described in Procedure B-1-5 Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters (Ministry of Environment and Energy [MOEE], 1994) with reference to the Water Management Policies, Guidelines, Provincial Water Quality Objectives (PWQOs) of the Ministry of Environment and Energy (MOEE, 1994). The above guidelines should be followed in a receiving water assimilative capacity study.

2.1 Boyne River Flow Data

For continuous effluent discharges, monthly 7Q20 low flows (the lowest 7-day average flow over a 20-year return period) are typically determined as the basic design flow in the receiver to complete the assimilative capacity assessment and develop effluent requirements. Environment Canada's Water Survey of Canada (WSC) does not have any monitoring station on the Boyne River near the confluence area. In this situation, an accepted practice to estimate flows is to use a flow regionalization approach in which flow data from a monitored location is used to estimate the flow in an unmonitored location. Therefore, the flow data from WSC's monitoring station #02ED102 located at the Boyne River at Earl Rowe Park near Alliston was used to estimate the River flows at the Besley Drain confluence on Boyne River.

Available flow data between 1997 and 2015 (19 years) for the Boyne River at Earl Rowe Park was obtained from Water Survey of Canada website for flow monitoring station #02ED102. Per MOE Procedure B-1-5 "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters" (MOEE, 1994a), the monthly 7Q20 flows were calculated as the lowest 7-day average flow over the past 20 years for each month. At this minimum flow in the receiver, the wastewater effluent will have the most significant impact on receiver water quality.

Table 2-1 presents Boyne River monthly average and 7Q20 flow data for each month based on the approach discussed above. Since the data used for the 7Q20 calculation was based on 19 years of continuous data available, WSP checked the next closest available data which was for 1986. The result shows that the lowest 7 day flow in 1986 was higher than the 7Q20 calculated based 1997-2015 low flow. Therefore, the result in

Table 2-1 can be considered as the 7Q20 low flow at the station. The lowest monthly 7Q20 flow was determined as 0.28 m^3/s which occurred in August 2 - 8, 2007. The following section discusses the methodology used to pro-rate the flow data so that it is reflective of the flows in the Boyne River at the confluence of the Besley Drain.

Table 2-1 Boyne River at WSC Station 02ED102 (1997-2015)

Month	7Q20 Flows m^3/s	Average Flows m^3/s
January	0.69	2.03
February	0.67	2.00
March	0.72	3.99
April	0.89	4.49
May	0.55	2.31
June	0.38	1.77
July	0.32	1.09
August	0.28	0.93
September	0.36	0.90
October	0.52	1.21

November	0.64	1.67
December	0.66	2.03
7Q20 Flow	**0.28**	

2.1.1 Flow Monitoring

To supplement the WSC data, seven (7) monitoring stations were established along the Boyne River, upstream and downstream of the Besley Drain confluence. This monitoring data was collected to understand the quantity and quality of the Boyne River at the Besley Drain confluence. This data will also be used to pro-rate the WSC data at the confluence of the Beesley Drain and the Boyne River. The locations of monitoring stations are indicated in Figure 2-1. For three (3) of the seven stations hourly flow data was collected over a period of one year (Aug 14, 2014 to Sep 23, 2015) including the summer dry season but excluding the winter between December, 2014 and March 2015. The flow data has been included in **Appendix B** for this TM.

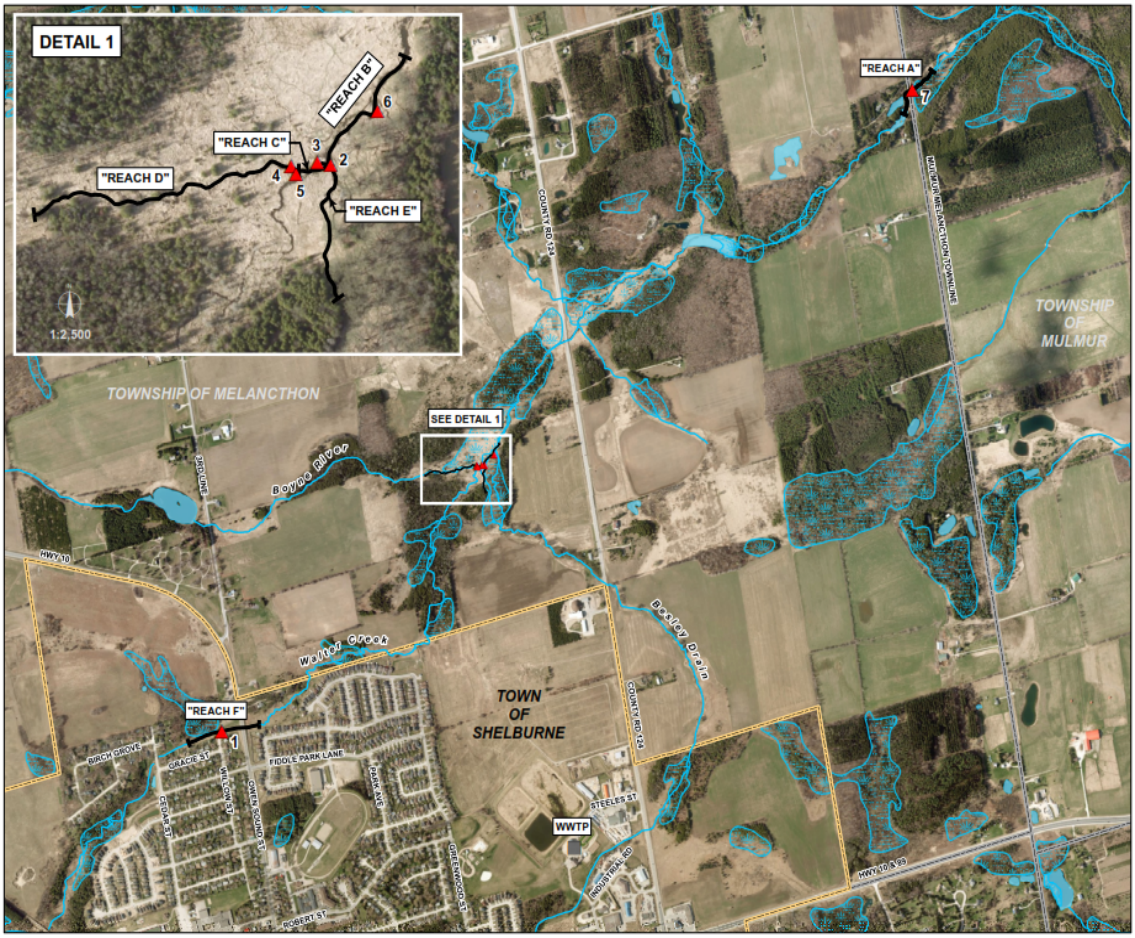


Figure 2-1 2014 – 2016 WSP Boyne River sampling locations

The approach recommended by the Ministry of Environment and Climate Change (MOECC) and used in this study is to prorate monthly 7Q20 low flows upstream of the confluence location (Station #3) and use the collected steam flow measurements from August 2014 to September 2015 upstream of the confluence location to refine the correlation to the WSC's station (#02ED102) flow.

A comparison of the Boyne River flow at the confluence of the Besley Drain and the WSC's station #02ED102 is presented in Table 2-2 below.

Table 2-2 Rate of Boyne River Flow at WSC's Station #02ED102 to the Flow at the Confluence – Aug 14, 2014 – Sep 23, 2015

Flow	Aug-14	Sep-14	Oct-14	Nov-14	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Average
WSC station #02ED102	1.80	2.00	1.68	2.41	3.89	1.21	3.33	1.76	0.83	0.67	
WSP Station #3	0.07	0.08	0.07	0.09	0.09	0.04	0.08	0.05	0.04	0.04	
Rate (%)	3.6	3.9	4.3	3.9	2.2	3.7	2.3	3.1	4.8	5.8	**3.8**

Based on the analysis above, the prorated 7Q20 low flow at the confluence on Boyne River was calculated to be 3.8%.

The results of the pro-rating is presented in Table 2-3.

Table 2-3 Prorated Boyne River 7Q20 Flow at the Upstream Confluence (WSP Station 3)

Month	7Q20 Flows m^3/s	Measured Flows m^3/s
January	0.026	
February	0.025	
March	0.027	
April	0.033	0.086
May	0.021	0.045
June	0.014	0.078
July	0.012	0.054
August	0.011	0.040
September	0.014	0.039
October	0.020	0.072
November	0.024	0.093
December	0.025	
Annual 7Q20 Flow	**0.011**	

Notes: Measured flow data is from August 2014 to September 2015 exclude frozen season at upstream of the confluence (Station #3).

It should also be noted that the MOECC recently accepted the Town of Shelburne's Well Field Capacity Assessment, which could potentially affect the streamflow of Boyne River.

2.2 Background Water Quality for Boyne River

The water quality conditions in the receiver are typically identified based on the 75th percentile water quality value. The 75th percentile water quality statistic is an indicator of poor water quality conditions. Lower concentration of contaminants such as BOD_5, total phosphorus or ammonia, would result in a better water quality in the receiver.

The Provincial Water Quality Monitoring Network (PWQMN) database does not have any historical water quality data for the Boyne River upstream of the Shelburne WPCP discharge location. Therefore, the Boyne

River water quality monitoring programs were conducted in recent years to study the assimilative capacity of Boyne River as the receiving water body for Shelburne WPCP.

2.2.1 Water Quality Monitoring Programs

Since 2011 to date, three (3) Boyne River water quality monitoring programs have been implemented, which include:

1. In 2011, The Town of Shelburne collected water samples from May to September from four (4) monitoring/sampling locations along Besley Drain and Boyne River downstream the confluence as illustrated in **Appendix F**.

2. In the summer of 2012, WSP undertook additional water quality sampling from six (6) monitoring stations. These stations were located at both upstream and downstream of the confluence as illustrated in **Appendix F.**

3. Starting September 2015, WSP has been performing additional sampling to further evaluate the Boyne River water quality. The samples have been taken since September 2015 up to June 2016 from seven (7) stations located both upstream and downstream of the confluence. The locations of these sampling stations are illustrated in Figure 2-1. The detailed test results are presented in **Appendix F**.

In order to be able to compare the obtained water quality data, Table 2-4 correlates different sampling stations used during 2011, 2012 and 2015 – 2016 sampling procedures. Please note that the only sampling location "Station #3" clearly represents the Boyne River water quality upstream the confluence (effective Shelburne WPCP discharge location). Station #3 was included in the 2015 to 2016 monitoring program

Table 2-4 Sampling locations for the monitoring programs in 2011, 2012 and 2015

Physical Location	WSP 2014/15	WSP 2011/12	Town of Shelburne 2011
Walters Creek at HWY 10	1		
Besley Drain U/S of confluence	2	3	
U/S of confluence	3		
Main Boyne River U/S of confluence	4	2	
Walters Creek U/S of confluence	5		
D/S of confluence	6	4	SW1
Boyne River at M-M Townline	7	6	
Main Boyne River at 3rd Line		1	
Besley Drain at Co.Rd.124 (N crossing)			SW2
Boyne River at Co.Rd.124		5	SW1A
North branch Boyne River at Co.Rd.124			SW1B

2.2.2 Ministry Policies

To ensure that the surface waters in Ontario are of a quality which is satisfactory for the preservation of aquatic life and recreation (i.e. that is in accordance with the PWQO), the MOE has established water quality management policies that relate to the protection or restoration of water quality in water bodies. These policies are summarized as follows:

Policy 1

In areas which have water quality better than the Provincial Water Quality Objectives, water quality shall be maintained at or above the Objectives.

Policy 2

Water quality which presently does not meet the Provincial Water Quality Objectives shall not be degraded further and all practical measures shall be taken to upgrade the water quality to the Objectives.

2.2.3 Total Phosphorus

The Provincial Water Quality Objective (PWQO) for total phosphorus in rivers is 0.03 mg/l. Phosphorus is a key parameter of concern within the Boyne River since total phosphorus concentrations frequently exceed PWQOs in the upstream and downstream portions of the catchment based on the existing monitored data (

Table 2-5). The analysis of the all available sampling data, the Boyne River upstream the confluence data and the exceedances of phosphorus limits is presented in **Error! Reference source not found.** and Table 2-6.

Table 2-5 Analysis of Total Phosphorus Concentrations at Boyne River Sampling Stations

Sampling Station (2015-2016 ID)	Total samples	Total Exceedances (>0.03 mg/L)	75th Percentile (mg/L)	Mean (mg/L)
1	13	5(38%)	0.038	0.029
2	13	11(85%)	0.065	0.048
3	10	1 (10%)	0.020	0.016
4	13	1(8%)	0.010	0.012
5	13	5(38%)	0.020	0.018
6	17	7 (41%)	0.040	0.031
7	13	3(23%)	0.020	0.020

Table 2-6 Boyne River Phosphorus Data at Station #3 (2015-2016)

Sampling Date	23-Sep-15	7-Oct-15	11-Nov-15	17-Dec-15	25-Jan-16	
TP (mg/L)	0.02	0.02	0.04	0.01	0.01	
Sampling Date	**17-Feb-16**	**22-Mar-16**	**21-Apr-16**	**19-May-16**	**23-Jun-16**	**75th Percentile**
TP (mg/L)	0.01	<0.01	<0.01	0.01	0.02	0.02

The highlighted data indicate that the corresponding parameter concentration is equal to or has exceeded the PWQO for total phosphorus in rivers (0.03 mg/L). Based on the presented data in

Table 2-5, Walters Creek (Station 1), Besley Drain (Station 2) and downstream the confluence (Station 6) have exceeded the 75th percentile values for TP. Table 2-6 shows that there is only one exceedance for Boyne River upstream of the Shelburne WPCP discharge confluence, 0.04 mg/L which occurred in the November 11 2015 sample. The 75th percentile of 0.02 mg/L of total phosphorus concentration indicates that Boyne River at the Shelburne WPCP discharge location is a Policy 1 water body with respect to total phosphorus.

2.2.4 Un-ionized Ammonia

There is a PWQO for unionized ammonia (NH_3, UIA) of 0.02 mg/L or 20 µg/L. UIA is the portion of ammonia that is toxic to aquatic life. The percentage of UIA in total ammonia is based on pH and temperature. At high temperature and high pH values, the UIA is higher. It is most critical to achieve low UIA concentrations in the summer.

The ambient conditions for total ammonia nitrogen (TAN), temperature and pH data from Station 3 located upstream of the confluence was used for the analysis of UIA in the Boyne River. Since there is no data

available for July and August, only 10 months of sampling results were analyzed. The 75th percentile value for UIA is 9.4 µg/L in the Boyne River. Therefore the Boyne River would be considered a Policy 1 with respect to UIA. The analysed temperatures, pH values, associated UIA values from Station 3 are presented in Table 2-7.

Table 2-7 Boyne River UIA Data at Station #3 (2015-2016)[1]

Month	Temperature (°C)	pH	% UIA	UIA (µg/L)
January	3.1	8.01	1.1%	2.4
February	2.5	8.00	1.0%	1.2
March	3.2	7.91	0.9%	28.1
April	9.6	7.92	1.5%	12.5
May	11.9	7.77	1.3%	10.4
June	16.1	7.72	1.5%	6.6
September	10.5	8.14	2.6%	0.5
October	12.4	8.10	2.7%	0.5
November	7.9	7.95	1.4%	2.8
December	5.3	8.14	1.7%	1.9
75th Percentile				9.4

Notes:
1. Data are from Station 3 from September 2015 to June 2016. There are 10 months data.

2.2.5 All Other Water Quality Parameters

The other key water quality parameters used to assess the biological, chemical and/or physical conditions of Boyne River monitored at Station 3 are summarized in Table 2-8.

Table 2-8 Boyne River Water Quality Data at Station #3 (2015-2016)

Parameter	Units	Concentration		
		PWQO	75th Percentile	Mean
DO[1]	mg/L	See note below		8.9
BOD_5	mg/L		<5	<5
TSS	mg/L		<10	<10
Total Ammonium-N	mg/L		0.73	0.60
Un-ionized Ammonia	µg/L	20	9.44	6.7
Total Nitrite	mg/L		<0.25	<0.25
Total Nitrate	mg/L		3.15	2.64
Total Kjeldahl N	mg/L		1.40	1.35
pH		6.5-8.5	8.08	7.97
TDS	mg/L		395	365
Temperature	°C		11.55	8.25
Temperature in Summer (Jun &Sep)	°C			13.3
E. coli	CFU/100mL	100	520	308

Notes:

1. PWQO limits for DO for coldwater biota are as follows: 8 mg/L DO at 0°C; 7 mg/L DO at 5°C; 6 mg/L DO at 10°C and 15°C; 5 mg/L DO at 20°C and 25°C.There only two testing results are available at this station.
2. Un-ionized Ammonia concentration is calculated based on the total ammonia nitrogen, pH and temperature data.

Dissolved Oxygen

In total, there were only two (2) dissolved oxygen (DO) samples collected during the months of September and October 2015. The lowest value observed was 7.9 mg/L; this sample was collected in September 2015. Based on PWQO, the DO should be greater than 6 mg/L at 10°C and 15°C; 5 mg/L DO at 20°C and 25°C for cold water biota. The minimum value observed was higher than the PWQO. The second DO analysis was completed in October and was 9.9 mg/L, which is much higher than the PWQO. Based on the limited data, the Boyne River receiver would be considered a Policy 1 receiver with respect to DO.

BOD_5 and TSS

There was low BOD_5 and TSS concentrations measured in all available 10 samples. All samples were under the detection limits of 5 mg/L and 10 mg/L for these two parameters respectively. Therefore, it can be concluded that there is significant assimilative capacity for BOD_5 and TSS.

Total Ammonia Nitrogen (TAN)

There is no PWQO for TAN in Ontario. The highest TAN concentration of 3.24 mg/L occurred in March 2016. In September and October (when the water temperature is still warm), the total ammonia concentration in the Boyne River was quite low, this results in a low Unionized ammonia (UIA) concentration.

Nitrate and Nitrite

There is no PWQO for nitrate (NO_3^-) and nitrite (NO_2^-) in Ontario. However, Canadian Water Quality Guidelines (CWQG) and US EPA Water Quality Criteria recommend 13 mg/L NO_3^-, and 10 mg/L (NO_2^-). The measured nitrite concentration is between 0.05 and 0.25 mg/L and nitrate concentration is between 1.0 and 3.5 mg/L.

E.coli

E.coli was analyzed for all the samples collected at Station 3. The *E.coli* count ranged from 2 to 900 CFU/100mL with an average value of over 300 CFU/100mL. The high E.coli CFU/100 mL is not surprising and is reflective of the location of the Boyne River at the confluence of the Besley Drain. The Boyne River flows through a mosaic of farm fields and wetland. Streamside vegetation and field drainage activities impact stream health in this area. The 75th percentile of 520 indicates that Boyne River at the confluence is Policy 2 receiver with respect to *E.coli*.

3. Determine of Effluent Requirements

3.1 Shelburne WPCP Receiving Water Body Status

Boyne River at the Shelburne WPCP discharge location is classified as a Policy 1 water body with respect to most parameters since the water quality is assessed to be better than PWQO for most of the relevant parameters listed above include total phosphorus.

Therefore, the effluent limits for the Shelburne WPCP will have to be established to ensure that the water quality of the Boyne River is maintained at or better than the current status. The key parameters to be controlled for the Shelburne WPCP are total phosphorus and total ammonia nitrogen. The impact of the BOD_5 and TSS discharges of the Shelburne WPCP to the background concentrations in Boyne River are not significant.

In the following sections, the impact of the continued effluent flows from the Shelburne WPCP were considered in developing proposed effluent criteria to minimize impacts on the receiving water.

To determine the effluent limits, the impacts of the various parameters on Boyne River were evaluated based on worst case conditions i.e. low flow conditions combined with high pollutant concentrations. The low flow statistic 7Q20 is used as the basic design flow for the receiving stream. High pollutant concentrations were characterized by the 75th percentile of background water quality data for that particular pollutant in Boyne River.

3.2 Proposed Total Phosphorus Limits

MOE Procedure B-1-5 Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters has outlined the procedure to mixing zone analysis to assist in establishing effluent limits for Policy 1 receivers. The MOECC defines a mixing zone "A mixing zone is defined as an area of water contiguous to a point source or definable non-point source where the water quality does not comply with one or more of the Provincial Water Quality Objectives". During a mixing zone analysis, the Ministry of the Environment (MOE) requires a minimum dilution of 20:1 for near field zone.

Due to the Boyne River flow at the Shelburne WPCP discharge location cannot provide a sufficient dilution to meet the MOE's required 20:1, furthermore, the receiver 7Q20 flow is significantly lower than the WPCP discharge volume.

The B-1-5 guidelines go on to state that "However, when background water quality conditions at a proposed mixing zone site do not meet one or more of the Provincial Water Quality Objectives, effluent requirements should be established that ensure, at the very least, that background water quality is not further degraded".

To better understand the impact of the Boyne River with respect to total phosphorus, TP concentration variations along the river were studied. Based on the recorded data for TP in 2011, 2012 and 2015 – 2016, **Error! Reference source not found.** was plotted for six stations along the Boyne River. These stations represent the locations of samplings in different years. The first station is located on the main Boyne River upstream of Walter Creek confluence whereas the last station is located on the main Boyne River downstream of the Besley Drain confluence. This figure shows that the Boyne River is impacted by Shelburne WPCP effluent at Besley Drain confluence since TP concentrations have increased at this location. However, downstream of the Besley Drain, TP concentrations in the river show a downward trend as they get closer to M-M Townline station which is 2km downstream of the confluence. 2015 – 2016 TP concentration in Boyne River at the discussed locations showed a great improvement compared with 2011 and 2012 data which were consistently below 0.03 mg/L with the last station TP concentration below 0.02 mg/L suggesting a healthy receiver. For all thirteen (13) recorded samples for the Boyne River at M-M Townline, ten (10) samples show the same trend and three (3) show no change. Overall, this figure shows that the Boyne River has potential assimilative capacity in regards to TP and the river water quality improves along the river with distance from the Besley Drain confluence.

NVCA 2013 Boyne River Subwatershed Health Check report card also stated that even the headwaters of the Boyne River exhibit "below potential" or impaired" stream health as they flow through farm field and wetland, "stream health rapidly improves as the Boyne River enters the Escarpment zone. Extensive groundwater discharge and well forested valley system is responsible for this improvement". Additional information regarding the health of the receiver in terms of fisheries habitat is provided in the sections below.

Commonly, with established Water Pollution Control Plants in southern Ontario the approach is to ensure that "no additional harm" is made to the receiver. This strategy is especially valid at the Shelburne WPCP where comprehensive studies have been undertaken to determine the health of the receiver. The existing plant is licensed to discharge a phosphorous loading limit of 0.86 kg/d. This means all future plant expansion should not exceed this established loading limit regardless of the plant's capacity.

However, an analysis of the historical data of effluent TP loadings indicated that the plant has been operating below both its C of A's phosphorus loading objective (0.41 kg/d) and limit (0.86 kg/d). TP loading objective was calculated using the existing C of A's objective TP concentration (0.12 mg/L) and current rated capacity of 3420 m3/d. Figure 5 1 shows effluent TP loadings from 2007 to 2015. The data from 2008 to 2015 follow the same trend whereas in 2007, there were only two months (January & April) that TP loading was above the TP loading objective and is not following the trend. These data were considered as outliers. Therefore it can be concluded that the WPCP has been generally operating below its existing phosphorus loading objective and limit. Figure 4-2 shows effluent TP concentrations from 2007 to 2015.

In order to ensure the long term health of the Boyne River while increasing the WPCP's capacity, reducing the WPCP's current licenced TP loading by approximately 50% is proposed. This cutting is based on the following measures:

- The new Effluent TP Limit concentration would be based on the existing Effluent Objective concentration (0.12 mg/L) leading to a new TP Loading Limit of 0.53 kg/d.
- The new Effluent TP Objective concentration would be 0.09 mg/L which leads to a new TP Loading Objective of 0.40 kg/d. It should be noted that the new TP loading objective remains approximately the same as the existing TP loading objective (0.41 kg/d).

The comparison of the existing C of A criteria and proposed criteria for total phosphorus for the Shelburne WPCP is presented in **Error! Reference source not found.**.

Table 3-1 Compression of Existing and Proposed TP Criteria for Shelburne WPCP

Effluent TP Criteria	Existing	Value
Proposed Rated Capacity (m^3/d)	3420	4400
TP Concentration Objective (mg/L)	0.12	0.09
TP Concentration Limit (mg/L)	0.25	0.12
TP Loading Limit (kg/d)	0.86	0.53

Therefore, at the new upgraded WPCP (rated capacity of 4400 m^3/d) the effluent discharge limit for TP concentration would be reduced to 0.12 mg/L and the discharge effluent objective for TP would be reduced to 0.09 mg/L.

Based on the mass balance calculation, the worst case (7Q20 flow) phosphorus concentration in the Boyne River downstream of the confluence are shown in Table 3-2. Due to the low flow at the confluence, a phosphorus concentration increase in the receiver is predicted.

Table 3-2 Predicted Worst Case Boyne River P Concentration Downstream of the Confluence

Month	Boyne River		Shelburne WPCP		Boyne River
	7Q20 Flows	P Concentration	Effluent Flow	Proposed P Limit	New P Concentration Based on Mass Balance
	m^3/s	mg/L	m^3/s	mg/L	mg/L
January	0.026	0.012	0.051	0.12	0.084
February	0.025	0.012	0.051	0.12	0.084
March	0.027	0.01	0.051	0.12	0.082
April	0.033	0.01	0.051	0.12	0.076
May	0.021	0.01	0.051	0.12	0.088
June	0.014	0.02	0.051	0.12	0.098
July	0.012	0.02	0.051	0.12	0.101
August	0.011	0.02	0.051	0.12	0.103
September	0.014	0.02	0.051	0.12	0.099
October	0.020	0.019	0.051	0.12	0.092
November	0.024	0.038	0.051	0.12	0.094
December	0.025	0.013	0.051	0.12	0.085
Notes: There is no P concentration data available for July and August, the 75th percentile P concentration is applied.					

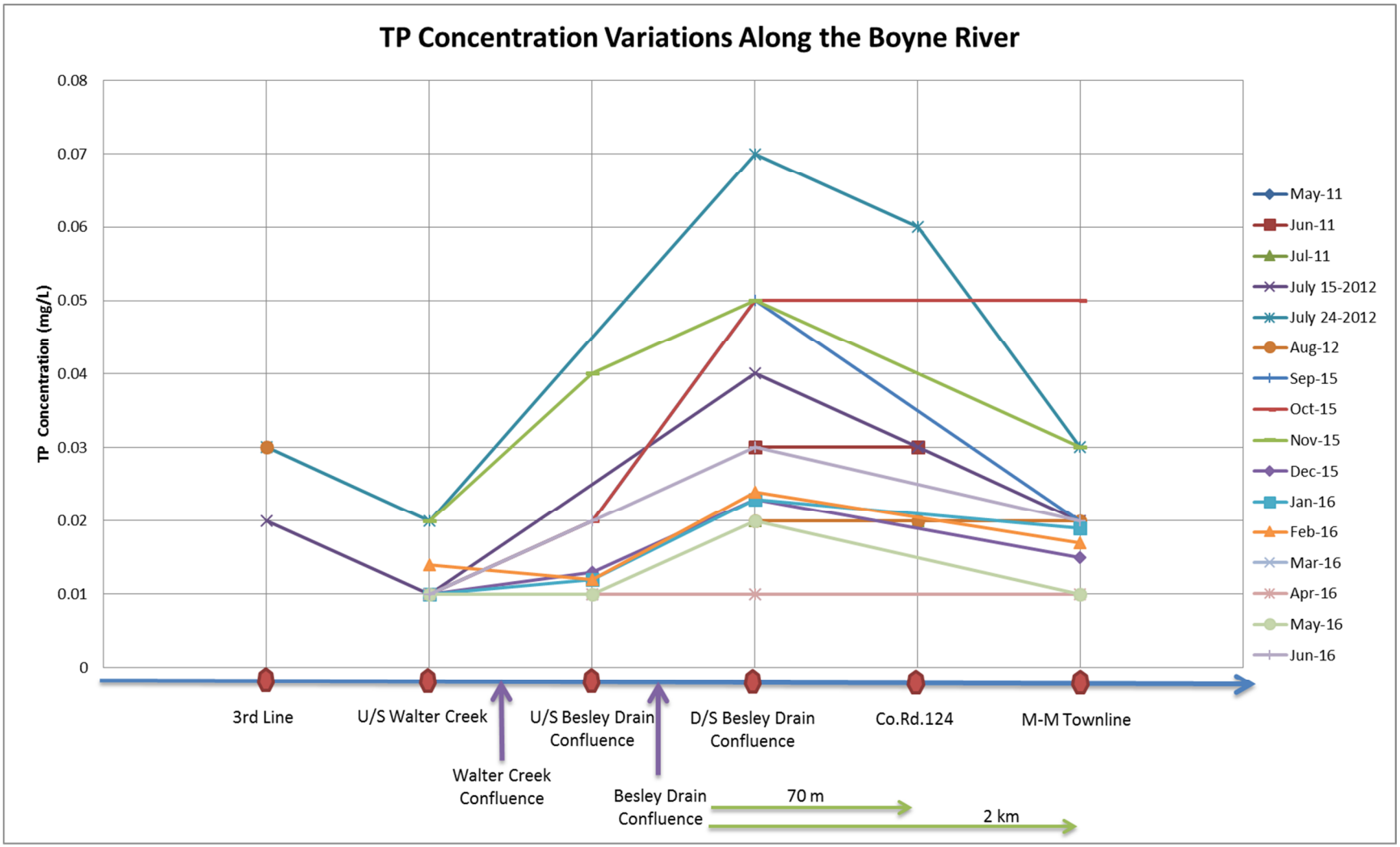


Figure 3-1 Total Phosphorus Variations along the Boyne River (2011, 2012 & 2015 Sampling Results)

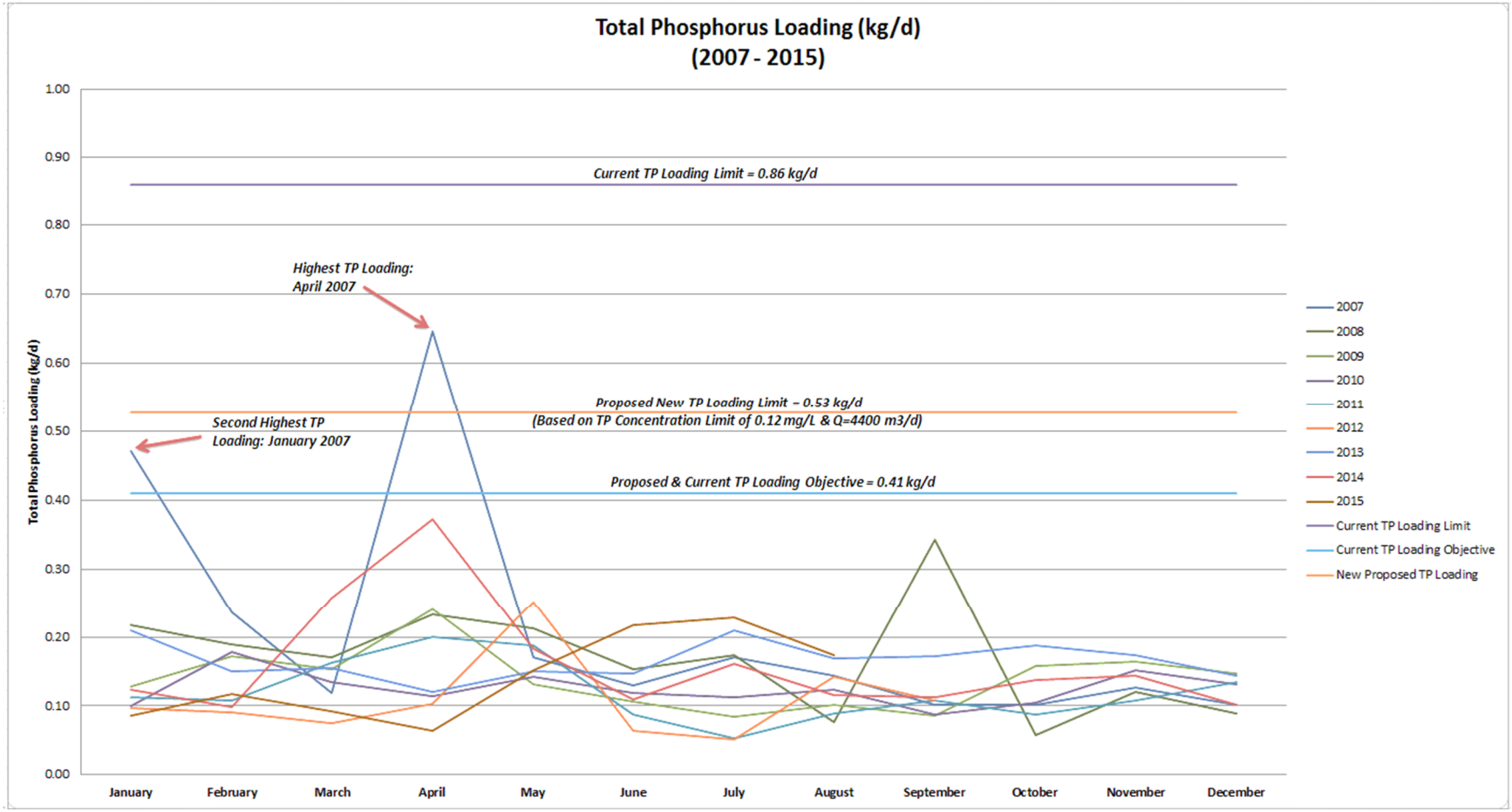


Figure 3-2 Historical TP loading (2007-2015)

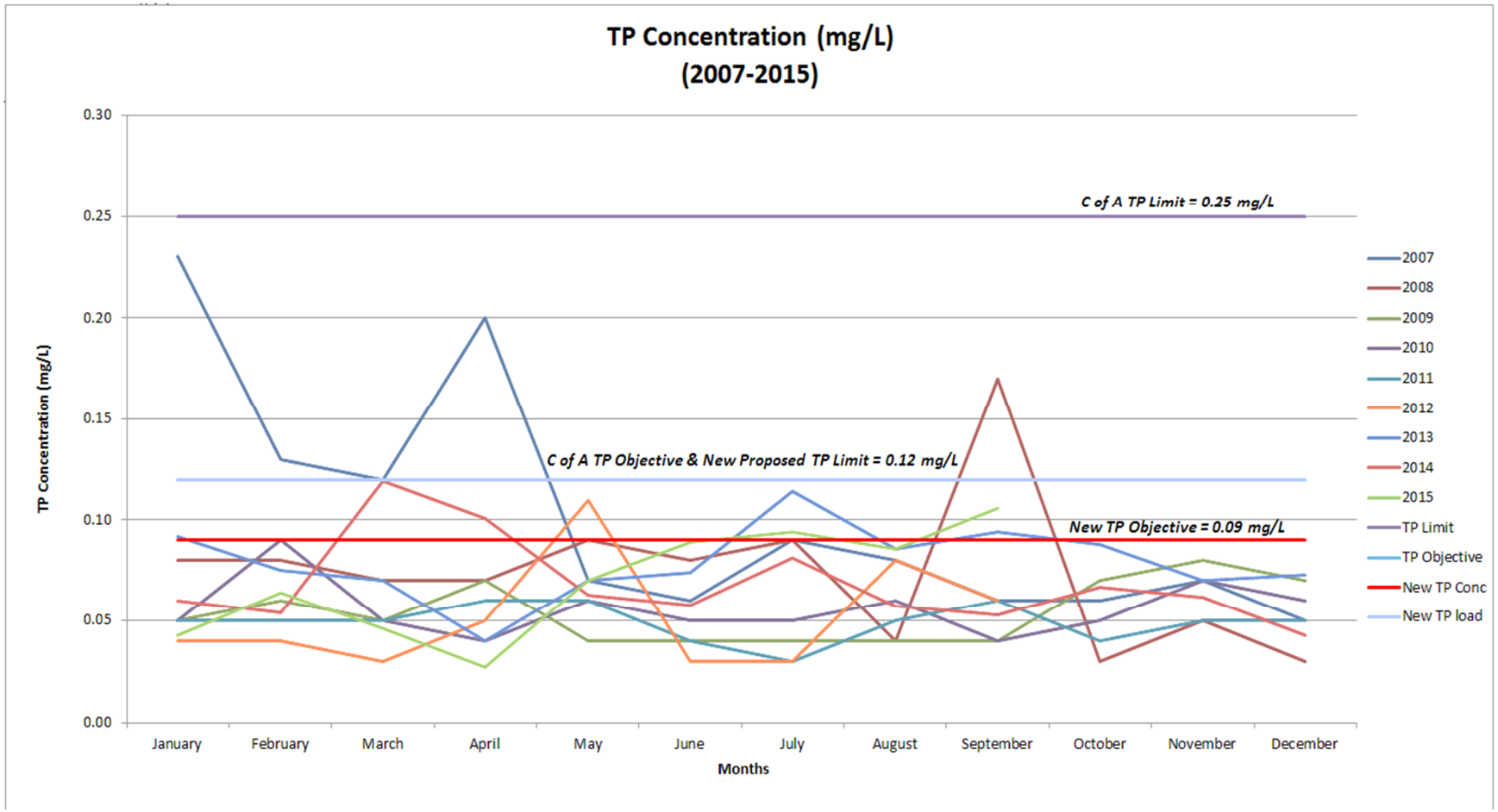


Figure 3-3 Historical TP Concentration (2007-2015)

3.3 Proposed Ammonia Limits

For ammonia limits, it was assumed that current MOE policy requiring a non-toxic effluent would apply. Extensive research by the US EPA and others has demonstrated that a non-toxic limit for un-ionized ammonia ranges between 0.1 mg/L and 0.5 mg/L depending on the fish species of interest. Therefore, a conservative non-toxic limit for un-ionized ammonia in the Shelburne WPCP effluent is 0.2 mg/L.

For calculating effluent toxicity, estimates of the pH and temperature of the effluent itself are required. For this purpose, average pH and temperature data from the Shelburne WPCP from 2013 to 2015 were used. Required monthly Non-Acutely Lethal Concentrations (NALC) was determined by using 0.2 mg/L of unionized ammonia for a toxicity threshold and are shown in Table 3-3. Ammonia criteria for the Shelburne WPCP were derived to ensure that a non-toxic effluent concentration of less than 0.2 mg/L would be achieved at the end of pipe at all times.

Table 3-3 Proposed Total Ammonia-N Concentration Based on NALC Requirement

Month	Effluent		Allowable TAN (mg/L)	Proposed TAN (mg/L)	
	pH	Temperature [1] (°C)	0.2 mg/L end-pipe UIA	Object.	Limit
January	8.14	8.0	7.3	2.0	2.4
February	8.09	7.3	8.7	2.0	2.4
March	8.09	8.3	8.0	2.0	2.4
April	8.20	10.7	5.1	2.0	2.4
May	8.08	12.4	5.9	2.0	2.4
June	8.11	12.9	5.4	0.5	0.8
July	8.15	13.6	4.7	0.5	0.8
August	8.14	11.6	5.6	0.5	0.8
September	8.14	13.3	4.9	0.5	0.8
October	8.14	15.6	4.1	2.0	2.4
November	8.15	10.3	6.0	2.0	2.4
December	8.15	7.4	7.5	2.0	2.4

Notes:

1. No monitored operational data on effluent temperature available from October to December. The 2015 values from the station 2 Besley Drain upstream of the confluence were used to estimate the Shelburne WPCP effluent temperature.
2. Historic pH are the average values of the Shelburne WPCP operation data between 2013 and 2015.

The proposed seasonal limits for Total Ammonia Nitrogen for Shelburne WPCP were 0.8 mg/L for summer (June 1 - September 31) and 2.4 mg/L for winter (October 1 - May 31). The effluent limits proposed in this study are much less than the NALC allowable concentrations shown in Table 3-3.

3.4 Proposed BOD_5 and TSS Limits

There is no PWQO for BOD and TSS. In theory, the BOD loading increase could lead to a decrease in the receiver's DO level. The most effective impact on DO concentration can be caused by photosynthesis and respiration of the aquatic plants in the waterbody. It has been noted, based on monitoring Station 3 that the BOD_5 and TSS concentrations in Boyne River are <5 mg/L, and <10 mg/L respectively. Therefore, the same low effluent concentrations specified in the previous ECA, 5 mg/L for both BOD_5 and TSS are recommended as the effluent limits for these parameters. These low level BOD and TSS will cause very limited impact on the receiver.

3.5 Effluent Disinfection

Sewage discharges to surface waters can cause a significant input source of pathogens to the receiving waters. Therefore, to protect the Boyne River water quality, the expanded Shelburne WPCP will continue to include an objective of 100 CFU/100 mL. In addition, a compliance limit of 200 CFU/100 mL for *E.coli* is recommended. Due to the receiver background E.coli concentration is way higher than this recommended effluent limit (average > 300 CFU/100 mL, see Table 2-8), Shelburne WPCP effluent discharge will improve this parameter at the confluence in Boyne River.

4. Aquatic Environment Impact

4.1 Effluent Disinfection

Sewage discharges to surface waters can cause a significant input source of pathogens to the receiving waters. Therefore, to protect the Boyne River water quality, the expanded Shelburne WPCP will continue to include an objective of 100 CFU/100 mL. In addition, a compliance limit of 200 CFU/100 mL for *E.coli* is recommended. Due to the receiver background E.coli concentration is way higher than this recommended effluent limit (average > 300 CFU/100 mL, see Table 2-8), Shelburne WPCP effluent discharge will improve this parameter at the confluence in Boyne River

4.2 Thermal Impact

According to the Shelburne ACS Fish Community Survey Report conducted by NVCA, 2012, Boyne River headwaters upstream Walter's Creek is characterized by cold water thermal regimes but rapidly degrade to a mixture of cold water, cool water and warm water thermal regimes downstream of the confluences of Walter's Creek and Besley Drain. Therefore, the confluence area is considered a cool/warm mixture thermal regime.

PWQO requires that natural thermal regime of any body of water shall not be altered so as to impair the quality of the natural environment. In particular the diversity, distribution and abundance of plant and animal life shall not be significantly changed.

Figure 4-1 was generated based our recorded hourly temperature analysis during the 2014 sampling period. This figure shows the temperature differences upstream and downstream of the Besley Drain at the Boyne River. The data shows that the maximum temperature difference between these two locations was 3.3 degree C which occurred in August. As shown on the graph, the temperature difference ranges from +3.3 C to -1.3 C with 75th percentile being +0.67 degree C.

The Town has met with the Nottawasaga Valley Conservation Authority on numerous occasions. NVCA does not have any concerns regarding the impact of the WPCP discharge on the fish community in this section of the Boyne River.

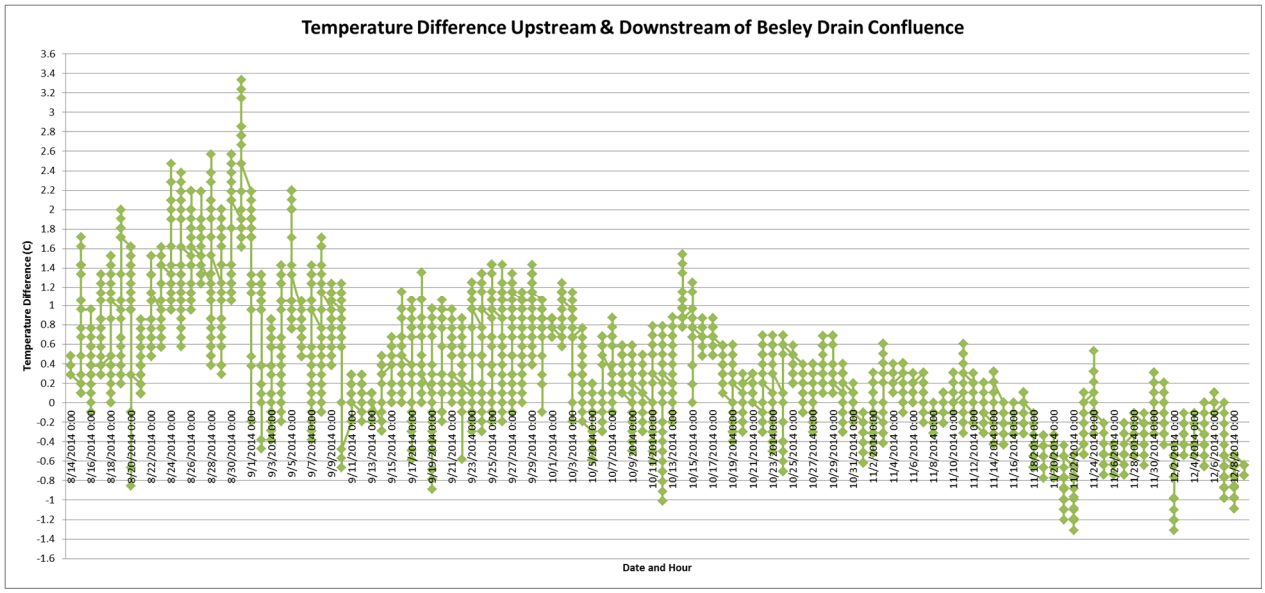


Figure 4-1 Boyne River Temperature Differences – Upstream & Downstream of the Besley Drain

4.3 Sodium Level

Sodium is not considered to be a toxic element. There is no sodium PWQO. However, the human health risks associated with high salt intake, including high blood pressure in sensitive individuals have been well documented. Canadian Drinking Water Guideline and Ontario Drinking Water Standard for sodium concentration in drinking water are set at 300 mg/L and 200 mg/L respectively.

Based on WSP's 2015 - 2016 monitoring program measured data (**Table** 4-1 **F**), Boyne River upstream of the confluence has a sodium concentration range of 22 – 47 mg/L (Station 3) whereas the Besley Drain (Station 2), containing Shelburne WPCP effluent, has a higher sodium concentration range of 104 – 199 mg/L. At the downstream of the confluence (Station 6) Boyne River water quality analysis shows higher sodium concentration range of about 58 – 136 mg/L which reflect the impact of the effluent on the receiver. It is worth noting that the sodium concentration in the Boyne River downstream of the confluence is still lower than Ontario Drinking Water Standard and Canadian Drinking Water Guidelines. The 75th percentile and average sodium concentration values monitored during the 2015 – 2016 sampling program is summarized in Table 4-1.

Table 4-1 2015-2016 Boyne River Water Quality Sodium Level Results

Station	Station No.	75th Percentile (mg/L)	Mean (mg/L)
Walters Creek at HWY 10	1	36.8	35.1
Besley Drain U/S of confluence	2	180.0	150.2
U/S of confluence	3	37.4	32.4
Walters Creek U/S of confluence	4	35.0	27.7
Main Boyne River U/S of confluence	5	45.4	55.4
D/S of confluence	6	109.3	90.3
Boyne River at M-M Townline	7	69.3	54.0

4.4 Nitrate and Nitrite Levels

There is no PWQO for nitrate and nitrite. However, these parameters are of concern in drinking water systems. Ontario Drinking Water Standards require drinking water to meet nitrate as nitrogen of 10 mg/L and nitrite as nitrogen of 1.0 mg/L. All 2011, 2012 and 2015 – 2016 sampling results indicated that the collected nitrite test results are lower than detection limit of 0.25 mg/L. The nitrate concentrations at 7 tested locations are shown in Table 4-2. It is noted that even with an increased nitrate concentration downstream of the confluence (Station 6) nitrate concentrations were still lower than MOECC required drinking water standards.

Table 4-2 2015-2016 Boyne River Water Quality Nitrate as N Level Results

Station	Station No.	75th Percentile (mg/L)	Mean (mg/L)
Walters Creek at HWY 10	1	5.3	4.4
Besley Drain U/S of confluence	2	16.3	11.8
U/S of confluence	3	3.2	2.6
Walters Creek U/S of confluence	4	2.6	2.3
Main Boyne River U/S of confluence	5	3.4	3.0
D/S of confluence	6	8.1	6.9
Boyne River at M-M Townline	7	5.1	4.2

5. Environmental Findings

5.1 Benthic Macroinvertebrate Assessment

Benthic macroinvertebrate sampling was conducted in the fall (October) of 2015 at the same locations as the water quality sampling locations (Figure 2-1, stations #1, #2, #3, #4, #6, #7) in order to duplicate NVCA's 2012 (see **Appendix C**) sampling effort. An additional sampling site was added (site 008) directly upstream of where the Besley Drain crosses County Rd 124. Qualitative sampling was completed using the d-net travelling kick and sweep method (Ontario Benthic Biomonitoring Network, OBBN) for a fixed time (3 minutes) per sample site. Organisms were identified to family level. BioMAP(q) values and additional metrics were calculated for all sites and compared to the expected parameters shown in Tables included in **Appendix C** (*Benthic Macroinvertebrate Assessment Report*)

Based on the fall 2015 sampling event the following conclusions can be made:

- Based on the calculated BioMAP(q) value and benthic assemblage Walters Creek is impaired. It should be noted that Walter Creek joins the Boyne River upstream of the Besley Drain confluence. Therefore, Walter's Creek is impacting the Boyne River.
- Based on the calculated BioMAP(q) value, Boyne River downstream of the confluence with the Besley Drain indicates that this portion of the river is unimpaired. However, benthic assemblages suggest slight impairment.
- BioMAP(q) analysis on further down Boyne River at M-M Townline sampling point suggests that this portion of the River is not impaired.

The findings in 2015 sampling correlate to NVCA findings in 2012 with the exception of downstream of the confluence of the Besley Drain where an improvement in the number of benthic assemblages was recorded.

A monitoring program should be developed and implemented after the expansion of the WPCP to monitor any associated impacts of increased effluent to the watercourses.

In conclusion, the Benthic Macroinvertebrate Assessment shows that the Besley Drain has no significant impact on the Boyne River.

5.2 Fish Community Assessment

A fisheries assessment was completed to support the Receiving Water Assessment for the Town of Shelburne's WPCP. Baseline conditions of the receiving waters, including the Boyne River, Walter Creek and the Besley Drain were collected during the summer of 2014. Studies included existing habitat conditions and fish community surveys. Fish Community Surveys were completed using backpack electrofishing 120m upstream and downstream of each sampling location. A fish collection permit was acquired from the OMNRF before this sampling was completed. All fish were live released at the site where they were captured. A total of six (6) reaches were assessed (Figure 2-1) and are described in detail in **Appendix D** (*Fish Community Assessment*).

The study area was confirmed to support cool and coldwater fish species, some of which are sensitive to changes in environmental conditions, such as dissolved oxygen, temperature, and suspended sediments. Assessments completed in 2012 indicated no change or minimal change to the temperature, dissolved oxygen, and turbidity levels of the stream from effluent discharge. Assessments completed in 2014 show that Walter's Creek does have some impact to fish habitat which is reflected by high abundances of tolerant fish species, Central Mudminnow. The Boyne River fish assemblages consist of mostly intermediate or intolerant fish species, indicating less impact and impairment. At reach B, downstream of the confluence of the Besley Drain, Brook Trout and Rainbow Trout were found which are both cold water species and are intolerant to poor water quality and contaminations suggesting higher quality fish habitat conditions at this location. At reach A, M-M Townline, the number of Rainbow Trout was noticeably higher than reach B, however no Brook Trout were found. Overall, the data indicates that the River provides high quality fish habitat to support more sensitive fish species.

The 2012 NVCA Fish Community Survey Report states that the population of resident brown trout located east of the MM-Townline would provide a "long-term indicator of the Shelburne wastewater treatment plant influences on stream health in the upper Boyne River". In the 2015 Fish Community Survey adult brown trout were again found indicating the healthy fish habitat in the river.

6. Conclusions and Next Steps

Based on past studies conducted on Boyne River and recent Boyne River water quality monitoring results, the Ministry of Environment and Climate Change (MOECC) has expressed concerns regarding the potential impacts of phosphorus discharges on the Boyne River. In this report, based on available data, an evaluation of the potential impacts of the Shelburne WPCP effluent to the Boyne River at the confluence of the Besley Drain was thoroughly assessed. A summary of the conclusions and recommendations from this study are as follows:

1. Based on the limited data monitored from the studies performed in 2012 and 2015, the Boyne River upstream of the Besley Drain confluence has had a 75th percentile TP concentration of 0.02 mg/L. This suggests that the Boyne River is a categorized as a Policy 1 receiver with respect to total phosphorus, un-ionized ammonia, and dissolved oxygen in the 10 months monitoring duration.

2. Even though, the receiver is a Policy 1 water body with respect to most water quality parameters due to the low dilution factor no mixing zone analysis can be conducted.

3. There is no indication of significant thermal impact on the Boyne River due to Shelburne WPCP discharges.

4. Although the Boyne River water quality analysis shows higher sodium concentration of about 130 mg/L at the downstream of the confluence, the levels are is still lower than Ontario Drinking Water Standard and Canadian Drinking Water Guidelines.

5. TP concentrations along the Boyne River downstream on the Besley Drain confluence to Mulmur – Melancthon Townline show a downward trend suggesting that the Boyne River has potential assimilative capacity in regards to TP.

It is recommended that the proposed effluent compliance limits be adopted for the expansion, as shown in Table 6-1.

Table 6-1 Proposed Effluent Limits

Parameter	Proposed (4,400 m^3/d)		
	Objective	Compliance	Average Loading (kg/day)
BOD_5 (mg/L)	4	5	22
TSS (mg/L)	4	5	22
Total Ammonia as N (Oct 1 - May 31) (mg/L)	2.0	2.4	10.5
Total Ammonia as N (Jun 1 - Sep 30) (mg/L)	0.5	0.8	3.5
TP (mg/L)	0.09	0.12	0.53
***E. coli.* (CFU/100 mL)**	100	200	

APPENDICES

Appendix A-1 – Shelburne WPCP Certificate of Approval (CofA – No.9972-7FYJUB)

CONTENT COPY OF ORIGINAL

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDED CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 9972-7FYJUB
Issue Date: August 12, 2008

The Corporation of the Town of Shelburne
203 Main St E P.O. Box 69
Shelburne, Ontario
L0N 1S0

Site Location: Shelburne Wastewater Treatment Plant
300 Centennial Rd L0N 1S4
Shelburne Town, County Of Dufferin

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

Alterations and upgrades to the existing municipal sewage treatment works for the collection, transmission, treatment and disposal of sewage and rated at the capacities mentioned below and consisting of the following *Works*:

Stage	***Rated Capacity***
Current (*Existing Works* and partial completion of *Proposed Works*)	2,971 m^3/d
Upgraded (*Substantial Completion* of all *Proposed Works*)	3,420 m^3/d

PROPOSED WORKS

Inlet Works Building

- one (1) existing manually cleaned bar rack to be removed and replace with an emergency bypass overflow weir;
- one (1) additional storm pump rated at 152 L/s, 16 m TDH., discharging through the existing storm forcemain to the storm holding ponds;

Storm Holding Ponds

- reconfiguring the existing Stormwater Holding Pond and Effluent Holding Ponds A and B to produce one (1) 19,900 m^3 capacity holding pond (Storm Holding Pond A) and one (1) 16,800 m^3 capacity holding pond (Storm Holding Pond B), to be used under emergency situations for temporary storage of sewage to be returned later to the inlet works for further treatment;

Aeration Tanks

- retrofitting both existing aeration tanks into a plug flow configuration by constructing a longitudinal baffle wall and modifying the inlet pipes to distribute flows into the two passes of each tank;

Sludge Digestion

- two (2) replacement digested sludge transfer pumps (one standby) each rated at 20 L/s at 19 m TDH;

Biosolids Storage Tank

- one (1) 4,300 m^3 biosolids storage tank with mixing nozzles and two (2) mixing pumps;

EXISTING WORKS

Trunk Sanitary Sewers

- 82 m of 750 mm diameter, 594 m of 600 mm diameter and 14.5 m of 300 mm diameter trunk sanitary sewers complete with emergency overflow to adjacent creek and all necessary manholes, appurtenances and inter-connections to the sanitary collection system, commencing at a point approximately 100 m south and 13 m west of the intersection of Ella Street and Highway Nos. 10 and 89 following an easement 60 m east and then north across Highway Nos. 10 and 89 and then generally along the creek bank to a point approximately 40 m south, 15 m west of the pumping station then due north to the centre of Centennial Street (unopened extension) and then north and west 82 m to the wet well of the raw sewage pumping station at the sewage treatment plant;

Hauled Sewage Receiving Station

- one (1) hauled sewage transfer tank with a capacity of 24,000 L, located adjacent to the inlet works building;

Inlet Works Building

- one (1) automatic mechanical bar screen having a *Peak Flow Rate* of 13,000 m^3/d and two (2) manually cleaned bar racks for emergency or maintenance bypass (to be modified as part of the *Proposed Works*);
- one (1) 7.50 m x 2.93 m x 5.40 m benched wet well equipped with two (2) submersible pumps, each with VFD and rated at 34.4 to 103.3 L/s at 10.2 to 12.0 m TDH;
- one (1) storm pump rated at 81.0 L/s, 8.53 m TDH, discharging to the storm holding ponds;
- one (1) 2.1 m diameter vortex grit separator having a *Peak Flow Rate* of 9,504 m^3/d and a grit classifier;

Grit Channels

- three (3) 5.7 m x 0.6 x 1.0 m SWD grit channels having a *Peak Flow Rate* of 9,130 m^3/d for back up to the vortex grit separator;

Aeration Tanks

- two (2) 40 m x 10 m x 4.6 m SWD aeration tanks equipped with fine bubble diffused aeration system and two (2) centrifugal air blowers (one duty and one standby), rated at 500 L/s and 250 L/s respectively;

Secondary Clarifiers

- one (1) 14.0 m diameter x 2.8 m SWD secondary clarifiers equipped with sludge and scum removal mechanisms and cold weather cover;
- one (1) 14.0 m diameter x 3.65 m SWD secondary clarifiers equipped with sludge and scum removal mechanisms and cold weather cover;

Clarifier Effluent Pump System

- two (2) 2.9 m x 2.1 m x 2.0 m SWD clarified effluent tanks;
- three (3) VFD controlled dry pit filter feed pumps each rated at 17.2 to 51.7 L/s at 9.9 to 11.3 m T.D.H. discharging to either the filters or to the storm holding ponds;

Tertiary Filtration

- one (1) 3.43 m x 8.91 m x 3.96 m four compartment dual media gravity filter, complete with air scour and self-contained backwash storage tank, scour air supplied by one (1) air blower providing 188 L/s at 27.5 kPa, discharging to the UV disinfection channel;

Ultraviolet (UV) Disinfection

- a 8.0 m x 0.61 m x 1.067 m deep channel equipped with a low pressure mercury vapour ultraviolet irradiation lamp

system having a *Peak Flow Rate* of 8,921 m^3/d and with a weighted lever gate on the outlet to the Parshall flume to maintain the liquid level in the channel at a depth of 460 mm;

Outfall Sewer

- approximately 60 m of 450 mm x 740 mm effluent outfall pipe discharging from the Parshall flume to a minor tributary of Boyne River;

Activated Sludge Pumping System

- three (3) VFD controlled sludge pumps, each rated at 8.6 to 34.4 L/s at 3.2 to 7.6 m T.D.H., complete with valving and piping to permit withdrawal from either the secondary clarifier sludge sump or the scum hopper and returning to either the aeration tanks or to wasting to the sludge digesters;

Phosphorus Removal

- one (1) 24.1 m^3 capacity chemical storage tank and four (4) chemical metering pumps (two with capacity of 23 L/h to the secondary clarifiers and two with capacity of 108 L/h to the tertiary filters) for phosphorus removal;

Sludge Digestion

- a two stage aerobic sludge digestion system with one (1) 450 m^3 stage 1 digester and one (1) 170 m^3 stage 2 digester, both equipped with coarse bubble aeration system and supernatant decanting facility;
- two (2) air blowers (one standby shared with the aeration tanks) rated at 1,800 m^3/h supplying air to the digesters;
- two (2) digested sludge transfer pumps (one standby) each rated at 1,800 m^3/d at 7.0 m TDH (to be replaced as part of the *Proposed Works*);

Biosolids Storage Tank

- an aerated digested sludge storage facility with a total storage volume of 2,037 m^3, which includes a maximum allowance of 560 m^3 for emergency storage of sludge generated at the Grand Valley Wastewater Treatment Plant on an ongoing basis from December 1 of each year to May 31 of the following year (to be decommissioned upon completion of the *Proposed Works*);

Effluent Washwater Pumps

- two (2) effluent washwater pumps (one standby) each rated at 3.5 L/s at 59.8 m TDH;

Effluent Flow Measurement

- one (1) 305 mm Parshall flume measuring quantity of effluent discharged from the plant located downstream of the UV disinfection system;

Standby Power

- one (1) 350 kW diesel generator set;

Miscellaneous

- all other controls, electrical equipment, instrumentation, piping, pumps, valves and appurtenances essential for the proper operation of the aforementioned *Existing Works* and *Proposed Works*;

all in accordance with the following submitted supporting documents:

1. Class Environmental Report dated July 1996, design brief, final plans and specifications for Phase 2 prepared by R.J. Burnside & Associates Limited;
2. Application for Approval of Municipal and Private Sewage Works submitted by the Corporation of the Town of

Shelburne dated July 26, 2005, including design brief and drawings prepared by R.J.Burnside & Associates Limited, and subsequent revised letter design brief dated September 01, 2005 and revised drawings;
3. Application for Approval of Municipal and Private Sewage Works submitted by Larry McGregor of the Corporation of the Town of Shelburne dated June 20, 2006 under a cover letter from R.J.Burnside & Associates Limited dated June 19, 2006 and final plans and specifications prepared by Knox Martin Kretch Limited;
4. Application for Approval of Municipal and Private Sewage Works submitted by Rui DeCarvalho of R.J.Burnside & Associates Limited dated May 15, 2008, including Environmental Study Report, Design Brief Report, final plans and specifications.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

"*Act*" means the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended;

"*Average Daily Flow*" means the cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year;

"*BOD5*" (also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand;

"*By-pass"* means any discharge from the *Works* that does not undergo any treatment before it is discharged to the environment;

"*CBOD5*" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

"*Certificate*" means this entire certificate of approval document, issued in accordance with Section 53 of the *Act*, and includes any schedules;

"*Daily Concentration*" means the concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required;

"*Director*" means any *Ministry* employee appointed by the Minister pursuant to section 5 of the *Act*;

"*District Manager*" means the District Manager of the Guelph District Office of the Ministry;

"*E. Coli*" refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius;

"Existing Works" means those portions of the sewage works previously constructed and existing on-site on the date of issuance of this *Certificate*;

"*Geometric Mean Density*" is the nth root of the product of multiplication of the results of n number of samples over the period specified;

"*Hauled Sewage*" means;

(a) domestic waste that is human body waste, toilet or other bathroom waste, waste from other showers or tubs, liquid or water borne culinary or sink waste or laundry waste, and

(b) other waste that is suitable for storage, treatment or disposal in a sewage system regulated under Part 8 of the building code made under the *Building Code Act, 1992*, if the waste is not fully disposed of at the site where it is produced, other than,

(i) waste from a sewage works approved under section 53 of the *Ontario Water Resources Act* that is conveyed away from the site where it is produced by a sewer approved under that section, or

(ii) waste in a vehicle sewage holding tank;

"*Ministry*" means the Ontario Ministry of the Environment;

"*Monthly Average Concentration*" means the arithmetic mean of all *Daily Concentrations* of a contaminant in the effluent sampled or measured, or both, during a calendar month;

"*Monthly Average Daily Flow*" means the cumulative total sewage flow to the sewage works during a calendar month divided by the number of days during which sewage was flowing to the sewage works that month;

"*Monthly Average Loading*" means the value obtained by multiplying the *Monthly Average Concentration* of a contaminant by the *Monthly Average Daily Flow* over the same calendar month:

"*Owner*" means The Corporation of the Town of Shelburne and includes its successors and assignees;

"*Peak Flow Rate*" means the maximum rate of sewage flow for which the plant or process unit was designed;

"Proposed Works" means the sewage works described in the *Owner*'s application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate*;

"*Rated Capacity*" means the *Average Daily Flow* for which the *Works* are approved to handle;

"*Regional Director*" means the Regional Director of the West Central Region of the Ministry;

"Substantial Completion" has the same meaning as *"substantial performance*" in the Construction Lien Act; and

"*Works*" means the sewage works described in the *Owner*'s application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate* and includes both *Existing Works* and *Proposed Works*.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Works* is notified of this *Certificate* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

(2) Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate*, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate*.

(3) Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate*, the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(4) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

(5) The requirements of this *Certificate* are severable. If any requirement of this *Certificate*, or the application of any requirement of this *Certificate* to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this certificate shall not be affected thereby.

(6) The approval granted by this *Certificate* is based upon a review of the *Works* in the context of its effect on the environment, its process performance and general principles of wastewater engineering. The review did not include a consideration of the architectural, mechanical, electrical or structural components and minor details of the *Works* except to

the extent necessary to review the *Works*.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate*.

3. CHANGE OF OWNER

(1) The *Owner* shall notify the *District Manager* and the *Director*, in writing, of any of the following changes within 30 days of the change occurring:

(a) change of *Owner*;

(b) change of address of the *Owner*;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager*;

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager*;

(2) In the event of any change in ownership of the *Works*, other than a change to a successor municipality, the *Owner* shall notify in writing the succeeding owner of the existence of this *Certificate*, and a copy of such notice shall be forwarded to the *District Manager* and the *Director*.

4. UPON THE SUBSTANTIAL COMPLETION OF THE WORKS

(1) Upon the *Substantial Completion* of the *Works*, the Owner shall prepare a statement, certified by a Professional Engineer, that the works are constructed in accordance with this *Certificate*, and upon request, shall make the written statement available for inspection by Ministry personnel.

(2) Within six (6) months of the *Substantial Completion* of the *Proposed Works*, a set of as-built drawings showing the *Works* "as constructed" shall be prepared. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be retained at the *Works* for the operational life of the *Works*.

5. BY-PASSES

(1) Any *By-pass* of sewage from any portion of the *Works* is prohibited, except where:

(a) it is necessary to avoid loss of life, personal injury, danger to public health or severe property damage;

(b) the *District Manager* agrees that it is necessary for the purpose of carrying out essential maintenance and the *District Manager* has given prior written acknowledgment of the *by-pass*; or

(c) the *Regional Director* has given prior written acknowledgment of the *By-pass*.

(2) The *Owner* shall collect at least one (1) grab sample of the *By-pass* and have it analyzed for the parameters outlined in Condition 7 using the protocols in Condition 9.

(3) The *Owner* shall maintain a logbook of all *By-pass* events which shall include, at a minimum, the time, location, duration, quantity of *By-pass*, the authority for *By-pass* pursuant to subsection (1), and the reasons for the occurrence.

(4) The *Owner* shall, in the event of a *By-pass* event pursuant to subsection (1), disinfect the by-passed effluent prior to it reaching the receiver such that the receiver is not negatively impacted.

6. EFFLUENT OBJECTIVES

(1) The *Owner* shall use best efforts to design, construct and operate the *Works* with the objective that the concentrations of the materials named below as effluent parameters are not exceeded in the effluent from the *Works*.

Table 1A - Effluent Objectives (Current)	
Effluent Parameter	**Average Concentration** (milligrams per litre unless otherwise indicated)
CBOD5	4.0
Total Suspended Solids	4.0
Total Phosphorus	0.15
Total Ammonia Nitrogen	0.5 (Jun 1 - Sep 30) 2.0 (Oct 1 - May 31)
E. Coli	100 organisms/100 mL Monthly *Geometric Mean Density*

Table 1B - Effluent Objectives (Upgraded)	
Effluent Parameter	**Average Concentration** (milligrams per litre unless otherwise indicated)
CBOD5	4.0
Total Suspended Solids	4.0
Total Phosphorus	0.12
Total Ammonia Nitrogen	0.5 (Jun 1 - Sep 30) 2.0 (Oct 1 - May 31)
E. Coli	100 organisms/100 mL Monthly *Geometric Mean Density*

(2) The *Owner* shall use best efforts to:

(a) maintain the pH of the effluent from the *Works* within the range of 6.5 to 8.5, inclusive, at all times;

(b) operate the works within the *Rated Capacity* of the *Works*;

(c) ensure that the effluent from the *Works* is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters.

(3) The *Owner* shall include in all reports submitted in accordance with Condition 10 a summary of the efforts made and results achieved under this Condition.

7. EFFLUENT LIMITS

(1) The *Owner* shall design and construct the *Proposed Works* and operate and maintain the *Works* such that the concentrations and waste loadings of the materials named below as effluent parameters are not exceeded in the effluent from the *Works*.

Table 2A - Effluent Limits (Current)		
Effluent Parameter	**Average Concentration** (milligrams per litre unless otherwise indicated)	**Average Waste Loading** (kilograms per day unless otherwise indicated)
Column 1	Column 2	Column 3
CBOD5	6.0	17.8
Total Suspended Solids	6.0	17.8
Total Phosphorus	0.3	0.9
Total Ammonia Nitrogen	0.8 (Jun 1 - Sep 30) 2.4 (Oct 1 - May 31)	2.4 (Jun 1 - Sep 30) 7.2 (Oct 1 - May 31)
pH of the effluent maintained between 6.0 to 9.5, inclusive, at all times		

Table 2B - Effluent Limits (Upgraded)		
Effluent Parameter	**Average Concentration** (milligrams per litre unless otherwise indicated)	**Average Waste Loading** (kilograms per day unless otherwise indicated)
Column 1	Column 2	Column 3
CBOD5	5.0	17.1
Total Suspended Solids	5.0	17.1
Total Phosphorus	0.25	0.86
Total Ammonia Nitrogen	0.8 (Jun 1 - Sep 30) 2.4 (Oct 1 - May 31)	2.7 (Jun 1 - Sep 30) 8.2 (Oct 1 - May 31)
pH of the effluent maintained between 6.0 to 9.5, inclusive, at all times		

(2) For the purposes of determining compliance with and enforcing subsection (1):

(a) The *Monthly Average Concentration* of a parameter named in Column 1 shall not exceed the corresponding maximum concentration set out in Column 2 of Tables 2A or 2B, whichever is applicable.

(b) The *Monthly Average Loading* of a parameter named in Column 1 shall not exceed the corresponding maximum waste loading set out in Column 3 of Tables 2A or 2B, whichever is applicable.

(c) The pH of the effluent shall be maintained within the limits outlined in subsection (1), at all times.

(3) Notwithstanding subsection (1), the *Owner* shall operate and maintain the *Works* such that the effluent is continuously disinfected so that the monthly *Geometric Mean Density* of *E. Coli* does not exceed 200 organisms per 100 millilitres of effluent discharged from the *works*.

(4) Table 2A shall apply upon the issuance of this *Certificate* and Table 2B shall apply upon *Substantial Completion* of the *Proposed Works*.

8. OPERATION AND MAINTENANCE

(1) The *Owner* shall exercise due diligence in ensuring that, at all times, the *Works* and the related equipment and appurtenances used to achieve compliance with this *Certificate* are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this *Certificate* and the *Act* and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the *Works*.

(2) The *Owner* shall prepare an operations manual within six (6) months of *Substantial Completion* of the *Proposed Works* , that includes, but not necessarily limited to, the following information:

(a) operating procedures for routine operation of the *Works*;

(b) inspection programs, including frequency of inspection, for the *Works* and the methods or tests employed to detect when maintenance is necessary;

(c) repair and maintenance programs, including the frequency of repair and maintenance for the *Works*;

(d) procedures for the inspection and calibration of monitoring equipment;

(e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the *District Manager*; and

(f) procedures for receiving, responding and recording public complaints, including recording any followup actions taken.

(3) The *Owner* shall maintain the operations manual current and retain a copy at the location of the *Works* for the operational life of the *Works*. Upon request, the *Owner* shall make the manual available to *Ministry* staff.

(4) The *Owner* shall provide for the overall operation of the *Works* with an operator who holds a licence that is applicable to that type of facility and that is of the same class as or higher than the class of the facility in accordance with Ontario Regulation 129/04.

9. MONITORING AND RECORDING

The *Owner* shall, upon commencement of operation of the *Works*, carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this *Certificate* are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

(2) For the purposes of this condition, the following definitions apply:

(a) Weekly means once each week;
(b) Monthly means once every month;

(3) Samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

Table 3 - Hauled Sewage Monitoring
(Sampling point at the hauled sewage receiving station)

Parameters	Sample Type	Frequency
BOD5	Grab	Monthly
Total Suspended Solids	Grab	Monthly
Total Phosphorus	Grab	Monthly
Total Kjeldahl Nitrogen	Grab	Monthly

Table 4 - Raw Sewage Monitoring

Parameters	Sample Type	Frequency
BOD5	Composite	Monthly
Total Suspended Solids	Composite	Monthly
Total Phosphorus	Composite	Monthly
Total Kjeldahl Nitrogen	Composite	Monthly

Table 5 - Final Effluent Monitoring		
Parameters	**Sample Type**	**Frequency**
CBOD5	Composite	Weekly
Total Suspended Solids	Composite	Weekly
Total Phosphorus	Composite	Weekly
Total Ammonia Nitrogen	Composite	Weekly
E. Coli	Grab	Weekly
pH	Grab/Probe	Weekly
Temperature	Grab/Probe	Weekly
Alkalinity	Grab	Weekly

(4) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions;

(5) The temperature and pH of the effluent from the *Works* shall be determined in the field at the time of sampling for Total Ammonia Nitrogen. The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended, for ammonia (un-ionized).

(6) The measurement frequencies specified in subsection (2) in respect to any parameter are minimum requirements which may, after 12 months of monitoring in accordance with this Condition, be modified by the *District Manager* in writing from time to time.

(7) The *Owner* shall install and maintain continuous flow measuring device, to measure the flowrate of the effluent from the *Works* with an accuracy to within plus or minus 15 per cent (+/- 15%) of the actual flowrate for the entire design range of the flow measuring device, and record the flowrate at a daily frequency.

10. REPORTING

(1) One week prior to the start up of the operation of the *Proposed Works*, the *Owner* shall notify the *District Manager* (in writing) of the pending start up date.

(2) Ten (10) days prior to the date of a planned *By-pass* being conducted pursuant to Condition 5 and as soon as possible for an unplanned *By-pass*, the *Owner* shall notify the *District Manager* (in writing) of the pending start date, in addition to an assessment of the potential adverse effects on the environment and the duration of the *By-pass*.

(3) The *Owner* shall report to the *District Manager* or designate, any exceedence of any parameter specified in Condition 7 orally, as soon as reasonably possible, and in writing within seven (7) days of the exceedence.

(4) In addition to the obligations under Part X of the Environmental Protection Act, the *Owner* shall, within 10 working days of the occurrence of any reportable spill as defined in Ontario Regulation 675/98, bypass or loss of any product, by-product, intermediate product, oil, solvent, waste material or any other polluting substance into the environment, submit a

full written report of the occurrence to the *District Manager* describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.

(5) The *Owner* shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to *Ministry* staff.

(6) The *Owner* shall prepare and submit to the *District Manager* a performance report, on an annual basis, within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the commencement of operation of the *Works* and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:

(a) a summary and interpretation of all monitoring data and a comparison to the effluent limits outlined in Condition 7, including an overview of the success and adequacy of the *Works*;

(b) a description of any operating problems encountered and corrective actions taken;

(c) a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the *Works*;

(d) a summary of any effluent quality assurance or control measures undertaken in the reporting period;

(e) a summary of the calibration and maintenance carried out on all effluent monitoring equipment; and

(f) a description of efforts made and results achieved in meeting the Effluent Objectives of Condition 6.

(g) a tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed;

(h) a summary of any complaints received during the reporting period and any steps taken to address the complaints;

(i) a summary of all *By-pass*, spill or abnormal discharge events; and

(j) any other information the *District Manager* requires from time to time.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the Owners their responsibility to notify any person they authorized to carry out work pursuant to this *Certificate* the existence of this *Certificate*.

2. Condition 2 is included to ensure that the *Works* are constructed in a timely manner so that standards applicable at the time of Approval of the *Works* are still applicable at the time of construction, to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the *Ministry* records are kept accurate and current with respect to the approved works and to ensure that subsequent owners of the *Works* are made aware of the *Certificate* and continue to operate the *Works* in compliance with it.

4. Condition 4 is included to ensure that the *Works* are constructed in accordance with the approval and that record drawings of the *Works* “as constructed” are maintained for future references.

5. Condition 5 is included to indicate that by-passes of untreated sewage to the receiving watercourse is prohibited, save in certain limited circumstances where the failure to *By-pass* could result in greater injury to the public interest than the *By-pass* itself where a *By-pass* will not violate the approved effluent requirements, or where the *By-pass* can be limited or

otherwise mitigated by handling it in accordance with an approved contingency plan. The notification and documentation requirements allow the *Ministry* to take action in an informed manner and will ensure the *Owner* is aware of the extent and frequency of *By-pass* events.

6. Condition 6 is imposed to establish non-enforceable effluent quality objectives which the *Owner* is obligated to use best efforts to strive towards on an ongoing basis. These objectives are to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs and before the compliance limits of Condition 7 are exceeded.

7. Condition 7 is imposed to ensure that the effluent discharged from the *Works* to the Boyne River meets the *Ministry*'s effluent quality requirements thus minimizing environmental impact on the receiver and to protect water quality, fish and other aquatic life in the receiving water body.

8. Condition 8 is included to require that the *Works* be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the owner and made available to the *Ministry*. Such a manual is an integral part of the operation of the *Works*. Its compilation and use should assist the *Owner* in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for *Ministry* staff when reviewing the *Owner*'s operation of the work.

9. Condition 9 is included to enable the *Owner* to evaluate and demonstrate the performance of the *Works*, on a continual basis, so that the *Works* are properly operated and maintained at a level which is consistent with the design objectives and effluent limits specified in the Certificate and that the Works does not cause any impairment to the receiving watercourse.

10. Condition 10 is included to provide a performance record for future references, to ensure that the *Ministry* is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this *Certificate,* so that the *Ministry* can work with the *Owner* in resolving any problems in a timely manner.

This Certificate of Approval revokes and replaces Certificate(s) of Approval No. 3655-72CPBR issued on May 10, 2007.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, 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, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval 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.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

CONTENT COPY OF ORIGINAL

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 12th day of August, 2008

Mansoor Mahmood, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

FL/
c: District Manager, MOE Guelph
Rui DeCarvalho, R.J. Burnside & Associates
Manager, Water Standards, MOE Standards Development Branch

Appendix A-2 –Work Completed to Date

The original Shelburne WPCP was constructed in 1981. Subsequently, three expansions and modernizations have been completed. The plant currently operates under Amended Certificate of Approval (C of A) Number 9972-7FYJUV, August 12, 2008. As discussed above, an amendment to the existing C of A (now referred to as an Environmental Compliance Approval (ECA)) is required to increase the treatment capacity at the plant.

The following section provides a summary of the work completed on the Assimilative Capacity Study (ACS) to date.

The Boyne River Assimilative Capacity and Improvement Study Workplan

On January 26, 2012, before the Assimilative Capacity Study commenced, the Boyne River Assimilative Capacity and Improvement Study Workplan was submitted to the Ministry of the Environment (MOE) for review and comment. The Workplan included:

- A detailed sampling plan
- Details regarding the Assimilative Capacity Study which was to focus on phosphorus and nitrogen assimilation downstream of the Besley Drain confluence point with the Boyne River
- Guidelines to complete the baseline water quality and fisheries and aquatic life at key locations in the upper Boyne River watershed
- Requirements to investigate reducing summer water temperatures
- Requirements to reduce sediment loadings due to stormwater, and
- A review of infiltration into the sanitary sewers

The Workplan submitted stated that an attempt to reduce the effluent total phosphorus (TP) target to 0.03 mg/L would be made. The potential to attain, this very low effluent phosphorus criteria will be discussed further in Section 3.0 below.

Expansion of Shelburne Wastewater Pollution Control Plant – Moving Forward

On February 2, 2012 a response from the MOE regarding the aforementioned workplan was received. The response included a comprehensive history of the plant and previous Assimilative Capacity Studies completed by the Ministry of the Environment and Envirosearch. There were several key considerations documented in the letter including the potential to use the current lagoons as treated effluent storage.

Town of Shelburne Wastewater Treatment Plant, Assimilative Capacity Study (ACS), November 2012

The Town of Shelburne initiated an Assimilative Capacity Study (ACS) in early 2012. The ACS concluded the following:

1) The base flow in the Boyne River and the Besley Drain inflow site was approximately 20 L/s.
2) The flow from the WPCP was also approximately 20 L/s therefore the effluent dilution ratio was 1:1 with the background stream flow.
3) There were no significant effects on the stream's ecology and water quality given the current effluent flows and dilution ratio.
4) Based on the sampling completed as part of the ACS the Boyne River upstream of the confluence of Besley Drain is a Policy 1 receiver for phosphorus.

5) The report concluded that it is feasible to increase the rated capacity of the Shelburne Water Pollution Control plant to discharge an additional 1,000 m^3/d effluent to the Boyne River.

6) The ACS recommends considering an effluent TP of 0.03 mg/L. Concerns have recently arisen regarding this low TP concentration as discussed further in Section 3.0 below.

7) A strategy to mitigate temperature increases in the wastewater will be established.

Shelburne WPCP Draft Assimilation Reports

A response from the MOE to the ACS was received on December 10, 2012. The following concerns were raised regarding the ACS:

1) The document was more of a Receiving Water Impact assessment than an ACS.

2) The focus of the assessment should be the Boyne River at the discharge point of Besley Drain

3) More data is required to complete the ACS

Response to the MOE (April 9th, 2013)

WSP responded to the MOE letter with an update regarding additional sampling which was to take place over the summer of 2013.

Response from MOE (April 24th, 2013)

The MOE responded to sampling questions posed in the April 9th, 2013 letter.

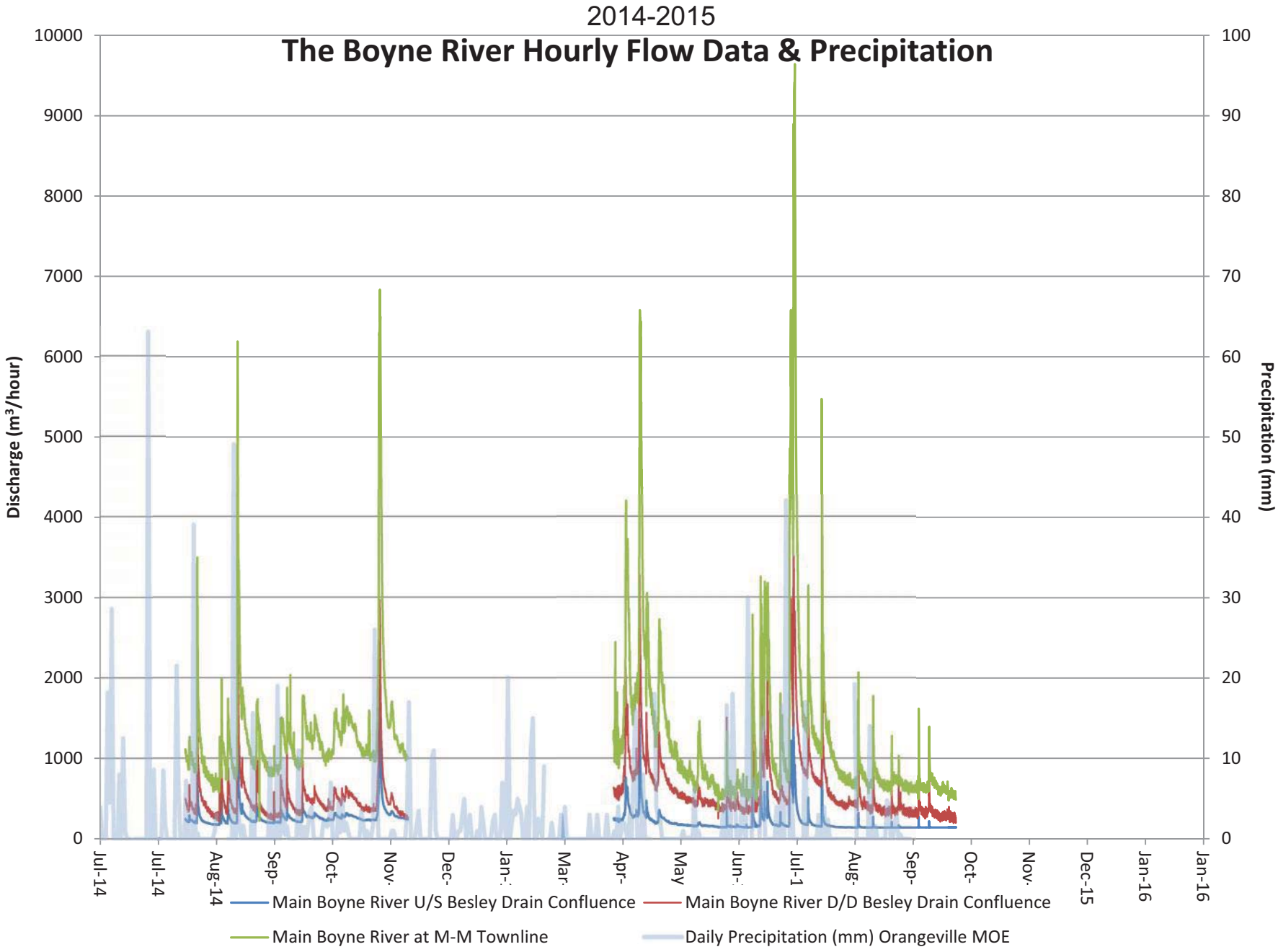
Revised Assimilative Capacity Report (December 19h, 2013)

A revised assimilative capacity report was submitted to the MOECC.

Follow up Meetings in 2014

There were several follow up meetings to review the findings of the Assimilative Capacity Report with the MOECC. In all meetings the MOECC reiterated their concerns regarding the lack of data on the receiver.

Appendix B – 2014-2015 Flow Data


2014-2015
The Boyne River Hourly Flow Data & Precipitation
Discharge (m3/hour)
Precipitation (mm)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
100
90
80
70
60
50
40
30
20
10
0
Jul-14
Jul-14
Aug-14
Sep-
Oct-
Nov-
Dec-
Jan-
Mar-
Apr-
May
Jun-
Jul-1
Aug-
Sep-
Oct-
Nov-
Dec-15
Jan-16
Jan-16
Main Boyne River U/S Besley Drain Confluence
Main Boyne River D/D Besley Drain Confluence
Main Boyne River at M-M Townline
Daily Precipitation (mm) Orangeville MOE

The tables below summarize the statistical results of the analysis.

Site 001, where Walters Creek crosses Hwy 100, has a substrate consisting of sand and boulders and was surrounded by meadow, deciduous forest, and urban sprawl. A BioMAP(q) value of 3.1 was calculated for this site. This creek is considered to be impaired, though slightly, when compared to the expected value of <3.2 for impaired creeks. A total of 26 species was used in determining he BioMAP(q) value of which ten (10) species had sensitivity values over 2 suggesting less impairment. Additional metrics were calculated using a total of 915 individuals representing 35 taxa. Four (4) of ten (10) additional metrics calculated were outside the expected parameters for creeks. Percent Insects was under the expected value for creeks (>90%) with a value of 73%. Percent Crustaceans, Percent Isopods, and Percent Tubificids were over the expected values for creeks (<3%, <1%, and <1% respectively) with 22%, 13% and 3% respectively. Fifteen (15) percent of the sample were Chironomids (within the expected parameters for creeks) and the EPT (Ephemeroptera, Plecoptera, and Trichoptera) ratio was low at this site with only 5% of the total sample. Low numbers of Ephemeroptera, Plecoptera, and Trichoptera within a watercourse suggest a reduced quality of the water and ecosystem. The low level of insects and EPT present within the sample combined with increased presence of Crustacea, Isopods and Tubificid Oligochaeta further supports the BioMAP(q) analysis determination that Walters Creek is slightly impaired.

Site 002, upstream of the confluence of Besley Drain with the Boyne River has a substrate comprised of sand, cobble and gravel, and was located in a meadow marsh wetland habitat, dominated by tall forb and grass species. A BioMAP(q) value of 3.3 was calculated for this site. This creek is considered to be unimpaired, when compared to the expected value of <3.2 for impaired creeks. Thirty-seven (37) taxa were used in the BioMAP(q) calculation of which eleven (11) had sensitivity values over 2 which suggest less impairment. Additional metrics were calculated using a total of 900 individuals representing 47 taxa. Four (4) of ten (10) additional metrics calculated were outside the expected parameters for creeks. Percent Insects was under the expected value for creeks (>90%) with a value of 76%. Percent Chironomids was also under the expected value for creeks (10-30%) with 8% of the total sample. Percent Isopods, and Percent Gastropods were over the expected values for creeks (<1% and <1% respectively) with 12% and 10% respectively. The percent EPT (Ephemeroptera, Plecoptera, and Trichoptera) was higher at this site with 22% of the total sample. The low percentage of insects and Chironomids present within the sample combined with increased presence of Isopods and Gastropods suggests the watercourse has reduced quality.

Site 003, on the Boyne River upstream of the confluence with Besley Drain, substrate consisted of sand and cobble and was located within the same meadow marsh wetland habitat, dominated by tall forb and grass species as site 002. A BioMAP(q) value of 3.3 was calculated for this site. This river is considered to be unimpaired, when compared to the expected value of <2.0 for impaired rivers. Thirty-three (33) taxa were used in calculating the BioMAP(q) value. Of this group there were ten (10) species with sensitivity values over 2 suggesting some impairment. Additional metrics were calculated using a total of 2035 individuals representing 46 taxa. All ten (10) additional metrics were within the expected ranges for unimpaired rivers (see table below for expected parameters). Insects made up 94% of the sample with 32% being within Ephemeroptera, Plecoptera, or Trichoptera. The high EPT percentage further supports the BioMAP(q) analysis determination that this section of the Boyne River is unimpaired.

Site 004, on the Boyne River upstream of Walters Creek confluence, substrate consisted of a mixture of silt and cobble and was located within the same meadow marsh wetland habitat, dominated by tall forb and grass species as site 002 and 003. A BioMAP(q) value of 2.5 was calculated for this site. This portion of the river is considered to be unimpaired when compared to the expected value of <2.0 for impaired rivers. It should be noted that this site had a significantly lower number of individuals identified, 91 within the total sample of which 70 were used in the calculation. Sixteen taxa were used in the calculation of the BioMAP(q) value, of which, two (2) species had sensitivity values over 2 suggesting impairment. Additional metrics were calculated using a total of 91 individuals, significantly less than upstream at site 001, representing 23 taxa. Five (5) of ten (10) additional metrics calculated are outside the expected

parameters for creeks. Percent Insects was under the expected value for creeks (>90%) with a value of 84%. Percent Chironomids, Percent Isopods, Percent Gastropods and Percent Bivalves were over the expected values for creeks (10-30%, <1%, <1% and <3% respectively) with 38%, 2%, 7% and 5% respectively. Though Chironomids are an important food source for riparian ecosystems, high proportions can be indicative of stressed environments commonly associated with silty, organically enriched ecosystems which is consistent with this site. Percent EPT (Ephemeroptera, Plecoptera, and Trichoptera) was very low at this site making up 1% of the total sample. Low numbers of Ephemeroptera, Plecoptera, and Trichoptera within a watercourse suggest a reduced quality of the water and ecosystem. The low number of insects and EPT present within the sample combined with increased presence of Chironomids, Isopods, Gastropods and Bivalves contradict the the BioMAP(q) analysis determination that the Boyne River upstream of Walters Creek is unimpaired.

Site 006, on the Boyne River downstream of the confluence with Besley Drain, substrate consisted of sand and was located within the same meadow marsh wetland habitat, dominated by tall forb and grass species as site 002, 003, and 004. A BioMAP(q) value of 2.9 was calculated for this site. This river is considered to be unimpaired, when compared to the expected value of <2.0 for impaired rivers. This site had six (6) species with sensitivity values over 2 which suggest some impairment due to the majority of the sample consisting of tolerant species (27 taxa total). Additional metrics were calculated using a total of 2297 individuals representing 37 taxa. Four (4) of ten (10) additional metrics calculated are outside the expected parameters for rivers. Percent Chironomids, Percent Crustaceans and Percent Isopods were over the expected values for rivers (10-30%, <10%, and <3% respectively) with 44%, 11% and 10% respectively. As with Site 004 an increased population of Chironomids can indicate an environmentally stressed ecosystem. Though BioMAP(q) analysis classifies this portion of the river as unimpaired the benthic assemblages indicate potential for slight impairment.

Site 007, where the Boyne River crosses Mulmur-Melancthon Townline, substrate consisted of a mixture of boulders, sand and cobble. The river flowed from an open habitat area in wooded corridor just east of the townline bridge A BioMAP(q) value of 3.2 was calculated for this site. This river is considered to be unimpaired, when compared to the expected value of <2.0 for impaired rivers. This site had ten (10) species with sensitivity values over 2 (out of a total 38). Additional metrics were calculated using a total of 479 individuals representing 48 taxa. All ten (10) additional metrics were within the expected ranges for unimpaired rivers (see table below for expected parameters). Insects made up 98% of the sample with 20% being within Ephemeroptera, Plecoptera, or Trichoptera. The high EPT percentage further supports the BioMAP(q) analysis determination that this section of the Boyne River is unimpaired.

Site 008, Besley Drain at County Rd 124 (downstream of the WPCP), is primarily gravel, cobble, and sand and flows through an open habitat. A BioMAP(q) value of 3.2 was calculated for this site. This river is considered to be unimpaired, when compared to the expected value of <2.0 for impaired rivers. This site had six (6) species with sensitivity values over 2 out of 22 taxa total. Additional metrics were calculated using a total of 3347 individuals representing 32 taxa. Four (4) of ten (10) additional metrics calculated are outside the expected parameters for creeks. Percent Insects and Chironomids were under the expected value for creeks (>90%, 10-30% respectively) with 74% and 1% of the total sample. Percent Crustaceans and Percent Isopods were over the expected values for creeks (<10%, and <3% respectively) with 24% and 21% respectively. Individuals within EPT taxa accounted for 50% of the total sample.

Table 1 - BioMap WQI(q) expected parameters(1)

Watercourse Classification	Unimpaired	Impaired
Creek	>3.2	<3.2
River	>2.4	<2.0

(1) Source: Griffiths, R.W. 1999. BioMAP: Bioassessment of Water Quality.

Table 2- BioMAP WQI(q) Calculated Values

Station	Station Number	BioMAP WQI(q) Value	Within Unimpaired Range for Creeks (Yes/No)	Within Unimpaired Range for Rivers (Yes/No)
Walters Creek at HWY 10	001	3.1	No	
Besley Drain U/S of confluence	002	3.3	Yes	
U/S of confluence (005 + 004)	003	3.3		Yes
Walters Creek U/S of confluence	004	2.5	No	
Main Boyne River U/S of confluence	005	Did not complete		
D/S of confluence	006	2.9		Yes
Boyne River at M-M Townline	007	3.2		Yes
Besley Drain at County Rd 124	008	3.2	Yes	

Table 3 - Additional Benthic Macroinvertebrate Metrics including Expected Parameters

	Range of Expected Unimpaired Values	Range of Expected Unimpaired Values	Pooled K&S	Pooled K&S	Pooled K&S	Pooled K&S	Pooled K&S	Pooled K&S	Pooled K&S	Pooled K&S
	Creeks[1]	Streams[1]	Site 001	Site 002	Site 003	Site 004	Site 005	Site 006	Site 007	Site 008
Taxa Richness (per site)	19 - 40	29 - 60	35	47	46	23	-	37	48	32
% EPT	N/A	N/A	5	22	32	1	-	8	20	50
% Insects	> 90	> 80	73	76	94	84	-	82	98	74
% Chironomids	10-30	10-30	15	8	14	38	-	44	30	1
% Crustaceans	< 3	< 10	22	13	2	3	-	11	2	24
% Isopods	< 1	< 3	13	12	1	2	-	10	0	21
% Gastropods	< 1	< 5	0	10	3	7	-	4	0	1
% Bivalves	< 3	< 5	1	1	1	5	-	1	0	0

% Annelids	< 5	< 5	0	0	0	0	-	0	0	0
% Tubificids	< 1	< 2	3	1	0	1	-	1	0	0
% Flatworms	< 3	< 3	0	0	0	0	-	0	0	0

(1) Source: Griffiths, R.W. 1999. BioMAP: Bioassessment of Water Quality, Range of expected values for unimpaired, gravel-bottom creeks and streams.

Shelburne ACS
Biomonitoring Assessment Report



Prepared by
Nottawasaga Valley Conservation Authority
October 2012

EXECUTIVE SUMMARY

The Town of Shelburne operates a wastewater treatment facility that discharges into the headwaters area of the Boyne River through the Besley Drain. The Town is updating the Assimilative Capacity Study for the facility and has contracted the Nottawasaga Valley Conservation Authority to document the current state of stream health in the Boyne River headwaters through the use of benthic macroinvertebrates.

Benthic macroinvertebrates are a useful "tool" for the determination of stream water quality as they are relatively easy to sample, identify and analyze. They remain in the stream for up to three years and are exposed to a wide range of river conditions and water quality. Different stream invertebrate species exhibit a range of tolerances to pollution and other stream stressors. Thus, by analyzing the community of organisms present at a site, researchers can determine stream health.

Results from a 2012 sample event indicate that the headwaters of the Boyne River and in particular the confluence area were somewhat impaired and operating below its physiographic potential. Mayflies, stoneflies and caddisflies - preferred food sources for trout - were sparse, while numbers of aquatic worms and midges were more plentiful. Determining sources of the impairment was not practical with the benthic macroinvertebrate assays but signs point to upstream influences that are changing the hydrologic regime and nutrient chemistry of the confluence watercourses.

Three locations, Walter's Creek at Highway 10, Besley Drain at the confluence and an unnamed Boyne River tributary sampled at 5th Sideroad, were found to be impaired. These three stations were found lacking in mayfly, stonefly and caddisfly populations while pollution-tolerant animals were abundant. High levels of anthropogenic influence were found at all three stations. Walter's Creek was impacted by nutrient enrichment likely arising from residential development. Besley Drain was impacted by nutrient enrichment but also a lack of suitable habitat provided by a sand dominated substrate. The unnamed tributary was impacted by current and historic agricultural influences.

Two locations, "North" Branch Boyne River and the Boyne River at Mulmur-Melancthon Townline, were found to be unimpaired. These two stations were found to have high numbers of mayflies, stoneflies and caddisflies while pollution-tolerant animals were low. While both stations show signs of anthropogenic impacts, those impacts do not appear to be significantly affecting the benthic communities.

1 Background

The Boyne River arises as a series of tributaries from headwater wetlands near Shelburne. These tributaries flow eastward through a gently rolling rural/agricultural landscape, joining to form the main branch in a meadow marsh on the northern edge of Shelburne. At the Mulmur-Melancthon Townline, the Boyne River leaves the slower marsh environment as it enters the Niagara Escarpment, cascading through a steep, forested valley system which extends downstream past Airport Road.

The Town of Shelburne operates a wastewater treatment facility (WWTP) that discharges into the main branch of the Boyne River through the Besley Drain. The Nottawasaga Valley Conservation Authority (NVCA) entered into a partnership with the Town to assess the current biological condition of the headwater tributaries of the Boyne River through the analysis of both fisheries and benthic macroinvertebrate communities, as part of updating the assimilative capacity study (ACS) for the WWTP.

2 Methodology

Site Descriptions

The Shelburne ACS biomonitoring stations were located north and east of the Town of Shelburne (Figure 1) on the Boyne River and several of its tributaries. A key focus of the monitoring program was the confluence area where the main branch of the Boyne River, Walter's Creek and Besley Drain join together.

The confluence stations were located in a meadow marsh environment characterized by deep and narrow channels with shallow waters within low gradients reaches with high silt and organic material substrates and an abundance of instream vegetation, primarily watercress. The combination of deep and narrow channel morphology within a meadow marsh environment is a likely indicator of ongoing channel instability in response to an upstream stressor on the hydrologic cycle.

The Boyne River main branch station (station 10) was located about 50m upstream of the confluence in a low flow stream reach with moderate levels of aquatic algae, suggesting a moderate degree of nutrient enrichment. The sampling reach was overgrown by watercress, indicative of cold groundwater-rich flow inputs.

The Walter's Creek station (station 8) was located about 20m upstream of the confluence in a moderately flowing reach with a small amount of gravel substrate, in addition to the silt and organic material found in all the confluence systems. Moderate levels of algae and watercress were present through the reach suggesting cold groundwater-rich flow inputs, and a moderate degree of nutrient enrichment.

The Besley Drain station (station 11) was located about 10m upstream of the confluence in a low flow stream reach with a sand dominated substrate. Moderate levels of algae were present; watercress and other aquatic vegetation were not found at the site,

suggesting the Besley Drain, unlike the Boyne River or Walter's Creek is not a groundwater-fed system.



Figure 1: Shelburne Assimilative Capacity Study Benthic Macroinvertebrate Sampling Stations

The Boyne River station downstream of the confluence (station 12) was also located in the meadow marsh vegetation community but, unlike its contributing systems, was located in a much wider channel dominated by a sand and gravel substrate. The higher maintained flows at the downstream station also allowed for a more defined riffle-pool structure to be developed. Instream vegetation was present, but was no longer characterized by watercress. Algae levels remained moderate.

Walter's Creek was sampled again at Highway 10 (station 7) well upstream of the confluence area. This station had a deep and narrow channel with shallow waters in a low gradient stream reach that was dominated by a silt and cobble substrate. The cobble appears to be unnatural and migrating downstream from the Highway 10 culvert works. The channel had a high level of aquatic algae growth and a dense instream vegetative community, both of which suggest elevated nutrient concentrations. Beyond the riparian vegetation, the station lies within an urban parkette with maintained grasses to the south and an unmaintained wet meadow community to the north. Beyond the parkette lies a new residential subdivision.

The "north" branch of the Boyne River (also called Melancthon Creek) was sampled upstream of Dufferin Road 124 (station 15). This station had a deep and narrow channel with very shallow waters in a low gradient reach that was dominated by a gravel and

cobble substrate. Based upon the amount of flow this small watercourse transports leads one to conclude that the large size of the substrate is unnatural likely originating from road and/or crossing construction activities. The instream vegetation and algae levels were both low. Station 15 was situated in a meadow marsh community that was heavily influenced by opportunistic invasive species (Queen Anne's Lace, Reed Canary Grass), likely arising due to its proximity to the roadside.

An unnamed north tributary of the Boyne River was sampled upstream of 5th Sideroad in Melancthon (station 16). This station had a shallow and wide channel with shallow waters in a low gradient reach that was dominated by a sand and gravel substrate. At the time of sampling this reach was also impacted by a beaver dam which dispersed upstream flow out of the natural channel and through traditionally upland communities before flow reentered the channel about 50m upstream of the sampling site. Flow volumes were low and similar in volume to Melancthon Creek. Instream vegetation and algae were absent or very low. Station 16 was situated in a fallow agricultural/orchard vegetation community that had experienced significant human influence in the past.

The Boyne River was sampled again downstream of the Mulmur-Melancthon Townline prior to it entering the Niagara Escarpment physiographic zone (station 14). This station had a shallow and wide channel with moderately shallow waters in a low gradient reach that was dominated by cobble and sand. Instream vegetation was absent. Instream algae levels were high which likely reflect immediate upstream influences like residential activities (e.g. lawn maintenance) and wetland environments, but may also reflect influences further upstream arising from the Town of Shelburne including its WWTP. Station 15 was situated in an established cedar forest community.

Sampling Protocol

Benthic macroinvertebrate samples were collected using the Ontario Benthos Biomonitoring Network protocol (Jones *et al.*, 2004). The OBBN protocol uses a kick-and-sweep method of sampling using a 500-micron mesh D-frame dipnet. Two riffle sub-samples were obtained at each site. The samples were preserved in 95% ethanol prior to processing.

Following field collections, samples were washed through a 500-micron sieve, sorted, and randomly sub-sampled to obtain an approximately 100-animal fixed count (the entire sub-sample containing the 100th animal was processed to permit estimates of total sample abundance to be made). Detailed identification was completed by BII Consulting (Minesing, ON). Invertebrates continue to be preserved in 95% ethanol and were archived for future reference.

3 Data Analysis

Biomonitoring studies generate complicated rows and columns of numbers that correspond to the counts of animals collected at different sites. These data matrices are extremely difficult to comprehend without reducing the information down to a more

manageable level. Summarizing invertebrate compositions with metrics is a way to do this. Typical metrics describe the taxonomic richness, taxonomic composition, the proportion of pollution-tolerant individuals in a community, or the proportion of taxa in a particular trophic group (Jones, 2008). Note: It must be understood that when determining biomonitoring metrics for wetland sampling stations, their traditional interpretation criteria often do not apply. This will be explained further with each of the metrics that were used for the Shelburne ACS bioassessment.

Abundance

Abundance is the total number of individual benthic macroinvertebrates in the sample. A healthy stream reach should maintain a high number of benthic macroinvertebrates, however, it has been discovered in NVCA sampling that samples collected in wetlands often have smaller abundances despite being healthy systems. Total abundance is calculated by determining the percent of the sample picked to achieve the 100^{th} individual and multiplying it by the number of individuals picked. Due to a lack of abundance data for all the reference stations, abundance cannot be properly evaluated for the confluence stations.

Hilsenhoff Biotic Index (BI)

The Hilsenhoff Biotic Index (BI) is used to indicate the degree of water quality impairment, as determined by the amount of organic pollution present in a stream. This index assigns sensitivity values to organisms based on their pollution tolerance to nutrient enrichment. This index classifies water quality as unimpaired (0 to 4.5), potentially impaired (4.51 – 6.5), or impaired (6.51 – 10) based on quantitative scores (Hilsenhoff, 1988). Note: Wetland locations have an abundance of organic materials in their substrate and therefore even healthy wetlands have depressed BI scores when compared to non-wetland stations.

Species Richness

Species richness is defined as the total number of species present in a sample. Higher species richness is usually associated with higher water quality. Note: Wetland samples often have low species richness even in healthy locations.

EPT Richness and %EPT

These metrics measure the diversity and proportion of mayflies (**E**phemeroptera), stoneflies (**P**lecoptera) and caddisflies (**T**richoptera) within each sample. These three orders are often associated with unimpaired conditions. Higher metric values generally indicate better water quality. Note: Healthy wetland samples often have lower EPT populations, as reflected in both richness and proportion calculations.

% CIGH

This metric measures the diversity and proportion of water boatman (**C**orixidae), **I**sopods, snails (**G**astropods) and leeches (**H**irudinea) within each sample. These four orders are often associated with highly impaired conditions usually arising from algae enrichment. Higher metric values generally indicate poor water

quality. Note: Healthy wetland samples may have slightly elevated CIGH proportions when compared to non-wetland locations.

% Aquatic Worms

Aquatic worms tolerate organic pollution and low oxygen. Higher percentages of these taxa in samples suggest impaired water quality. Note: Healthy wetland samples often have moderately high levels of aquatic worms when compared to non-wetland locations.

% Chironomids

Chironomids (i.e., midges) are common in a variety of stream habitats, however high proportions are typically indicative of poor water quality. Note: Healthy wetland samples may have slightly elevated levels of chironomids when compared to non-wetland locations.

These indices were compared with available stream reach and land use data to generate a bioassessment prognosis for each station.

4 Results

This section presents analyses of stream health derived from data collected in 2012. Each station was assessed based on the results of several indices that highlight different attributes of benthic communities (Table 1). Results from the four confluence stations were also weighed against historic information available from relatively unimpacted stations that were situated within a wetland environment, much like the confluence stations, before making a final health prognosis (Table 2). The NVCA has typically used the grading scale: unimpaired = good, below potential = fair, impaired = poor.

Station Analysis

The Confluence Stations

Station 8 – Walter's Creek Upstream of the Confluence

Benthic indices for station 8 suggest that the site was "below potential" operating at a level below that of the unimpacted reference sites. Station 8 had a higher than reference Hilsenhoff BI score and proportions of Chironomidae, CIGH and aquatic worms, as well as a lower than reference proportion of EPT taxa. The EPT taxa that were present were more generalist in nature, with the more sensitive taxa lacking. The indicator species for this station were insensitive Chironomidae. The slight impairment at station 8 along with the deep and narrow channel form, the dominance of insensitive or generalist macroinvertebrate taxa with the near absence of sensitive taxa suggest that this station was in flux, likely from upstream inputs. These inputs likely include additional nutrients, as seen through higher algae growth, and a change in the timing, duration and magnitude of the hydrology of the system, as seen through a deep and narrow dynamic channel form in a meadow marsh environment.

Station 10 – Boyne River Upstream of the Confluence

Benthic indices for station 10 suggest that the site was "below potential" operating at a level below that of the unimpacted reference sites. Station 10 had a higher than reference Hilsenhoff BI score and proportion of Chironomidae and aquatic worms, as well as a lower than reference proportion of EPT taxa. The EPT taxa that were present were more generalist in nature, with only a couple of the more sensitive taxa present. The indicator species for this station were also insensitive Chironomidae. Much like Walter's Creek, the Boyne River confluence station exhibited similar indicators of flux, but slightly muted. The Boyne River channel structure was not as deep and narrow as Walter's Creek, and the Boyne River algae growth was not as abundant as Walter's Creek.

Station 11 – Besley Drain Upstream of the Confluence

Benthic indices for station 11 suggest that the site was "impaired" operating at a level well below that of the unimpacted reference sites. Station 11 had a low overall abundance of individuals and no EPT taxa indicating that the location was lacking a key habitat component. Benthic macroinvertebrate habitat is commonly restricted due to the availability of suitable substrate on which to live and/or an environment made unsuitable due to physical (e.g. intermittent flow) or chemical conditions (e.g. low oxygen concentrations, toxicity). In the transects sampled for benthic analysis, the Besley Drain was a sand dominated system. Sand is a poor substrate for benthic habitat due to it its mobility and its inability to provide sheltered attachment locations, like gravel or cobble. The highly abrasive texture of moving sand also poses the risk to macroinvertebrates of being abraded as the sand grains rub against the soft-bodied benthos. Sampling conducted in other sand dominated systems in the watershed has resulted in similar findings. Water chemistry was not collected as part of the benthic sampling; therefore conclusions on the potentially limiting effects of the chemical environment on benthos could not be evaluated. Station 11 also demonstrated indicators of flux in its channel form and nutrient enrichment likely originating from upstream inputs.

Station 12 – Boyne River Downstream of the Confluence

Benthic indices for station 12 suggest that the site was "below potential" operating at a level below that of the unimpacted reference sites. Station 12 had a moderate overall abundance of individuals, a low proportion of EPT taxa and aquatic worms and higher than reference proportions of CIGH, Chironomidae and a higher Hilsenhoff BI score. The benthic taxa at station 12 were dominated by insensitive generalist species with the more sensitive taxa lacking. The increase in gravel substrate and a more defined riffle-pool channel structure at station 12 should be reflected in an increase in the proportion of EPT taxa if the system was healthy. When comparing station 12 to its three contributing systems (Walter's, Boyne and Besley) proportions of EPT taxa were lower than those observed at Walter's (station 8) and the Boyne (station 10). All four of the stations were dominated by generalist EPT taxa with only a few of the more sensitive species present in the Boyne River (station 10). Upstream impacts continued to cause flux downstream of the confluence as was evidenced at station 12 through moderate algae growth and the resulting benthic community.

Table 1: Benthic Data Summary for 2012 Sampling at the Shelburne ACS Stations

Metric	Walter's Hwy 10 Sta-7	Walter's upstream confluence Sta-8	Boyne upstream confluence Sta-10	Besley upstream confluence Sta-11	Boyne downstream confluence Sta-12	"North" Branch Boyne Duff Rd 124 Sta-14	Boyne Trib 5 Sideroad Sta-15	Boyne Mul-Mel TL Sta-16
Abundance	21,361	22,120	19,327	17,166	26,330	25,014	18,260	35,904
Hilsenhoff BI	6.42D	5.75D	5.78D	5.86D	5.84D	4.08B	5.65D	4.05B
Richness	34	41	31	27	32	42	37	47
EPT Richness	5	11	8	0	6	15	8	19
% EPT	5.0	14.5	13.6	0.0	5.1	34.6	10.1	55.3
% CIGH	36.0	2.6	1.0	4.7	3.3	0.0	0.0	0.0
% Aquatic Worms	0.0	3.1	2.0	9.0	0.4	0.0	1.0	0.0
% Chironomidae	14.4	22.5	29.2	23.2	26.3	12.9	34.1	16.5
Condition	Impaired	Below Potential	Below Potential	Impaired	Below Potential	Unimpaired	Impaired	Unimpaired

Unimpaired = good, below potential = fair, impaired = poor.

Table 2: Benthic Data Summary for Historic Unimpacted Stations Situated Within a Wetland Environment

Metric	Matheson Cr Trib Penetanguishene Rd	Black Ash Cr (Petun Branch) 2nd Line	Mad R Centre Line B	Black Cr Trib Vespra Valley Rd (2011)	Black Cr Trib Vespra Valley Rd (2002)
Abundance	Low	Low	Low	Low	Low
Hilsenhoff BI	5.17C	3.74B	3.51B	4.60C	3.74B
Richness	33	10	19	31	17
EPT Richness	11	4	11	5	6
% EPT	66	45	79	22	50
% CIGH	2	3	0	0	0
% Aquatic Worms	0	1	1	0	0
% Chironomidae	0	19	4	53	3
Condition	Unimpaired	Unimpaired	Unimpaired	Unimpaired	Unimpaired

Unimpaired = good, below potential = fair, impaired = poor.

Non-Confluence Stations

Station 7 – Walter's Creek at Highway 10

Benthic indices for station 7 suggest that the site was "impaired" and operating below its physiographic potential. Station 7 had only a moderate overall abundance of individuals, with low proportions of EPT taxa and Chironomidae, yet the station had very high levels of CIGH and a very high Hilsenhoff BI score. For a non-wetland site, all these matrices were indicators of some form of impairment. While not definitive, the station's proximity to new construction (upstream culvert works), residential development and the maintained parkette feature through which the channel flows may all be causes of this impairment. The very high levels of CIGH were a strong indicator that impairment was being caused by an overabundance of algae. A significant proportion of the sampled benthos were *Asellus* sp, a genus of Isopod that are omnivorous and commonly found in NVCA samples in environments with high algae concentrations. *Asellus* sp are also tolerant of a range of pollutant conditions.

Station 14 – "North" Branch Boyne River (Melancthon Creek) at Dufferin Road 124

Benthic indices for station 14 suggest that the site was "unimpaired" and operating at or very near its physiographic potential. Station 14 had high proportions of EPT taxa, a moderate Hilsenhoff BI score, and moderate overall abundance while having low CIGH, aquatic worm and Chironomidae levels. The presence of high proportions of sensitive Ephemeroptera (mayfly), Tipulidae (cranefly) and Chironomidae taxa demonstrate the high quality performance of this system.

Station 15 – Unnamed Boyne River Tributary at 5th Sideroad

It was very difficult to assess station 15 due to the ongoing beaver dam activity. In order to augment the evaluation of station 15 data from this sampling event (2012) will be compared with a sample collected by the NVCA at the same location in October 2009. Benthic indices for station 15 from both 2012 and 2009 results suggest that the site was "impaired" and operating below its physiographic potential. Station 15 had a moderate overall abundance, moderate levels EPT taxa and Chironomidae, a high Hilsenhoff BI score, and low levels of CIGH and aquatic worms in 2012. In 2009, levels of Chironomidae, aquatic worms and CIGH were high, while levels of abundance and EPT taxa were unchanged. The combined data from 2012 and 2009 both show that station 15 was negatively impacted by the agricultural setting through which it flowed. The beaver activity appears to have had very little effect on the overall benthic community downstream of the dam.

Station 16 – Boyne River at Mulmur-Melancthon Townline

Station 16 demonstrated the highest quality benthic macroinvertebrate community in the study area with a high overall abundance and high levels of EPT taxa, very low levels of CIGH, aquatic worms and Chironomidae and a moderate Hilsenhoff BI score. Benthic indices for station 16 suggest that the site was "unimpaired" and operating at or near its physiographic potential. The high quality benthic community at this station appears to be thriving despite relatively high levels of instream algae.

5 Discussion and Conclusions

Sampling results for the Shelburne ACS stations provide valuable baseline data for monitoring the potential impacts of proposed future growth within the Town of Shelburne. Results of this sampling indicate a variety of stream health conditions with impairment on Walter's Creek (Hwy 10), the Besley Drain (confluence) and the Boyne River tributary (5 Sideroad) and unimpaired conditions at the "North" Branch of the Boyne River and the Boyne River (Mulmur-Melancthon Townline).

Walter's Creek at Highway 10 represents a small headwaters watercourse with cold groundwater-rich inputs that flows through the developed northern edge of the Town of Shelburne. The small watercourse had significant algae growth, a high degree of channel incision and an impaired benthic community representative of a system still coping with the effects of the change going on around it. The watercourse's proximity to new development, ongoing road crossing work and a maintained parkette feature are all likely causes of this impairment.

As Walter's Creek and the other headwater systems (Boyne River and Besley Drain) enter the confluence area they descend into a natural, low gradient meadow marsh wetland. Two of the systems (Boyne and Walter's) receive cold groundwater inputs as they flow through this area raising their potential to support high quality habitat for both fish and benthic macroinvertebrates. It is unclear if the Besley Drain receives groundwater inputs through the confluence area.

Benthic macroinvertebrate sampling in the confluence area showed that the benthic communities of Walter's Creek and the Boyne River upstream of their confluence were both somewhat impaired and operating "below potential". Sampling in the Besley Drain showed it to be impaired.

The impairment observed at the confluence stations was most likely reflecting an ongoing change that was occurring in the systems. The channel structure of all three watercourses through the meadow marsh was deep and narrow which is uncharacteristic for this environment. Ongoing degradation of the channel bed and undercutting of the banks is indicative of a channel form still striving to adjust to upstream changes to its flow regime. Elevated algae growth through the meadow marsh was also uncharacteristic for this environment and was also likely caused by upstream sources of nutrient enrichment. In addition to these symptoms of impairment, the Besley Drain was a sand dominated system. Previous NVCA sampling has shown that sand dominated systems proved for poor benthic habitat regardless of the scale of impairment introduced from external variables.

Downstream of the confluence, but still within the meadow marsh, the Boyne River gains in size and develops a well defined riffle-pool structure with a sand and gravel substrate. Despite these physical changes the Boyne River reach continued to be impacted by upstream influences on its flow regime and nutrient enrichment. Channel degradation and undercutting and algae levels were less than upstream of the confluence, but

remained impactful on the benthic community. Benthic sampling showed the Boyne River downstream of the confluence to be somewhat impaired and operating "below potential".

Two very different tributaries discharge into the Boyne River downstream of the confluence near Dufferin Road 124. The "North" Branch or Melancthon Creek enters the Boyne River at Dufferin Road 124 as a high quality unimpaired system with high proportions of sensitive EPT taxa. Despite draining agricultural fields and rural residential properties Melancthon Creek was able to maintain high quality habitat for benthic macroinvertebrates. An unnamed tributary of the Boyne River (sampled at 5th Sideroad) enters the Boyne River in a large meadow marsh environment downstream of Dufferin Road 124. The unnamed tributary was impaired with a history of agricultural impacts, which have proven to be strong drivers at deteriorating benthic communities in most systems. Both tributary systems had low flows at the time of sampling and were unlikely to contribute significantly to overall flow or stream health of the Boyne River at their respective points of confluence.

The Boyne River emerges from the meadow marsh environment and flows through two decommissioned online ponds before crossing Mulmur-Melancthon Townline where the final benthic sampling occurred. By this point the Boyne River has a shallow and wide channel structure with a cobble substrate within a cedar forest community. Benthic sampling indicated that the Boyne River had an unimpaired benthic community with high proportions of sensitive EPT taxa. Relative algae levels were fairly high likely reflecting the combined impacts of upstream rural residences, wetland environments, but may also reflect influences further upstream arising from the Town of Shelburne including its WWTP. As the impacts of the algae were not reflected in the structure of the benthic community it is unlikely that the algae was having a negative effect on the biota in this reach of river.

Overall, the headwaters area of the Boyne River was somewhat impaired and operating below its physiographic potential with some stream reaches impaired and others unimpaired. The watercourses of the Boyne River confluence area were undergoing change due to upstream influences to its hydrologic regime and water chemistry.

6 References

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Shelburne Benthos 2012	Besley Drain U/S confluence Riffle 1 Sept 17/12	Besley Drain U/S confluence Riffle 2 Sept 17/12	Walter's Ck HWY 10 Riffle 1 Sept 17/12	Walter's Ck HWY 10 Riffle 2 Sept 17/12	Walter's Ck U/S confluence Riffle 1 Sept 17/12	Walter's Ck U/S confluence Riffle 2 Sept 17/12	Boyne R. U/S confluence Riffle 1 Sept 17/12	Boyne R. U/S confluence Riffle 2 Sept 17/12	Boyne R. D/S confluence Riffle 1 Sept 17/12	Boyne R. D/S confluence Riffle 2 Sept 17/12	Boyne R. Mulmur Townline Riffle 1 Sept 17/12	Boyne R. Mulmur Townline Riffle 2 Sept 17/12	"North" Branch Boyne R. Dufferin Rd 124 Riffle 1 Sept 17/12	"North" Branch Boyne R. Dufferin Rd 124 Riffle 2 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 1 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 2 Sept 17/12
Acarina					1						1	1				
Hygrobates sp			3	2							1	2				
Lebertia sp			4	1		2	1	1			1					
Piona sp			1													
Sperchon sp										1	6					
Coleoptera																
Elmidae																
Dubiraphia sp (larvae)	11	6	10	2	20	22	13	19	8	57			2	7	15	6
Dubiraphia quadrinotata	2		1			1			2						1	
Dubiraphia vittata														1		
Optioservus sp (larvae)	2		3	11	5				9	8	3	1	5	7	3	
Optioservus fastiditus		2	1			1										
Promoresa sp (larvae)											1	1	7	10		
Stenelmis sp (larvae)	5	4			6				7	1	2	3	33	24	4	5
Stenelmis crenata									1	1	1			2	5	
Dytiscidae																
Agabus sp							1									
Haliplidae																
Haliplus sp			1	2												
Hydrophilidae																
Helophorus sp			1				1									
Tropisternus sp						1										
Psephenidae																
Psephenus herricki											5			2		
Decapoda																
Orconectes propinquus									1							
Diptera																

Shelburne Benthos 2012	Besley Drain U/S confluence Riffle 1 Sept 17/12	Besley Drain U/S confluence Riffle 2 Sept 17/12	Walter's Ck HWY 10 Riffle 1 Sept 17/12	Walter's Ck HWY 10 Riffle 2 Sept 17/12	Walter's Ck U/S confluence Riffle 1 Sept 17/12	Walter's Ck U/S confluence Riffle 2 Sept 17/12	Boyne R. U/S confluence Riffle 1 Sept 17/12	Boyne R. U/S confluence Riffle 2 Sept 17/12	Boyne R. D/S confluence Riffle 1 Sept 17/12	Boyne R. D/S confluence Riffle 2 Sept 17/12	Boyne R. Mulmur Townline Riffle 1 Sept 17/12	Boyne R. Mulmur Townline Riffle 2 Sept 17/12	"North" Branch Boyne R. Dufferin Rd 124 Riffle 1 Sept 17/12	"North" Branch Boyne R. Dufferin Rd 124 Riffle 2 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 1 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 2 Sept 17/12
Ceratopogonidae											1					2
Bezzia/Palpomyia sp.				1												
Probezzia sp	1	4			3	3	1	2					1		1	5
Chironomidae	7	20	10	16	23	37	44	51	3	26	30	20	16	8	54	27
Ablabesmyia sp															1	
Chironomus spp																2
Cladotanytarsus sp							2									
Corynoneura sp													1		1	1
Cricotopus sp	6	7	5	12	9	1	4		24	7	2	1				2
Cricotopus bicinctus	3	4	1	1	1	2	1		20	8		1				
Cryptochironomus sp	1	2	1				1	1							2	1
Dicrotendipes sp																1
Eukieferellia sp											2					
Larsia sp																1
Limnophyes sp			1													
Microtendipes sp				1	1				6	9	2	1		2	4	7
Nanocladius sp			1		1											
Natarsia sp						1										1
Pagastia sp											1					
Parachaetocladius sp													1			
Parakiefferiella sp	18	27	1	1	2	6	1	4	5	14						
Parametriocnemus sp	3	2		2		1			2			2		1		
Paratanytarsus sp	2					1				1						
Paratendipes sp	2		8		1	2										
Phaenopsectra sp																1
Polypedilum sp	2	7		1	3	2	1	1	2	8	2		3	4	6	7
Procladius sp							1	2					1			

Shelburne Benthos 2012	Besley Drain U/S confluence Riffle 1 Sept 17/12	Besley Drain U/S confluence Riffle 2 Sept 17/12	Walter's Ck HWY 10 Riffle 1 Sept 17/12	Walter's Ck HWY 10 Riffle 2 Sept 17/12	Walter's Ck U/S confluence Riffle 1 Sept 17/12	Walter's Ck U/S confluence Riffle 2 Sept 17/12	Boyne R U/S confluence Riffle 1 Sept 17/12	Boyne R U/S confluence Riffle 2 Sept 17/12	Boyne R D/S confluence Riffle 1 Sept 17/12	Boyne R D/S confluence Riffle 2 Sept 17/12	Boyne R Mulmur Townline Riffle 1 Sept 17/12	Boyne R Mulmur Townline Riffle 2 Sept 17/12	"North" Branch Boyne R. Dufferin Rd 124 Riffle 1 Sept 17/12	"North" Branch Boyne R. Dufferin Rd 124 Riffle 2 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 1 Sept 17/12	Boyne R Trib at 5 Sideroad Riffle 2 Sept 17/12
Rheotanytarsus sp											6			1		
Stempellinella sp														2		
Synorthocladius sp				1												
Tanytarsus sp									1		3		6	2	2	4
Thieneminella sp			1		6	1	2	1	2	1		2		3		
Thienemannimyia group				3	3	3	1	2	3	2	2	2	4	2	1	
Tvetenia sp			3	13	1	2		1	4		12	11	2	3		
Zavrelia sp						1										2
Empididae																
Hemerodromia sp					2	1		1	1		2	2				
Muscidae			1	2												
Psychodidae		1														1
Simuliidae																
Simulium sp										1		1				
Tabanidae																
Chrysops sp	1	1			1										3	
Tipulidae																
Antocha sp				1			1			1	17	12	1			
Dicranota sp													1			
Pseudolimnophila sp	1															1
Tipula sp	1	1							1				1			1
Ephemeroptera																
Baetidae																
Baetis sp			1		3	4	5				5	2	1	6		
Caenidae																
Caenis sp					1	1	2	2		4		1	2	5	1	
Ephemerellidae											7	3	1			

Shelburne Benthos 2012	Besley Drain U/S confluence Riffle 1 Sept 17/12	Besley Drain U/S confluence Riffle 2 Sept 17/12	Walter's Ck HWY 10 Riffle 1 Sept 17/12	Walter's Ck HWY 10 Riffle 2 Sept 17/12	Walter's Ck U/S confluence Riffle 1 Sept 17/12	Walter's Ck U/S confluence Riffle 2 Sept 17/12	Boyne R. U/S confluence Riffle 1 Sept 17/12	Boyne R. U/S confluence Riffle 2 Sept 17/12	Boyne R. D/S confluence Riffle 1 Sept 17/12	Boyne R. D/S confluence Riffle 2 Sept 17/12	Boyne R. Mulmur Townline Riffle 1 Sept 17/12	Boyne R. Mulmur Townline Riffle 2 Sept 17/12	"North" Branch Boyne R Dufferin Rd 124 Riffle 1 Sept 17/12	"North" Branch Boyne R. Dufferin Rd 124 Riffle 2 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 1 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 2 Sept 17/12
Ephemerella sp												1				
Seratella sp											33	12				
Ephemeridae																
Ephemera sp											1					
Heptagenidae					2									4		
Stenonema sp											1			1		
Stenonema tripunctatum														1		
Stenonema vicarium											3	2		4		
Leptophlibiidae																
Paraleptophlebia sp			4		1	1	4	4			1	1	40	13	3	5
Oligoneuridae																
Isonychia sp											18	14	1		1	1
Siphlonuridae																1
Hemiptera																
Veliidae																
Rhagovelia sp											1					
Hirudinea																
Glossiphonidae																
Glossoponia heteroclita					1											
Isopoda																
Asellus sp (immature)	2	4	26	53			1		5	4						
Megaloptera																
Corydalidae																
Nigronia sp														3		
Sialidae																
Sialis sp								1								
Odonata																

Shelburne Benthos 2012	Besley Drain U/S confluence Riffle 1 Sept 17/12	Besley Drain U/S confluence Riffle 2 Sept 17/12	Walter's Ck HWY 10 Riffle 1 Sept 17/12	Walter's Ck HWY 10 Riffle 2 Sept 17/12	Walter's Ck U/S confluence Riffle 1 Sept 17/12	Walter's Ck U/S confluence Riffle 2 Sept 17/12	Boyne R. U/S confluence Riffle 1 Sept 17/12	Boyne R. U/S confluence Riffle 2 Sept 17/12	Boyne R. D/S confluence Riffle 1 Sept 17/12	Boyne R. D/S confluence Riffle 2 Sept 17/12	Boyne R Mulmur Townline Riffle 1 Sept 17/12	Boyne R. Mulmur Townline Riffle 2 Sept 17/12	"North" Branch Boyne R Dufferin Rd 124 Riffle 1 Sept 17/12	"North" Branch Boyne R Dufferin Rd 124 Riffle 2 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 1 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 2 Sept 17/12
Anisoptera																
Aeshnidae																
Boyera sp	1								2							
Gomphidae															1	
Zygoptera																
Calopterygidae																
Calopteryx sp		1					2	1					1		2	1
Plecoptera																
Taeniopterygidae																
Taeniopteryx sp							1							1		
Mollusca																
Pelecypoda																
Sphaeriidae																
Pisidium sp (immature)	2	2				2	3					1				
Sphaerium striatinum		1												1		
Gastropoda																
Physa sp	2	1			2	3		1								
Pseudosuccinae columella				1												
Oligochaeta																
Naididae	9															
Tubificidae (immature)		8			3	3	1	3	1							2
Trichoptera																
Brachycentridae																
Micrasema sp											4	2				
Hydropsychidae			1		8	2	5				14	23	4	2	4	
Cheumatopsyche sp					1					1	16	7		1	2	
Hydropsyche sp				4	1	1	1		4		14	3		1		

Shelburne Benthos 2012	Besley Drain U/S confluence Riffle 1 Sept 17/12	Besley Drain U/S confluence Riffle 2 Sept 17/12	Walter's Ck HWY 10 Riffle 1 Sept 17/12	Walter's Ck HWY 10 Riffle 2 Sept 17/12	Walter's Ck U/S confluence Riffle 1 Sept 17/12	Walter's Ck U/S confluence Riffle 2 Sept 17/12	Boyne R. U/S confluence Riffle 1 Sept 17/12	Boyne R. U/S confluence Riffle 2 Sept 17/12	Boyne R. D/S confluence Riffle 1 Sept 17/12	Boyne R. D/S confluence Riffle 2 Sept 17/12	Boyne R. Mulmur Townline Riffle 1 Sept 17/12	Boyne R. Mulmur Townline Riffle 2 Sept 17/12	"North" Branch Boyne R. Dufferin Rd 124 Riffle 1 Sept 17/12	"North" Branch Boyne R. Dufferin Rd 124 Riffle 2 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 1 Sept 17/12	Boyne R. Trib at 5 Sideroad Riffle 2 Sept 17/12
Hydropsyche betteni											1					
Hydropsyche bronta									1		2	4				
Hydropsyche slossonae					1				1	1	2	2				
Hydropsyche spama												1		2		
Hydroptilidae																
Orthotrichia sp				1												
Lepidostomitidae																
Lepidostoma sp					3	1	1			2						1
Limnephilidae						1							1		2	
Philopotamidae																
Chimarra sp											6	2				
Phryganeidae																
Ptilostomis sp						1										
Polycentropodidae							1	1								

1. Introduction

A fisheries assessment was completed to support the assimilative capacity study for the Town of Shelburne's wastewater treatment plant. Baseline conditions of the receiving waters, including the Boyne River, Walter Creek and Besley drain were collected during the summer of 2014.

WSP biologists completed a habitat assessment on August 8, 2014, and aquatic sampling on August 14, 2014. Sampling occurred during overcast conditions and at a temperature of 15° C. A two-man backpack electrofisher crew, consisting of a Nottawasaga Valley Conservation Authority (NWVA) aquatic specialist and a WSP biologist undertook a single-pass approach to document fish present within receiving waters.

A total of six (6) reaches were assessed (Figure 1) and are described in detail below.

2. Existing Conditions

The habitat conditions provided by the downstream-most location (Reach A) was the widest section of the Boyne surveyed. The substrate consisted of cobble and gravel. The reach flowed from an open habitat area in wooded corridor just east of the town-line bridge.

The habitat conditions provided by Reach B through to Reach E, overall, were very similar. This section occurs within a meadow marsh wetland habitat, dominated by tall forb and grass species. The mainstem of the Boyne River had the greatest width and depth, while the Besley Drain and Walter Creek were less than half the width. Cover opportunities were provided by overhanging vegetation and in some cases, completely shaded the stream.

2.1 Sampling Results

2.1.1 Reach A

The Boyne River, occurring 100 m upstream and 100 m downstream from the Mulmur Melancthon Townline crossing was assessed.

The sampling results from this crossing are identified in the table below.

Table 2: Sampling results for Reach A.

Species		Thermal Regime	Tolerance	Fish Captured		Total Length Range (mm)
				YOY	Adult	
Blacknose Dace	*Rhinichthys atratulus*	Coolwater	Intermediate	2	10	70-74
Brown Trout	*Salmo trutta*	Coldwater	Intolerant	1	4	72-315
Creek Chub	*Semotilus atromaculatus*	Coolwater	Intermediate		5	71-100
Johnny Darter	*Etheostoma nigrum*	Coolwater	Tolerant		1	60
Longnose Dace	*Rhinichthys cataractae*	Coolwater	Intermediate	2	13	50-105
Mottled Sculpin	*Cottus bairdii*	Coldwater	Intermediate		12	35-90

Pumpkinseed	*Lepomis gibbosus*	Warmwater	Intermediate	1		68
Rainbow Trout	*Oncorhynchus mykiss*	Coldwater	Intolerant	12	37	55-188
White Sucker	*Catostomus commersonii*	Coolwater	Tolerant		2	197
Effort:	852 Seconds					

2.1.2 Reach B

The Boyne River occuring downstream of the confluence with the Besley Drain was assessed.

The sampling results from this crossing are identified in the table below.

Table 3: Sampling results for Reach B.

Species		Thermal Regime	Tolerance	Fish Captured		Total Length Range (mm)
				YOY	Adult	
Blacknose Dace	*Rhinichthys atratulus*	Coolwater	Intermediate		6	74-94
Brook Trout	*Salvelinus fontinalis*	Coldater	Intolerant	10	11	60-275
Brown Trout	*Salmo trutta*	Coldwater	Intolerant		1	330
Central Mudminnow	*Umbra limi*	Coolwater	Tolerant		1	55
Creek Chub	*Semotilus atromaculatus*	Coolwater	Intermediate		10	86-143
Longnose Dace	*Rhinichthys cataractae*	Coolwater	Intermediate		2	82-106
Mottled Sculpin	*Cottus bairdii*	Coldwater	Intermediate		4	32-84
Rainbow Trout	*Oncorhynchus mykiss*	Coldwater	Intolerant	2	6	142-159
White Sucker	*Catostomus commersonii*	Coolwater	Tolerant		4	120-250
Effort:	593 Seconds					

2.1.3 Reach C & D

The Boyne River, occurring upstream of the confluence with the Besley Drain and 100 m upstream into Water Creek was assessed.

The sampling results from this crossing are identified in the table below.

Table 4: Sampling results for Reach C

Species		Thermal Regime	Tolerance	Fish Captured		Total Length Range (mm)
				YOY	Adult	
Brook Trout	*Salvelinus fontinalis*	Coldater	Intolerant	17	8	51-219
Central Mudminnow	*Umbra limi*	Coolwater	Tolerant		2	72-76
Creek Chub	*Semotilus atromaculatus*	Coolwater	Intermediate	1	4	51-161
Johnny Darter	*Etheostoma nigrum*	Coolwater	Tolerant		1	60
Longnose Dace	*Rhinichthys cataractae*	Coolwater	Intermediate		2	72-80
Mottled Sculpin	*Cottus bairdii*	Coldwater	Intermediate		8	55-62
Rainbow Trout	*Oncorhynchus mykiss*	Coldwater	Intolerant		3	118-140
White Sucker	*Catostomus commersonii*	Coolwater	Tolerant		5	135-204
Effort:	700 Seconds					

2.1.4 Reach E

The Besley Drain, occurring 100 m upstream from the confluence with the Boyne River was assessed.

The sampling results from this crossing are identified in the table below.

Table 5: Sampling results for Reach E.

Species		Thermal Regime	Tolerance	Fish Captured		Total Length Range (mm)
				YOY	Adult	
Blacknose Dace	*Rhinichthys atratulus*	Coolwater	Intermediate		5	65-90
Brook Trout	*Salvelinus fontinalis*	Coldater	Intolerant		7	51-189
Creek Chub	*Semotilus atromaculatus*	Coolwater	Intermediate		4	54-122
Mottled Sculpin	*Cottus bairdii*	Coldwater	Intermediate	1	2	75-86
Rainbow Trout	*Oncorhynchus mykiss*	Coldwater	Intolerant		7	126-180

Effort:	588 Seconds

2.1.5 Reach F

Walter Creek, occurring approximately 1.7 k m upstream from the confluence with the Boyne River was assessed.

The sampling results from this crossing are identified in the table below.

Table 6: Sampling results for Reach F.

Species		Thermal Regime	Tolerance	Fish Captured	Fork Length Range (mm)
Brook Trout	*Salvelinus fontinalis*	Coldater	Intolerant	3	110-280
Brook Stickleback	*Culaea inconstans*	Coolwater	Intermediate	15	
Central Mudminnow	*Umbra limi*	Coolwater	Tolerant	29	
Mottled Sculpin	*Cottus bairdii*	Coldwater	Intermediate	2	
White Sucker	*Catostomus commersonii*	Coolwater	Tolerant	1	
Effort:	219 Seconds				

3. Discussion & Conclusion

The study area was confirmed to support cool and coldwater fish species, some of which are sensitive to changes in environmental conditions, such as dissolved oxygen, temperature, and suspended sediments. Assessments completed in 2012 indicated no change or minimal change to the temperature, dissolved oxygen turbidity levels of the stream from effluent discharge.

Shelburne ACS
Fish Community Survey Report
Boyne River Headwaters



Prepared by
Nottawasaga Valley Conservation Authority
October 2012

Shelburne ACS

Fish Community Survey Report

Boyne River Headwaters

Nottawasaga Valley Conservation Authority, October 2012

Background and Methods

This fish community survey completed by the Nottawasaga Valley Conservation Authority (NVCA) was designed to provide background data that would support environmentally sound recommendations as part of an Environmental Assessment Project for an expanded waste water treatment plant in the Town of Shelburne. Management of nutrients and phosphorus in particular, is important for controlling aquatic plant growth (including algae) and for maintaining dissolved oxygen concentrations at levels that are suitable for fish and fish-food organisms. Excess plant growth can reduce oxygen concentrations due to respiration of plants at night during the summer and through oxidation of decomposing plant material in the fall and winter.

A total of 5 exploratory (qualitative) and 1 quantitative fish community stations (Figure 1) were sampled in the Boyne River Headwaters in the summer of 2012 using a backpack electrofisher. The quantitative station was sampled using the 3-Pass Removal Method.

The qualitative stations were all located west of Dufferin Road 124 (Figure 1) and included:

1. Boyne River upstream from confluence with Walter's Creek tributary.
2. Walters Creek downstream from Highway 10.
3. Walters Creek upstream from Boyne River confluence.
4. Besley Drain upstream from Boyne River confluence.
5. Boyne River downstream from Besley Drain confluence.

The quantitative station was located downstream from Dufferin Road 124 on the east side of the Mulmur-Melancthon Townline (Figure 1).

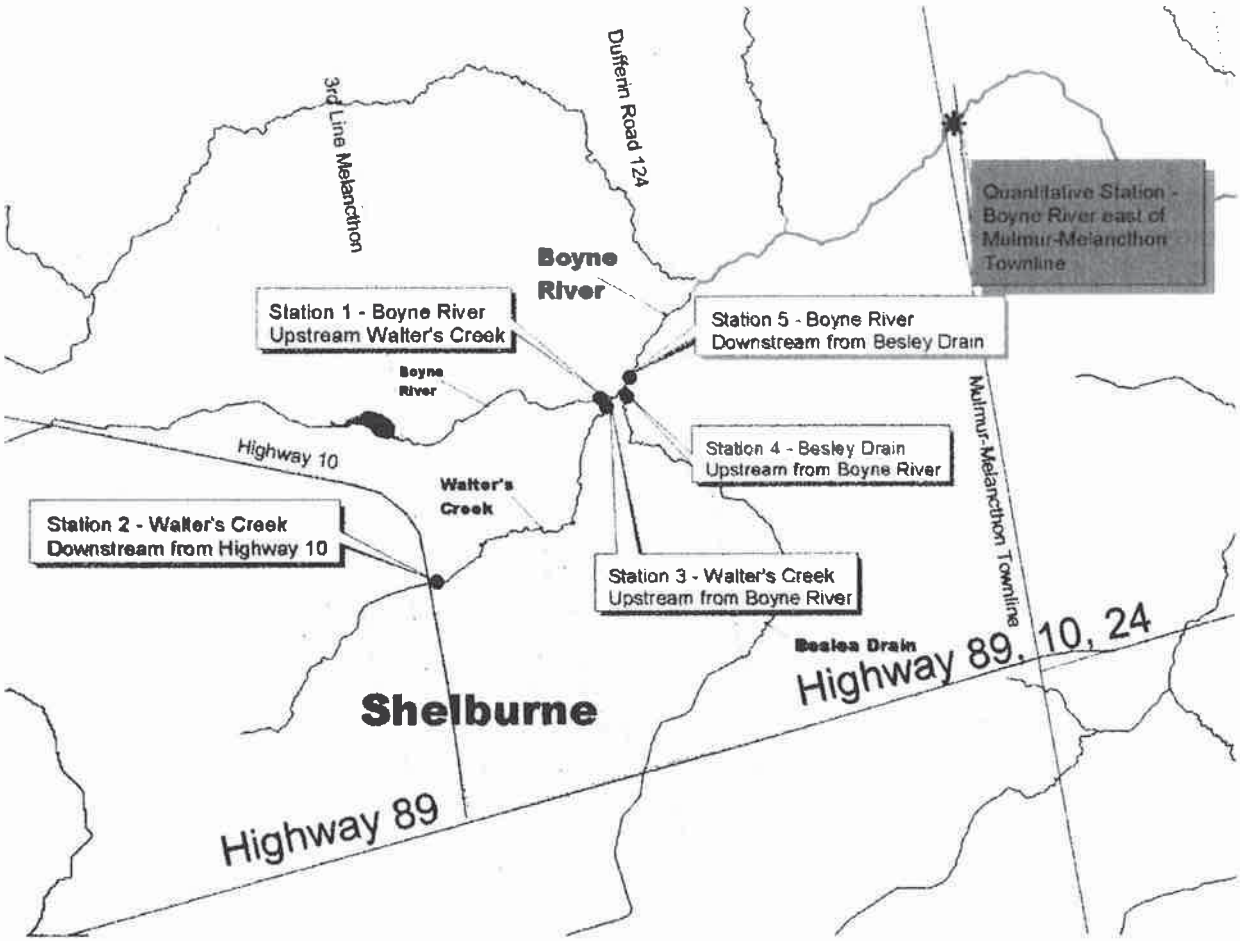


Figure 1. Locations of Fish Community Sampling Stations on the Boyne River and Tributary Streams Sampled in the Summer of 2012.

Results

Diverse fish communities including both coldwater species and tolerant warmwater species were sampled at most of the qualitative fish community stations sampled (Table 1) and at the quantitative station which was sampled (Table 2). Station 1 on the Boyne River upstream from the Walter's Creek tributary confluence (Figure 1), was the only exception where coldwater species predominated. A total of 21 of the 23 fish sampled at this location were native brook trout (Table 1). Native brook trout, including an even distribution of young of the year (7), older juveniles (7) and adults (7), were the dominant species sampled at Station 1 (Table 1). This was the only station in which young of the year brook trout represented a significant proportion (30%) of the fish sampled.

The catch at Station 5 located on the Boyne River downstream from the Walter's Creek and Besley Drain confluences (Figure 1) also included young of the year, older juvenile and adult brook trout. Young of the year rainbow trout were also documented at this location. Unlike Station 1, the fish community sampled at Station 2 exhibited several warmwater species including (in order of abundance) creek chub, blacknose dace, white sucker, johnny darter and longnose dace.

The fish communities sampled at both stations on Walters Creek (Stations 2 and 3) were similar to each other and exhibited a bend of coldwater, coolwater and warmwater species (Table 1). Brook trout were present at both stations but not sensitive young of the year, only older juveniles and adults. Young of the year rainbow trout and sculpin (a coolwater species) were also documented at both Walter's Creek stations. Warmwater species found in Walter's Creek included (in order of abundance) creek chub, blacknose dace, white sucker, johnny darter, central mudminnow and fathead minnow (Table 1).

The fish community sampled in the Besley Drain (Station 4) was dominated by warmwater species (89%) but did include 1 adult brook trout and 1 young of the year rainbow trout. Creek chub and blacknose dace were the two dominant species captured at this location.

The fish community sampled at the quantitative fish community station east of the Mulmur-Melancthon Townline was dominated by warmwater species which represented 94% of the catch, but also included brown trout, rainbow trout and sculpin. All of the brown trout sampled were 2 years of age and older including adults while all of the rainbow trout sampled were young of the year. The quantitative stations was the only sampling station in this survey where brown trout were sampled.

Species/Life History Stage	Station 1 - Boyne River Upstream Walter's Creek	Station 2 - Walter's Creek Downstream from Highway 10	Stations 3- Walter's Creek Upstream from Boyne River	Station 4 - Besley Drain Upstream from Boyne River	Station 5 - Boyne River Downstream from Besley Drain
# Brook Trout - Young of the Year (<10cmFL)	7	0	0	0	2
# Brook Trout - Older Juveniles (10-15cmFL)	7	1	2	0	2
# Brook Trout – Adult (>15cmFL)	7	2	3	1	9
# Rainbow Trout – Young of the Year (<10cmFL)	0	1	5	1	2
# Rainbow Trout – Older Juveniles (10-15cmFL)	0	0	0	0	1
# Rainbow Trout – Adult (>15cmFL)	0	0	0	0	0
# Brown Trout	0	0	0	0	0
# Sculpin Species	1	2	5	0	0
# Creek Chub	0	7	14	6	25
# Blacknose Dace	0	7	5	8	20
# Longnose Dace	1	0	0	1	2
# Fathead Minnow	0	0	1	0	0
# Central Mudminnow	0	2	0	0	0
# White Sucker	0	1	4	0	7
# Johnny Darter	0	0	4	1	3
Totals	**23**	**23**	**43**	**18**	**73**

Table 1. Numbers of various fish species and life history stages sampled at 5 qualitative fish community sampling stations in the headwaters of the Boyne River including tributary streams, on August 28, 2012.

Species/Life History Stage	Pass #1 (1145 electro-seconds)	Pass #2 (1337 electro-seconds)	Pass #3 (1378 electro-seconds)	Total	Population Estimate (Fishnet Program)
# Brook trout	0	0	0	0	n.a.
# Rainbow Trout – Young of the Year (<10cmFL)	25	14	10	49	61
# Rainbow Trout – Older Juveniles (10-15cmFL)	0	0	0	0	n.a.
# Rainbow Trout – Adult (>15cmFL)	0	0	0	0	n.a.
# Brown Trout – Young of the Year and Yearlings (<15cmFL)	0	0	0	0	n.a.
# Brown Trout – 2 years of age and older (>15cmFL)	7	0	0	7	7
# Sculpin Species	0	1	2	3	n.a.
# Pearl Dace	1	0	0		n.a.
# Creek Chub	39	29	18		122
# Common Shiner	1	1	0		n.a.
# Blacknose Dace	342	168	117		765
# Longnose Dace	20	52	23		142
# Fathead Minnow	1	0	1		n.a.
# Brook Stickleback	0	1	5	6	n.a.
# White Sucker	21	9	6	36	40
# Johnny Darter	0	1	0		n.a.
# Largemouth Bass	0	1	0	1	n.a.
Totals	**457**	**277**	**182**	**916**	n.a.

Table 2. Numbers of various fish species and life history stages sampled at a 69m long quantitative fish community sampling station on the Boyne River on the east side of the Mulmur Melancthon Townline, on August 29, 2012. Station was sampled using the 3-Pass Removal Method with blocking nets installed at both the upstream and downstream ends.

Discussion

The fish community data collected for the Boyne River headwaters by the NVCA was evaluated in the context of summer 2012 stream temperature data collected by Genivar and subsequent stream reach temperature classifications made by applying the Chu nomogram (Figure 2). This combined interpretation provided insights into the status of fish habitat and stream health in the reaches surveyed. The discussion of fish habitat function and stream health has been broken down by coldwater indicator species to enhance clairity.

Native Brook Trout

The core stream habitat supporting brook trout in the Boyne River headwater area appears to be the main branch of the Boyne River upstream from the confluence of the Walter's Creek and Besley Drain. This reach of stream exhibited a fish community (see Station 1, Table 1) dominated by brook trout including relatively abundant young of the year brook trout, as well as older juveniles and adults. The upper Boyne River between the on-stream pond west of the 3rd Line Melancthon and the Walter's Creek confluence, likely support the major brook trout spawning habitats that provide a source of recruitment to the Boyne River downstream from the Walters Creek/Besley Drain confluences and to Walters Creek.

Excellent brook trout spawning habitat and abundant young of the year brook trout also exists in a short permanently-flowing stream reach located upstream from the pond on the west side of the 3rd Line (NVCA unpublished data), however it is not clear whether or not these fish would move downstream through the dam outlet to provide recruits to the upper Boyne River downstream from the dam. Brook trout also are present in permanently-flowing reaches of the northern tributary of the Boyne River which crosses Dufferin Raod 124 approximately 100m north of the main Boyne River (see Figure 2). It is unclear however if this habitat provides a source of brook trout recruitment to the main branch.

Note that the Boyne River headwaters downstream from the 3rd Line pond, was classified as a cool-warmwater habitat and further downstream was classified as a coolwater habitat (Figure 2). These stream temperature classes do not typically provide optimum brook trout habitat, however the cooler maximum temperatures moving from the 3rd Line downstream towards the Walter's Creek confluence provide a strong indication of significant groundwater inputs into this reach. These groundwater inputs likely provide temperature refuge areas for the brook trout during summer heat wave conditions. These suspected groundwater discharge areas would also likely support brook trout spawning habitats that provide recruitment of young of the year brook trout, given that brook trout use groundwater seepages (rather than riffles) as spawning habitat.

NVCA staff have noted that young of the year brook trout are seldom located in high densities downstream from areas exhibiting urban runoff. This situation is seen on Bear Creek at Ardagh Road in Barrie where all year classes of brook trout including young of the year are present upstream from the first urban stormwater discharge, while only older juveniles and adults are present downstream from the urban stormwater pond discharge. This may have been the case in rapidly urbanizing Walter's Creek where summer temperatures are suitable for brook trout but where urban stormwater inputs may impact potential spawning habitats and young of the year habitats. The presence of older juvenile and

adult brook trout in Walters Creek (see Stations 2 and 3, Table 1) may be consistent with the idea that the older brook trout life history stages are more tolerant and can make opportunistic use of urbanizing streams as feeding habitats where summer temperatures are suitable.

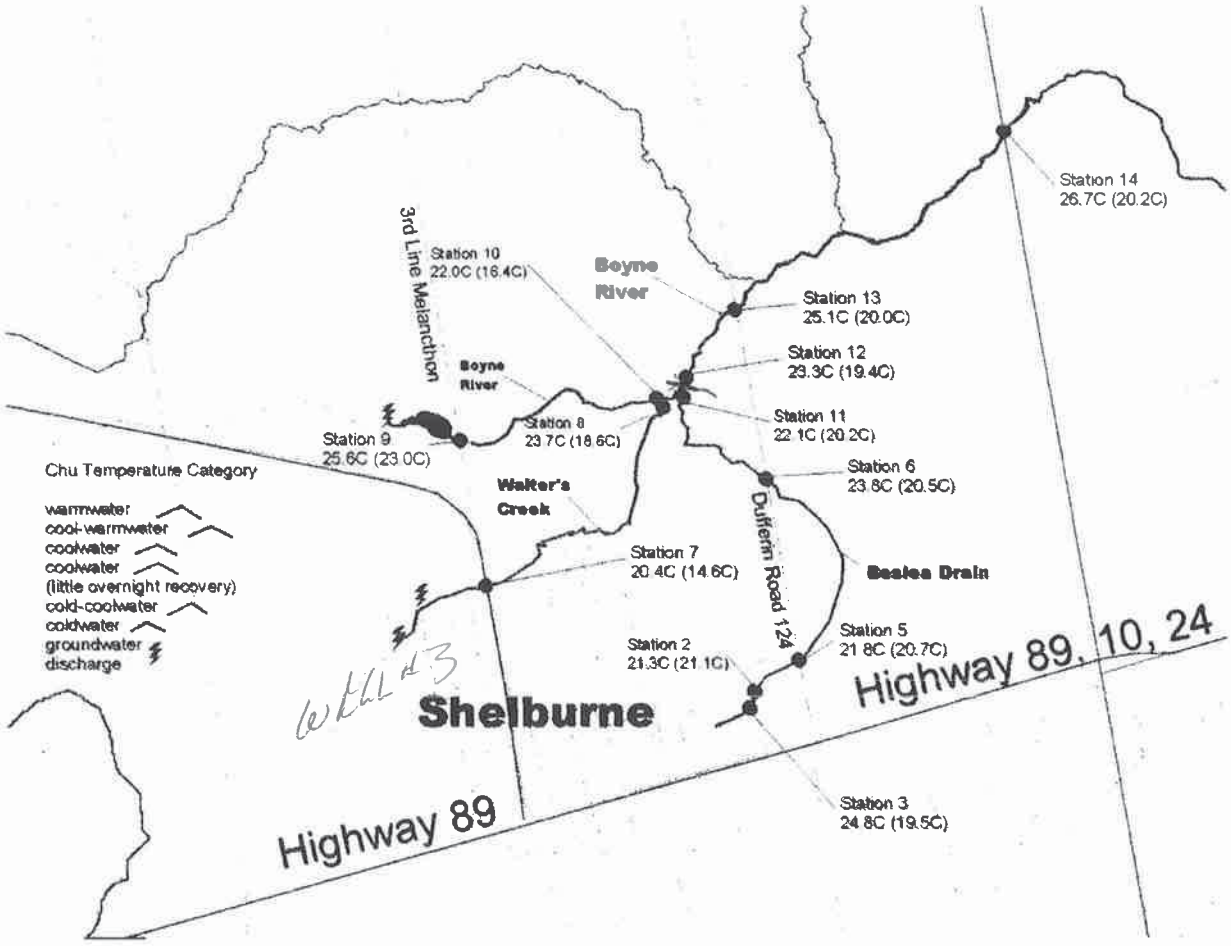


Figure 2. Maximum/minimum stream temperatures sampled on July 23, 2012 and associated stream reach temperature classifications based on the Chu Nomogram, for the upper Boyne River and tributary streams.

Rainbow Trout

Almost all of the rainbow trout captured in this survey were young of the year fish, with the exception of 1 larger potentially yearling trout which was captured in Station 5 (Table 1). The most logical explanation for the presence of young of the year rainbows only in the Boyne River headwaters is that these fish are the progeny of adult migratory rainbow trout which have migrated up from Georgian Bay into the Nottawasaga River and moved upstream into the Boyne River on their spawning run.

Most migratory rainbow trout spend at least 2 years as juvenile fish in stream tributary habitats before leaving for Georgian Bay as smolts. Therefore productive nursery habitats usually contain young of the year, yearling and in many cases 2 year old fish which haven't migrated downstream. The headwaters of the Boyne River however are likely at the upstream limits of migratory rainbow trout movement and adult spawners may only be able to access this area infrequently during optimum spring migratory conditions. Anecdotal reports from landowners indicated excellent upstream penetration by migratory rainbow trout in March of 2012 where air and water temperatures rapidly climbed into the optimal migratory range while snow-melt was still providing the elevated flows necessary for migration. The presence of young of the year rainbow trout only in the Boyne River headwaters in 2012 is likely due to the fact that spawners reached the headwater area in the spring of 2012 but not in the previous 2 springs.

Note that many anecdotal reports have been received of the presence of resident rainbow trout populations in the Boyne River and tributaries, as this species was well established in the upper and middle Boyne River before the construction of the fishway at the Earl Row Park Dam would have provided access for spawning fish migrating upstream from Georgian Bay. The lack of older juvenile and adult rainbow trout captured in the 2012 survey provides an indication that resident rainbow trout may not be abundant in the Boyne River headwaters.

Rainbow trout likely do not provide a reliable indicator of stream health and potential impacts from urban stormwater and wastewater treatment plant runoff, as their abundance may be more related to spring migration conditions that to stream health status. The abundance of rainbow trout in the quantitative station established in 2012 is unlikely to provide a reliable indicator of stream health trends through time.

Brown Trout

The only brown trout captured in this survey were sampled in the quantitative station located east of the Mulmur-Melancthon Townline (Table 2). Only 2 year old and young adult brown trout were sampled at this location, young of the year brown trout were absent in the data collected. This information suggests that the Boyne River in the vicinity of the quantitative station may not provide high quality spawning/early rearing habitat for brown trout but rather provides a baitfish-rich feeding habitat that is used opportunistically by more tolerant older life history stages. This concept is consistent with the cool-warmwater classification applied to the Boyne River at this location (Figure 2), which may not provide favorable early rearing conditions for young of the year brown trout which may be less tolerant than older life history stages.

The lack of juvenile brown trout captured west of Dufferin Road 124 (Stations 1 through 5) suggests that high quality spawning habitats for brown trout may be located several km downstream (east) from the Mulmur-Melanthon Townline in the Niagara Escarpment reaches of the Boyne River. Many Niagara Escarpment streams in the Nottawasaga River watershed exhibit improving coldwater stream habitat conditions moving downstream as the watercourse receives significant groundwater inputs (e.g. from the Amabel Aquifer) in a heavily forested escarpment environment. More fish sampling work would likely need to be completed however to determine whether or not successful brown trout spawning occurs in the Boyne River headwaters west of Dufferin Road 124.

As resident brown trout spend their entire life history in the Boyne River headwaters (unlike migratory rainbow trout), their population status will provide a long-term indicator of stream health trends in this area. Surveying trends in the abundance of 2 year old and adult brown trout in the quantitative station established east of the Mulmur-Melancthon Townline, would therefore provide a long-term indicator of Shelburne wastewater treatment plant influences on stream health in the upper Boyne River.

Appendix E – Shelburne WPCP Effluent Quality Data (2007-2015)

Summary of Sewage Flows and Effluent Quality
at Shelburne Wastewater Treatment Plant
Town of Shelburne

Year - 2007

02/11/2012 101-17077-00

Month	Average Flow at Treatment Plant (m^3/d)	Max Day Flow at Treatment Plant (m^3/d)
January	2045	3840
February	1821	2907
March	994	2005
April	**3233**	**7862**
May	2431	2993
June	2160	4418
July	1889	2256
August	1806	2606
September	1697	2180
October	1701	2014
November	1813	2364
December	2029	2944
Annual Average or Max Flow	**1,968**	**7,862**

Rated capacity of sewage plant is 3,420 m^3/d average day flow and peak flow rate of 7,983 m^3/d (based on sand filter system). Flows at treatment plant based on Parshall flume measurement downstream of UV and filter system.

Parameter	Average Value mg/L	Max Monthly Average Value mg/L
CBOD	3.0	5.8
Suspended Solids	4.4	9.6
Ammonia	0.37	4.6*
TKN	1.47	2.89
Nitrate	16.8	25.0
Total Phosphorus	0.12	0.23

* Daily maximum value of ammonia recorded

Summary of Sewage Flows and Effluent Quality
at Shelburne Wastewater Treatment Plant
Town of Shelburne

Year - 2008

02/11/2012 101-17077-00

Month	Average Flow at Treatment Plant (m^3/d)	Max Day Flow at Treatment Plant (m^3/d)
January	2709	4210
February	2358	3909
March	2440	3478
April	**3320**	**4726**
May	2370	3345
June	1919	2786
July	1930	3819
August	1910	2458
September	2018	3323
October	1948	2509
November	2392	3432
December	2945	4288
Annual Average or Max Flow	**2,355**	**4,726**

Rated capacity of sewage plant is 3,420 m^3/d average day flow and peak flow rate of 7,983 m^3/d (based on sand filter system). Flows at treatment plant based on Parshall flume measurement downstream of UV and filter system.

Parameter	Average Value mg/L	Max Monthly Average Value mg/L
CBOD	2.5	4.5
Suspended Solids	2.1	2.4
Ammonia	0.15	1.9*
TKN	0.76	1.35
Nitrate	17.9	22.2
Total Phosphorus	0.08	0.17

* Daily maximum value of ammonia recorded

Summary of Sewage Flows and Effluent Quality
at Shelburne Wastewater Treatment Plant
Town of Shelburne

Year - 2009

02/11/2012 101-17077-00

Month	Average Flow at Treatment Plant (m^3/d)	Max Day Flow at Treatment Plant (m^3/d)
January	2558	4100
February	2858	4298
March	3073	4149
April	**3445**	**5398**
May	3301	4588
June	2669	3330
July	2097	3202
August	2545	3769
September	2167	3114
October	2256	3650
November	2048	2484
December	2095	2636
Annual Average or Max Flow	**2,593**	**5,398**

Rated capacity of sewage plant is 3,420 m^3/d average day flow and peak flow rate of 7,983 m^3/d (based on sand filter system). Flows at treatment plant based on Parshall flume measurement downstream of UV and filter system.

Parameter	Average Value mg/L	Max Monthly Average Value mg/L
CBOD	3.3	4.0
Suspended Solids	2.3	2.8
Ammonia	0.10	0.20*
TKN	0.67	0.85
Nitrate	17.7	22.7
Total Phosphorus	0.05	0.08

* Daily maximum value of ammonia recorded

Summary of Sewage Flows and Effluent Quality
at Shelburne Wastewater Treatment Plant
Town of Shelburne

Year - 2010

02/11/2012 101-17077-00

Month	Average Flow at Treatment Plant (m^3/d)	Max Day Flow at Treatment Plant (m^3/d)
January	2013	2928
February	1976	3674
March	2697	**4170**
April	**2843**	3783
May	2370	3880
June	2365	2951
July	2235	3365
August	2064	2664
September	2182	3800
October	2083	2436
November	2167	2909
December	2200	3759
Annual Average or Max Flow	**2,266**	**4,170**

Rated capacity of sewage plant is 3,420 m^3/d average day flow and peak flow rate of 7,983 m^3/d (based on sand filter system). Flows at treatment plant based on Parshall flume measurement downstream of UV and filter system.

Parameter	Average Value mg/L	Max Monthly Average Value mg/L
CBOD	2.6	4.5
Suspended Solids	2.6	4.5
Ammonia	0.11	0.40*
TKN	0.75	1.25
Nitrate	18.2	23.8
Total Phosphorus	0.06	0.09

* Daily maximum value of ammonia recorded

Summary of Sewage Flows and Effluent Quality
at Shelburne Watewater Treatment Plant
Town of Shelburne

Year - 2011

02/11/2012 101-17077-00

Month	Average Flow at Treatment Plant (m^3/d)	Max Day Flow at Treatment Plant (m^3/d)
January	2253	3768
February	2152	3788
March	3240	**4445**
April	3225	4207
May	3131	4040
June	2180	3073
July	1750	2652
August	1778	2437
September	1809	2139
October	2190	3353
November	2171	4218
December**	2681	3460
Annual Average or Max Flow	**2,380**	**4,445**

Rated capacity of sewage plant is 3,420 m^3/d average day flow and peak flow rate of 7,983 m^3/d (based on sand filter system). Flows at treatment plant based on Parshall flume measurement downstream of UV and filter system.

Parameter	Average Value mg/L	Max Monthly Average Value mg/L
CBOD	2.3	3.3
Suspended Solids	2.4	2.8
Ammonia	0.13	0.80*
TKN	0.92	1.13
Nitrate	15.9	22.9
Total Phosphorus	0.05	0.08

* Daily maximum value of ammonia recorded

Summary of Sewage Flows and Effluent Quality
at Shelburne Wastewater Treatment Plant
Town of Shelburne

Year - 2012

02/11/2012 101-17077-00

Month	Average Flow at Treatment Plant (m^3/d)	Max Day Flow at Treatment Plant (m^3/d)
January	2413	3475
February	2284	2786
March	2498	3422
April	2076	2448
May	2295	**3604**
June*	2127	3218
July	1737	2229
August	1770	2837
September	1803	2599
October		
November		
December**		
Annual Average or Max Flow	**2,111**	**3,604**

* Plug placed in old Jane/Willow St. manhole on June 18, 2012. Reduced leakage into this manhole from decommissioned upstream sewers.

Rated capacity of sewage plant is 3,420 m^3/d average day flow and peak flow rate of 7,983 m^3/d (based on sand filter system). Flows at treatment plant based on Parshall flume measurement downstream of UV and filter system.

Parameter	Average Value ** mg/L	Max Monthly ** Average Value mg/L
CBOD	2.3	3.3
Suspended Solids	3.0	4.6
Ammonia	0.36	0.84*
TKN	1.43	2.43
Nitrate	18.2	25.3
Total Phosphorus	0.06	0.11

* Daily maximum value of ammonia recorded

** Values to end of September 2012 only

SHELBURNE WWTP

ANNUAL SUMMARY FOR 2007

FLOWS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			C. of A. LIMIT March 2006
Total	1000m3	63.408	51.001	30.810	97.004	75.355	64.796	58.545	55.987	50.900	52.741	54.392	62.910	717.849	Total	
Avg day flow	1000m3/d	2.045	1.821	0.994	3.233	2.431	2.160	1.889	1.806	1.697	1.701	1.813	2.029	1.967	Average	2.971
Max day flow	1000m3/d	3.840	2.907	2.005	7.862	2.993	4.418	2.256	2.606	2.180	2.014	2.364	2.944	7.862	Maximun	8.921
BYPASS																
Primary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total	
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total	
Secondary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total	
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total	
Tertiary Volume	1000m3	0.000	0.000	0.000	28.444	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	28.444	Total	
Time	hrs.	0.0	0.0	0.0	168.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	168.0	Total	
RAW SEWAGE														ANNUAL AVERAGE		
CBOD5	mg/l	158	187	98	61	140	166	180	210	178	142	152	152	147		
TSS	mg/l	133	221	147	110	174	126	185	205	144	149	104	132	153		
TKN	mg/l	19.3	27.1	14.1	17.0	17.9	19.8	25.4	24.9	23.1	26.8	17.5	11.9	21.7		
Total P	mg/l	3.5	6.5	3.3	2.7	4.0	2.9	4.0	4.6	4.0	4.9	2.5	3.2	4.2		
Alkalinity	mg/l	309	312	253	323	306	291	250	340	304	330	249	150	293		
pH		7.7	7.6	7.6	7.8	7.8	7.7	7.8	7.7	7.6	7.8	7.8	8.0	7.7		
FINAL EFFLUENT														ANNUAL AVERAGE	Monthly Limits	
CBOD5	mg/l	5.8	2.0	1.8	2.8	2.2	1.8	1.8	1.8	2.5	6.0	3.0	3.5	3.0	6.0	
TSS	mg/l	5.0	8.0	3.2	9.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3	4.4	6.0	
TAN Monthly Average	mg/l	0.14	0.37	0.24	2.12	0.44	0.46	0.10	0.12	0.13	0.10	0.10	0.10	0.658		
TAN Monthly Limits	mg/l	2.40	2.40	2.40	2.40	0.80	0.80	0.80	0.80	0.80	0.80	2.40	2.40	Monthly Limits		
TAN Daily Maximum	mg/L	0.20	0.60	0.70	4.60	0.90	1.50	0.10	0.20	0.20	0.10	0.10	0.10	4.60		
TAN Daily Limits	mg/l	4.70	4.70	4.70	4.70	2.40	2.40	2.40	2.40	2.40	2.40	4.70	4.70	Daily Limits		
TKN	mg/l	1.40	1.27	0.72	2.89	1.86	1.10	1.08	0.63	1.00	0.58	1.18	0.55	1.47		
Total P	mg/l	0.23	0.13	0.12	0.20	0.07	0.06	0.09	0.08	0.06	0.06	0.07	0.05	0.12	0.30	
Nitrite	mg/l	0.08	0.09	0.06	0.08	0.08	0.15	0.06	0.06	0.06	0.06	0.06	0.06	0.08		
Nitrate	mg/l	13.6	17.1	14.5	8.5	11.8	15.0	22.8	24.5	25.0	24.0	24.5	21.6	16.8		
Alkalinity	mg/l	148	114	125	202	176	166	148	139	134	136	140	129	157		
pH (grab)		7.3	7.6	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.2	7.35		
Temperature (grab)	Celsius	12.3	10.8	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.04		
Unionized Ammonia	mg/l	0.0000	0.0000	0.0010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		

STREAM LOADING COMPLIANCE is now an Annual Average Loading Limit "Average Waste Loadings"

" Note: the Total Ammonia Nitrogen(TAN) - Average Waste Loadings are "Seasonal Loadings"

SHELBURNE WWTP
ANNUAL SUMMARY FOR 2008

FLOWS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			C. of A. LIMIT Aug-08
Total	1000m3	83.988	68.384	75.650	99.591	73.479	57.571	59.828	59.214	60.528	60.373	71.767	91.302	861.675	Total	
Avg day flow	1000m3/d	2.709	2.358	2.440	3.320	2.370	1.919	1.930	1.910	2.018	1.948	2.392	2.945	2.354	Average	2.971
Max day flow	1000m3/d	4.210	3.909	3.478	4.726	3.345	2.786	3.819	2.458	3.323	2.509	3.432	4.288	4.725	Maximum	8.921
BYPASS																
Primary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		Total	
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Total	
Secondary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		Total	
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Total	
Tertiary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		Total	
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Total	
RAW SEWAGE														ANNUAL AVERAGE		
CBOD5	mg/l	109	188	161	36	110	146	190	25	177	209	177	144	139		
TSS	mg/l	198	118	122	69	102	141	133	116	324	153	159	110	145		
TKN	mg/l	12.4	25.0	17.3	6.1	17.3	20.6	19.0	19.7	45.3	23.2	23.9	19.7	20.8		
Total P	mg/l	2.6	4.1	3.4	1.6	4.3	4.4	3.1	3.4	6.1	4.2	3.9	2.9	3.7		
Alkalinity	mg/l	290	336	300	259	370	344	341	339	441	348	353	359	340		
pH		7.8	8.1	8.0	7.9	7.6	7.5	7.5	7.8	7.9	8.1	7.5	8.0	7.8		
FINAL EFFLUENT														ANNUAL AVERAGE	Monthly Limits	
CBOD5	mg/l	1.6	2.5	4.5	3.0	3.0	3.8	1.6	2.0	2.2	2.0	2.0	2.8	2.5	5.0	
TSS	mg/l	2.0	2.0	2.0	2.2	2.0	2.0	2.4	2.3	2.2	2.0	2.0	2.0	2.1	5.0	
TAN Monthly Average	mg/l	0.12	0.13	0.18	0.10	0.10	0.10	0.12	0.10	0.10	0.55	0.10	0.10	0.145		
TAN Monthly Limits	mg/l	2.40	2.40	2.40	2.40	2.40	0.80	0.80	0.80	0.80	2.40	2.40	2.40	Monthly Limits		
TAN Daily Maximum	mg/L	0.20	0.20	0.40	0.10	0.10	0.10	0.20	0.10	0.10	1.90	0.10	0.10	1.90		
TKN	mg/l	0.50	0.73	0.50	0.70	1.10	1.35	0.80	0.50	0.72	1.28	0.50	0.62	0.76		
Total P	mg/l	0.08	0.08	0.07	0.07	0.09	0.08	0.09	0.04	0.17	0.03	0.05	0.03	0.08	0.25	
Nitrite	mg/l	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.10	0.06	0.06	0.06		
Nitrate	mg/l	18.0	16.5	18.6	12.6	19.7	21.2	22.2	20.2	16.9	17.2	17.8	15.5	17.9		
Alkalinity	mg/l	179	176	185	206	192	177	180	179	186	175	183	182	184		
pH (grab)					7.1		7.2	7.3		7.2	7.2	7.2	7.2	7.22		
Temperature (grab)	Celsius				12.2		11.1	13.5		10.3	14.9	14.2	10.5	11.98		
Unionized Ammonia	mg/l	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0020	0.0000	0.0000	0.0000			

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SHELBURNE WWTP

SHELBURNE WWTP

ANNUAL SUMMARY FOR 2009

FLOWS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			C. of A. LIMIT Aug-08
Total	1000m3	79.283	80.020	95.269	103.348	102.321	80.058	64.992	78.882	65.009	69.935	61.453	64.939	945.509	Total	
Avg day flow	1000m3/d	2.558	2.858	3.073	3.445	3.301	2.669	2.097	2.545	2.167	2.256	2.048	2.095	2.590	Average	2.971
Max day flow	1000m3/d	4.100	4.298	4.149	5.398	4.588	3.330	3.202	3.769	3.114	3.650	2.484	2.636	5.398	Maximum	8.921
BYPASS																
Primary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total	
Time	hrs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total	
Secondary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total	
Time	hrs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total	
Tertiary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total	
Time	hrs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total	
RAW SEWAGE														ANNUAL AVERAGE		
CBOD5	mg/l	248	73	136	81	137	95	161	135	140	125	206	169	142		
TSS	mg/l	194	124	86	130	130	90	106	152	128	140	141	160	132		
TKN	mg/l	21.3	12.9	18.8	12.5	14.0	12.9	41.8	20.7	21.4	18.4	20.7	19.4	19.6		
Total P	mg/l	3.7	2.4	3.2	1.8	2.5	1.5	5.3	3.6	3.0	2.8	2.8	3.6	3.0		
Alkalinity	mg/l	347	278	338	327	340	310	462	359	389	298	277	307	336		
pH																
FINAL EFFLUENT														ANNUAL AVERAGE	Monthly Limits	
CBOD5	mg/l	4.0	3.5	3.2	2.5	3.3	5.2	3.0	2.8	3.2	2.0	3.0	3.5	3.3	5.0	
TSS	mg/l	2.3	2.8	2.0	3.3	2.3	2.2	2.3	2.0	2.2	2.0	2.6	2.5	2.3	5.0	
TAN Monthly Average	mg/l	0.10	0.10	0.10	0.13	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.102		
TAN Monthly Limits	mg/l	2.40	2.40	2.40	2.40	2.40	0.80	0.80	0.80	0.80	2.40	2.40	2.40	Monthly Limits		
TAN Daily Maximum	mg/L	0.10	0.10	0.10	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20		
TKN	mg/l	0.58	0.73	0.76	0.70	0.58	0.64	0.78	0.85	0.52	0.63	0.52	0.73	0.67		
Total P	mg/l	0.05	0.06	0.05	0.07	0.04	0.04	0.04	0.04	0.04	0.07	0.06	0.07	0.06	0.25	
Nitrite	mg/l	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.09	0.06	0.06	0.06	0.06	0.06		
Nitrate	mg/l	17.1	16.0	13.2	13.6	14.7	15.7	19.8	15.5	19.0	22.7	22.7	22.1	17.7		
Alkalinity	mg/l	197	195	209	219	217	190	157	145	174	158	167	177	184		
pH (grab)		7.1	7.1	7.3	7.5	7.2	7.1	7.3	7.4	7.3	7.3	7.5	7.3	7.30		
Temperature (grab)	Celsius	9.0	11.2	10.6	10.8	12.2	13.1	13.0	18.0	15.4	14.2	12.4	11.6	12.76		
Unionized Ammonia	mg/l	0.0000	0.0000	0.0000	0.0010	0.0000	0.0000	0.0000	0.0010	0.0010	0.0000	0.0010	0.0000	0.0010		

STREAM LOADING COMPLIANCE is now an Annual Average Loading Limit "Average Waste Loadings"

*** Note: the Total Ammonia Nitrogen(TAN) - Average Waste Loadings are "Seasonal Loadings"**

SHELBURNE WWTP
ANNUAL SUMMARY FOR 2010

FLOWS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			C. of A. LIMIT Aug-08
Total	1000m3	62.423	55.331	83.619	85.296	73.481	70.957	69.290	63.978	65.473	64.583	65.017	68.210	827.658	Total	
Avg day flow	1000m3/d	2.014	1.976	2.697	2.843	2.370	2.365	2.235	2.064	2.182	2.083	2.167	2.200	2.268	Average	2.971
Max day flow	1000m3/d	2.928	3.674	4.170	3.783	3.880	2.951	3.365	2.664	3.800	2.436	2.909	3.759	4.170	Maximum	8.921
BYPASS																
Primary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total	
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total	
Secondary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total	
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total	
Tertiary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total	
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total	
RAW SEWAGE														**ANNUAL AVERAGE**		
CBOD5	mg/l	150	243	172	105	108	131	110	82	104	110	80	212	134		
TSS	mg/l	178	190	206	104	143	180	143	198	320	197	182	234	190		
TKN	mg/l	25.0	26.7	24.9	15.0	18.7	18.1	20.1	21.1	21.7	20.0	20.9	18.2	20.9		
Total P	mg/l	4.1	4.5	3.3	1.9	2.8	3.0	3.2	3.2	4.1	2.7	3.6	3.4	3.3		
Alkalinity	mg/l	407	357	374	287	352	358	339	348	352	352	346	330	350		
FINAL EFFLUENT														**ANNUAL AVERAGE**	**Monthly Limits**	
CBOD5	mg/l	2.0	3.5	2.4	3.0	2.0	2.4	2.3	2.0	2.5	3.0	2.0	4.5	2.6	5.0	
TSS	mg/l	2.5	4.5	2.8	2.0	2.0	2.8	2.3	2.0	3.0	3.0	2.4	2.3	2.6	5.0	
TAN Monthly Average	mg/l	0.10	0.10	0.10	0.23	0.10	0.10	0.10	0.10	0.13	0.10	0.10	0.13	0.113		
TAN Monthly Limits	mg/l	2.40	2.40	2.40	2.40	2.40	0.80	0.80	0.80	0.80	2.40	2.40	2.40	**Monthly Limits**		
TAN Daily Maximum	mg/L	0.10	0.10	0.10	0.40	0.10	0.10	0.10	0.10	0.20	0.10	0.10	0.20	0.40		
TKN	mg/l	0.65	0.63	0.50	1.25	0.78	1.10	0.58	0.74	0.65	0.53	0.54	1.15	0.75		
Total P	mg/l	0.05	0.09	0.05	0.04	0.06	0.05	0.05	0.06	0.04	0.05	0.07	0.06	0.06	0.25	
Nitrite	mg/l	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06		
Nitrate	mg/l	23.8	22.9	16.8	10.2	16.2	18.8	19.6	20.5	21.3	18.8	18.4	11.4	18.2		
Alkalinity	mg/l	173	169	205	194	193	173	177	166	172	185	176	227	184		
pH (grab)		7.6	7.7	7.2	7.2	7.1	7.0	7.1	7.2	7.5	7.4	8.0	8.0	7.42		
Temperature (grab)	Celsius	8.4	9.5	10.2	11.6	13.8	15.6	15.9	16.5	14.8	14.4	10.9	8.9	12.50		
Unionized Ammonia	mg/l	0.0010	0.0020	0.0000	0.0010	0.0000	0.0000	0.0000	0.0010	0.0010	0.0010	0.0020	0.0030	0.0010		

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SHELBURNE WWTP
ANNUAL SUMMARY FOR 2011

FLOWS

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			C. of A. LIMIT Avg-m
Total	1000m3	69,847	60,282	100,436	99,744	97,072	85,392	54,243	55,108	64,267	67,895	65,137	83,116	872,518	Total	
Avg day flow	1000m3/d	2,253	2,152	3,240	3,325	3,131	2,180	1,750	1,778	1,809	2,190	2,171	2,681	2,390	Average	2,871
Max day flow	1000m3/d	3,798	3,768	4,445	4,207	4,040	3,073	2,662	2,437	2,139	3,353	4,218	3,460	4,445	Maximum	8,921

BYPASS

Primary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total
Secondary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total
Tertiary Volume	1000m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Total
Time	hrs.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Total

RAW SEWAGE

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVERAGE
CBOD5	mg/l	86	162	153	77	93	113	110	328	249	234	336	171	199
TSS	mg/l	299	228	186	166	186	286	224	291	356	306	324	217	263
TKN	mg/l	22.6	29.2	18.2	13.9	19.6	18.2	23.1	25.9	24.1	24.6	20.9	14.8	21.6
Total P	mg/l	2.6	3.6	2.6	1.3	2.6	2.6	2.2	3.3	2.9	3.7	2.6	1.7	2.7
Alkalinity	mg/l	358	364	318	319	342	337	336	368	336	362	378	372	354

FINAL EFFLUENT

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVERAGE	Monthly Limits
CBOD5	mg/l	3.0	3.3	2.2	2.3	2.0	2.3	2.0	2.0	2.0	2.3	2.2	2.6	2.3	5.0
TSS	mg/l	2.0	2.5	2.8	2.6	2.0	2.3	2.8	2.2	2.3	2.8	2.2	2.0	2.4	8.0
TAN Monthly Average	mg/l	0.10	0.13	0.14	0.13	0.10	0.10	0.10	0.10	0.13	0.19	0.24	0.18	0.13	
TAN Monthly Limits	mg/l	2.40	2.40	2.40	2.40	2.40	0.80	0.80	0.80	0.80	2.40	2.40	2.40	Monthly Limits	
TAN Daily Maximum	mg/L	0.10	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.20	0.10	0.80	0.20	0.80	
TKN	mg/l	1.13	0.90	0.72	1.05	0.89	0.68	1.03	1.88	0.98	1.23	0.76	0.60	0.93	
Total P	mg/l	0.06	0.08	0.05	0.08	0.08	0.04	0.03	0.05	0.06	0.04	0.05	0.05	0.05	0.25
Nitrite	mg/l	0.06	0.06	0.06	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
Nitrate	mg/l	10.8	16.9	10.2	10.5	10.4	17.5	17.3	21.4	22.9	21.7	18.0	14.6	16.9	
Alkalinity	mg/l	234	196	230	228	222	193	173	182	197	168	207	217	200	
pH (grab)		7.8	7.8	7.3	7.1	7.4	7.8	7.8	7.4	7.6	7.7	7.7	7.8	7.58	
Temperature (grab)	Celsius	8.1	6.6	9.5	10.5	13.4	18.7	17.5	17.9	18.1	14.9	13.0	12.8	13.2	
Unionized Ammonia	mg/l	0.001	0.002	0.000	0.000	0.001	0.004	0.002	0.001	0.001	0.003	0.002	0.001	0.001	

STREAM LOADING COMPLIANCE is now an Annual Average Loading Limit "Average Waste Loadings"

* Note: the Total Ammonia Nitrogen(TAN) - Average Waste Loadings are "Seasonal Loadings"

SHELBURNE WWTP
ANNUAL SUMMARY FOR 2012

FLOWS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			C. of A. LIMIT Aug-08
Total	1000m3	74 812	66 243	77 451	62 287	71 160	63 820	53 960	54 856	54 087				578.586	Total	
Avg day flow	1000m3/d	2 413	2 284	2 498	2 076	2 295	2 127	1 737	1 770	1 803				2.112	Average	2.971
Max day flow	1000m3/d	3 475	2 786	3 422	2 448	3 604	3 218	2 229	2 837	2 599				3.604	Maximun	8.921
BYPASS																
Primary Volume	1000m3	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000				0.000	Total	
Time	hrs	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0				0.0	Total	
Secondary Volume	1000m3	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000				0.000	Total	
Time	hrs	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0				0.0	Total	
Tertiary Volume	1000m3	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000	0 000				0.000	Total	
Time	hrs	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0				0.0	Total	
RAW SEWAGE														ANNUAL AVERAGE		
CBOD5	mg/l	293	149	338	356	330	331	453	280	181				302		
TSS	mg/l	278	197	386	454	340	310	200	448	557				352		
TKN	mg/l	25 4	22 9	25 9	5 8	26 5	41 6	30 2	44 8	25 6				27.6		
Total P	mg/l	4 0	2 7	3 0	4 4	1 6	4 4	3 9	5 4	6 0				3.9		
Alkalinity	mg/l	471	383	349	425	385	401	368	390	368				393		
FINAL EFFLUENT														ANNUAL AVERAGE	Monthly Limits	
CBOD5	mg/l	2 2	2 0	2 0	2 5	3 3	2 0	2 0	2 0	2 0				2 3	5.0	
TSS	mg/l	2 6	2 0	2 3	2 0	4 8	2 8	2 4	2 5	4 6				3.0	5.0	
TAN Monthly Average	mg/l	0 78	0 10	0 58	0 10	0 84	0 15	0 10	0 13	0 14				0 36		
TAN Monthly Limits	mg/l	2.40	2.40	2.40	2.40	2.40	0.80	0.80	0.60	0.80	2.40	2.40	2.40	Monthly Limits		
TAN Daily Maximum	mg/L	3 50	0 10	2.00	0 10	3 20	0 30	0 10	0 20	0 30				3 50		
TKN	mg/l	1 28	1 45	1 53	0 55	1 24	2 43	1 78	0 50	2 08				1.43		
Total P	mg/l	0 04	0 04	0 03	0 05	0 11	0 03	0 03	0 06	0 06				0.06	0.25	
Nitrite	mg/l	0 11	0 06	0 06	0 29	0 06	0 06	0 06	0 06	0 07				0.09		
Nitrate	mg/l	12 4	20 7	9 4	13 2	14 9	21 8	25 3	24 0	23 0				18.2		
Alkalinity	mg/l	232	195	243	217	219	196	189	174	171				205		
pH (grab)		7 7	7 4	7 5	8 0	7 4	7 4	8 2	7 3	7 7				7.62		
Temperature (grab)	Celsius	11 3	11 1	12 8	12 9	14 8	15 5	16 8	15 2	14 1				13.9		
Unionized Ammonia	mg/l	0 016	0 000	0 005	0 003	0 009	0 001	0 006	0 001	0 002				0.005		

STREAM LOADING COMPLIANCE is now an Annual Average Loading Limit "Average Waste Loadings"

*** Note: the Total Ammonia Nitrogen(TAN) - Average Waste Loadings are "Seasonal Loadings"**

Shelburne WPCP Effluent Quality Data 2013

	02/01/2013	08/01/2013	15/01/2013	22/01/2013	29/01/2013	06/02/2013	12/02/2013	19/02/2013	26/02/2013	04/03/2013	11/03/2013	19/03/2013	26/03/2013	02/04/2013	09/04/2013	16/04/2013	23/04/2013
Final Effluent / Alkalinity (as CaCO3) - mg/L																	
Published Lab	163.000	212.000	233.000	245.000	217.000	187.000	219.000	201.000	213.000	215.000	213.000	245.000	219.000	222.000	215.000	215.000	224.000
Final Effluent / Carbonaceous Biochemical Oxygen Demand: CBOD5 - mg/L																	
Published Lab	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	3.000	2.000	2.000	2.000	2.000	2.000
Final Effluent / E. Coli: EC - cfu/100mL																	
Published Lab	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Final Effluent / Nitrate + Nitrite as N: NO3-N + NO2-N - mg/L																	
Published Lab	26.300	20.300	11.000	14.900	19.600	22.600	16.900	20.200	20.100	21.000	19.600	13.100	14.500	11.500	13.100	12.800	12.400
Final Effluent / Nitrate as N: NO3-N - mg/L																	
Published Lab	26.300	20.300	11.000	14.900	19.600	22.600	16.900	20.200	20.100	21.000	19.600	13.100	14.500	11.500	13.100	12.800	12.400
Final Effluent / Nitrite as N: NO2-N - mg/L																	
Published Lab	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.030	0.030	0.030	0.030
Final Effluent / Total Ammonia Nitrogen: NH3 + NH4+ as N - mg/L																	
Published Lab	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.200	0.200	0.100	0.100	0.100	0.200	0.200	0.100
Final Effluent / Total Kjeldahl Nitrogen: TKN - mg/L																	
Published Lab	0.500	1.800	0.500	1.200	2.700	1.500	1.000	1.500	0.700	0.500	1.800	0.500	0.500	2.900	1.000	0.500	0.700
Final Effluent / Total Phosphorus: TP - mg/L																	
Published Lab	0.111	0.092	0.129	0.030	0.099	0.081	0.056	0.073	0.091	0.097	0.060	0.056	0.064	0.036	0.036	0.039	0.042
Final Effluent / Total Suspended Solids: TSS - mg/L																	
Published Lab	2.000	3.000	2.000	3.000	2.000	2.000	2.000	2.000	2.000	4.000	2.000	3.000	3.000	2.000	5.000	3.000	2.000
Final Effluent / pH - ---																	
Published Lab	8.030	8.100	8.040	7.990	8.230	7.990	8.180	8.040	8.020	8.050	8.070	7.970	8.070	8.190	8.270	8.150	8.190

30/04/2013	07/05/2013	14/05/2013	21/05/2013	28/05/2013	04/06/2013	11/06/2013	18/06/2013	25/06/2013	02/07/2013	09/07/2013	16/07/2013	23/07/2013	30/07/2013	06/08/2013	13/08/2013	20/08/2013	27/08/2013	04/09/2013	10/09/2013
184.000	171.000	210.000	162.000	179.000	200.000	198.000	192.000	202.000	167.000	186.000	195.000	183.000	195.000	226.000	207.000	207.000	207.000	195.000	178.000
2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
17.200	20.100	13.900	24.200	20.300	20.800	21.900	21.900	24.000	29.100	22.300	23.700	22.900	19.700	17.700	20.800	20.500	17.200	20.300	21.500
17.200	20.100	13.900	24.200	20.300	20.800	21.900	21.900	24.000	29.100	22.300	23.700	22.900	19.700	17.700	20.800	20.500	17.200	20.300	21.500
0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.040	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.400	0.100	0.100	0.100
2.300	2.100	0.500	2.600	0.500	1.600	1.500	2.500	1.800	2.800	2.500	0.500	2.200	3.900	1.600	2.200	2.700	0.700	0.500	2.000
0.052	0.072	0.088	0.079	0.042	0.059	0.057	0.084	0.096	0.120	0.147	0.105	0.101	0.096	0.093	0.092	0.066	0.091	0.144	0.059
2.000	3.000	5.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	4.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	3.000	3.000
8.070	8.030	8.250	8.060	7.980	8.020	8.150	8.050	8.180	8.290	8.170	8.070	8.190	8.130	8.210	8.050	7.970	8.180	8.130	8.030

17/09/2013	24/09/2013	01/10/2013	08/10/2013	15/10/2013	22/10/2013	29/10/2013	05/11/2013	12/11/2013	19/11/2013	26/11/2013	03/12/2013	10/12/2013	17/12/2013	23/12/2013	30/12/2013	average	min	max
200.000	80.000	176.000	189.000	190.000	216.000	213.000	220.000	214.000	242.000	207.000	212.000	217.000	235.000	245.000	168.000	202.377	80.000	245.000
2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.019	2.000	3.000
2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000		2.000	2.000	2.000
21.800	17.100	23.000	16.500	20.500	18.700	16.800	16.400	14.600	8.760	18.600	17.700	18.300	14.600	11.400	24.900	18.671	8.760	29.100
21.800	17.100	23.000	16.500	20.500	18.700	16.800	16.400	14.600	8.760	18.600	17.700	18.300	14.600	11.400	24.900	18.671	8.760	29.100
0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.038	0.030	0.400
																0.118	0.100	0.400
0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.200	0.100	0.100	0.114	0.100	0.200
3.600	0.700	3.800	1.500	3.600	4.200	2.400	1.100	2.000	0.500	3.000	0.500	0.500	1.000	0.700	2.800	1.674	0.500	4.200
0.080	0.094	0.086	0.080	0.088	0.101	0.087	0.069	0.084	0.063	0.063	0.084	0.080	0.069	0.042	0.089	0.079	0.030	0.147
3.000	2.000	3.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	3.000	2.000	2.000	2.000	2.000		2.404	2.000	5.000
8.320	8.380	8.170	8.070	8.170	8.050	8.130	8.310	8.100	8.110	8.080	8.030	8.230	8.090	8.110	7.890	8.114	7.890	8.380

Shelburne WPCP Effluent Quality Data 2014

	03/01/2014	07/01/2014	09/01/2014	14/01/2014	21/01/2014	28/01/2014	04/02/2014	11/02/2014	19/02/2014	25/02/2014	05/03/2014	11/03/2014	18/03/2014	25/03/2014	03/04/2014	08/04/2014	15/04/2014
Final Effluent / Alkalinity (as CaCO3) - mg/L																	
Published Lab	207.000	223.000		197.000	207.000	234.000	245.000	200.000	230.000	252.000	304.000	203.000	220.000	219.000	236.000	159.000	208.000
Final Effluent / Carbonaceous Biochemical Oxygen Demand: CBOD5 - mg/L																	
Published Lab	2.000	2.000		2.000	2.000	2.000	2.000	2.000	2.000	2.000	3.000	3.000	2.000	2.000	2.000	2.000	2.000
Final Effluent / E. Coli: EC - cfu/100mL																	
Published Lab	2.000		2.000	2.000	2.000		2.000	2.000	2.000	2.000	2.000	2.000	0.000	0.000	2.000	2.000	2.000
Final Effluent / Nitrate + Nitrite as N: NO3-N + NO2-N - mg/L																	
Published Lab	20.200	15.500		13.100	14.600	11.100	6.190	15.300	12.400	9.860	5.020	10.100	16.200	15.400	3.790	9.930	10.900
Final Effluent / Nitrate as N: NO3-N - mg/L																	
Published Lab	20.200	15.500		13.100	14.600	11.100	6.190	15.300	12.400	7.620	3.640	9.640	15.800	15.200	3.790	9.780	10.800
Final Effluent / Nitrite as N: NO2-N - mg/L																	
Published Lab	0.030	0.030		0.030	0.030	0.030	0.030	0.030	0.040	2.240	1.380	0.480	0.360	0.180	0.030	0.150	0.080
Final Effluent / Total Ammonia Nitrogen: NH3 + NH4+ as N - mg/L																	
Published Lab	0.100	0.100		0.100	0.100	0.200	0.100	0.100	0.100	0.800	0.100	0.200	0.100	0.100	0.100	0.100	0.100
Final Effluent / Total Kjeldahl Nitrogen: TKN - mg/L																	
Published Lab	1.300	1.200		0.800	0.900	1.500	1.500	1.500	1.200	0.500	2.000	0.500	0.700	0.900	0.500	1.600	0.500
Final Effluent / Total Phosphorus: TP - mg/L																	
Published Lab	0.088	0.080		0.058	0.035	0.041	0.068	0.035	0.037	0.075	0.075	0.104	0.137	0.161	0.117	0.132	0.056
Final Effluent / Total Suspended Solids: TSS - mg/L																	
Published Lab	2.000		2.000	3.000	2.000	2.000	2.000	2.000	2.000	3.000	3.000	3.000	6.000	4.000	3.000	2.000	3.000
Final Effluent / pH - ---																	
Published Lab	8.100	8.060		8.020	8.100	8.190	8.180	8.050	8.270	8.180	8.370	8.140	8.200	8.150	8.160	8.260	8.240

22/04/2014	30/04/2014	06/05/2014	13/05/2014	20/05/2014	27/05/2014	03/06/2014	10/06/2014	17/06/2014	24/06/2014	02/07/2014	08/07/2014	15/07/2014	22/07/2014	29/07/2014	06/08/2014	13/08/2014	19/08/2014	26/08/2014	02/09/2014
222.000	251.000	229.000	192.000	171.000	181.000	161.000	168.000	151.000	162.000	168.000	156.000	184.000	201.000	177.000	222.000	215.000	215.000	224.000	189.000
4.000	4.000	4.000	2.000	4.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
0.000	2.000	2.000	2.000	2.000	2.000	0.000	0.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
13.700	10.600	11.000	14.600	16.500	15.200	24.300	24.300	25.600	25.100	24.200	24.500	19.500	21.900	21.700	20.500	19.600	19.600	19.500	23.900
13.500	10.600	11.000	14.600	16.500	15.200	24.300	24.300	25.600	25.000	24.200	24.500	19.500	21.900	21.700	20.500	19.600	19.600	19.500	23.900
0.200	0.040	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.050	0.030	0.040	0.030	0.040	0.030	0.030	0.030	0.030	0.030	0.030
0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.200	0.100	0.100	0.100	0.100	0.200	0.100	0.100	0.100	0.100	0.100
2.400	0.500	0.700	1.100	0.500	0.500	1.800	1.300	0.500	1.000	0.800	0.700	0.500	1.000	0.500	0.500	0.800	0.500	0.500	1.100
0.113	0.086	0.075	0.095	0.046	0.036	0.030	0.074	0.077	0.050	0.075	0.056	0.081	0.109	0.085	0.056	0.055	0.052	0.066	0.043
2.000	5.000	4.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	3.000	3.000	2.000	3.000	2.000	2.000
8.260	8.470	8.290	8.400	7.790	8.140	8.000	8.110	8.190	8.060	8.170	8.040	8.190	8.120	8.180	8.060	8.230	8.190	8.220	8.180

09/09/2014	16/09/2014	23/09/2014	30/09/2014	07/10/2014	14/10/2014	21/10/2014	28/10/2014	04/11/2014	12/11/2014	18/11/2014	26/11/2014	02/12/2014	09/12/2014	18/12/2014	22/12/2014	29/12/2014	average	min
276.000	268.000	300.000	289.000	271.000	273.000	281.000	298.000	207.000	277.000	284.000	264.000	298.000	288.000	303.000	279.000	223.000	227.981	151.000
2.000	2.000	3.000	5.000	2.000	2.000	4.000	9.000	3.000	7.000	2.000	2.000	2.000	2.000	2.000	2.000	3.000	2.577	2.000
2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.804	0.000
8.620	13.100	4.060	10.600	10.000	6.650	3.860	5.980	2.020	9.030	7.030	6.000	2.140	0.950	4.200	5.900	17.700	13.135	0.950
8.620	13.100	4.060	10.600	10.000	6.650	3.860	5.980	2.020	9.030	7.030	6.000	2.140	0.840	4.120	5.870	17.700	13.030	0.840
0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.110	0.080	0.030	0.030	0.127	0.030
																	0.111	0.100
0.100	0.100	0.100	0.100	0.100	0.100	0.200	0.100	0.100	0.100	0.100	0.300	0.100	1.800	0.800	0.300	0.300	0.218	0.100
0.500	0.500	0.500	1.000	0.500	0.600	1.000	0.700	2.200	2.200	1.400	1.400	1.100	2.800	1.800	0.500	0.800	1.010	0.500
0.059	0.052	0.054	0.058	0.110	0.048	0.080	0.031	0.068	0.050	0.093	0.038	0.058	0.042	0.034	0.051	0.029	0.068	0.029
2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.385	2.000
8.110	8.000	8.270	8.250	7.820	8.190	8.300	8.210	8.030	8.200	8.220	8.140	8.250	8.190	8.120	8.370	8.190	8.168	7.790

Shelburne WPCP Effluent Quality Data 2015

	06/01/2015	13/01/2015	20/01/2015	28/01/2015	03/02/2015	11/02/2015	18/02/2015	24/02/2015	03/03/2015	09/03/2015	16/03/2015	23/03/2015	30/03/2015	07/04/2015	16/04/2015	20/04/2015
Final Effluent / Alkalinity (as CaCO3) - mg/L																
Published Lab	293	291	283	270	213	252	247	272	281	233	192	211	199	202	307	232
Final Effluent / Carbonaceous Biochemical Oxygen Demand: CBOD5 - mg/L																
Published Lab	2	2	2	2	2	2	2	2	4	2	2	2	2	3	2	2
Final Effluent / Dissolved Reactive Phosphorus (Orthophosphate) - mg/L																
Published Lab	0.03				0.03				0.03					0.03		
Final Effluent / E. Coli: EC - cfu/100mL																
Published Lab	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Final Effluent / Nitrate + Nitrite as N: NO3-N + NO2-N - mg/L																
Published Lab	3.78	4.52	4.72	8.34	19.2	7.39	10.3	6.16	3.71	12.4	18.4	13.5	18.1	17.9	2.93	15.9
Final Effluent / Nitrate as N: NO3-N - mg/L																
Published Lab	3.78	4.52	4.72	8.34	19.2	7.35	10.2	6.06	3.58	12.4	18.4	13.5	18	17.9	2.87	15.8
Final Effluent / Nitrite as N: NO2-N - mg/L																
Published Lab	0.03	0.03	0.03	0.03	0.03	0.04	0.05	0.1	0.13	0.04	0.03	0.04	0.09	0.04	0.06	0.08
Final Effluent / Temperature Field: Lab Upload - °C																
Mean IH	7.2	7.6	8.4	8.7	7.2	8.5	7.3	6.1	7.7	7.9	8.8	8.7	10.7	10.25	12.2	10.7
Final Effluent / Total Ammonia Nitrogen: NH3 + NH4+ as N - mg/L																
Published Lab	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.5	0.8	0.1	0.1	0.1	0.1	0.1	0.8	0.1
Final Effluent / Total Kjeldahl Nitrogen: TKN - mg/L																
Published Lab	0.5	0.6	0.5	0.5	0.7	0.6	0.7	1.3	1.2	0.5	0.5	0.5	0.5	0.5	1.8	0.8
Final Effluent / Total Phosphorus: TP - mg/L																
Published Lab	0.04	0.043	0.036	0.052	0.068	0.059	0.054	0.073	0.075	0.059	0.031	0.021	0.046	0.02	0.009	0.029
Final Effluent / Total Suspended Solids: TSS - mg/L																
Published Lab	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Final Effluent / pH - ---																
Published Lab	8.31	8.22	8.3	8.15	8.05	8.17	7.82	8.08	8.06	7.84	8.06	8.04	8.1	8.11	8.23	8.13

27/04/2015	04/05/2015	11/05/2015	19/05/2015	25/05/2015	01/06/2015	08/06/2015	15/06/2015	22/06/2015	29/06/2015	06/07/2015	14/07/2015	20/07/2015	27/07/2015	04/08/2015	10/08/2015	17/08/2015	24/08/2015	31/08/2015
222	194	189	174	171	161	193	180	209	183	246	211	230	209	195.000	191.000	198.000	209.000	234.000
2	2	2	2	2	2	2	2	2	2	2	2	3	2	2.000	3.000	2.000	2.000	2.000
	0.03				0.12					0.03				0.030				
0	2	2	2	4	2	68	2	2	2	2	2	2	2	2.000	2.000	2.000	2.000	8.000
18.5	21.3	19.3	24.5	25.2	32.7	27.7	24	21.7	17.5	16.5	19.9	19.3	21.7	22.200	26.600	29.900	21.400	16.800
18.4	21.2	19.2	24.5	25.2	32.6	27.6	24	21.6	17.5	16.5	19.9	19.3	21.6	22.200	26.600	29.800	21.400	16.800
0.08	0.06	0.05	0.03	0.03	0.05	0.11	0.04	0.05	0.03	0.03	0.03	0.04	0.06	0.030	0.030	0.070	0.040	0.040
9.8	12.3	13.2	12.2	11.9	12.3	12.9	12.9	13.3	16.6	13.1	10.9	13.6	13.8	13.200	13.200	6.900	13.100	13.400
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.100	0.100	0.100	0.100	0.100
0.8	0.5	0.5	1	0.5	1.2	2.4	1.1	0.6	0.5	1	0.5	0.5	1	1.200	1.800	0.700	0.600	2.500
0.049	0.073	0.042	0.099	0.066	0.081	0.091	0.107	0.121	0.045	0.09	0.068	0.058	0.158	0.090	0.091	0.075	0.081	0.094
2	2	3	4	2	2	3	3	5	2	6	2	2	2	3.000	2.000	2.000	3.000	3.000
8.23	8.04	8.14	7.78	8.11	8.16	8.14	8.15	8.1	8.09	8.16	8.06	8.17	8.17	8.150	8.140	8.160	8.070	8.170

09/09/2015	14/09/2015	21/09/2015	average	min	max
165.000	183.000	193.000	218.894737	161	307
2.000	3.000	2.000	2.15789474	2	4
0.030			0.04	0.03	0.12
2.000	2.000	2.000	3.89473684	0	68
26.100	22.600	22.000	17.4907895	2.93	32.7
26.000	22.600	22.000	17.4505263	2.87	32.6
0.050	0.030	0.030	0.04894737	0.03	0.13
15.000	12.500	12.100	10.9513158	6.1	16.6
			0.1952381		
0.100	0.100	0.100	0.100		
0.800	0.500	1.500	0.87894737	0.5	2.5
0.105	0.090	0.122	0.06871053	0.009	0.158
2.000	2.000	2.000	2.39473684	2	6
7.870	7.950	8.250	8.10342105	7.78	8.31

?

Appendix F – Other Flow and Surface Water Quality Data

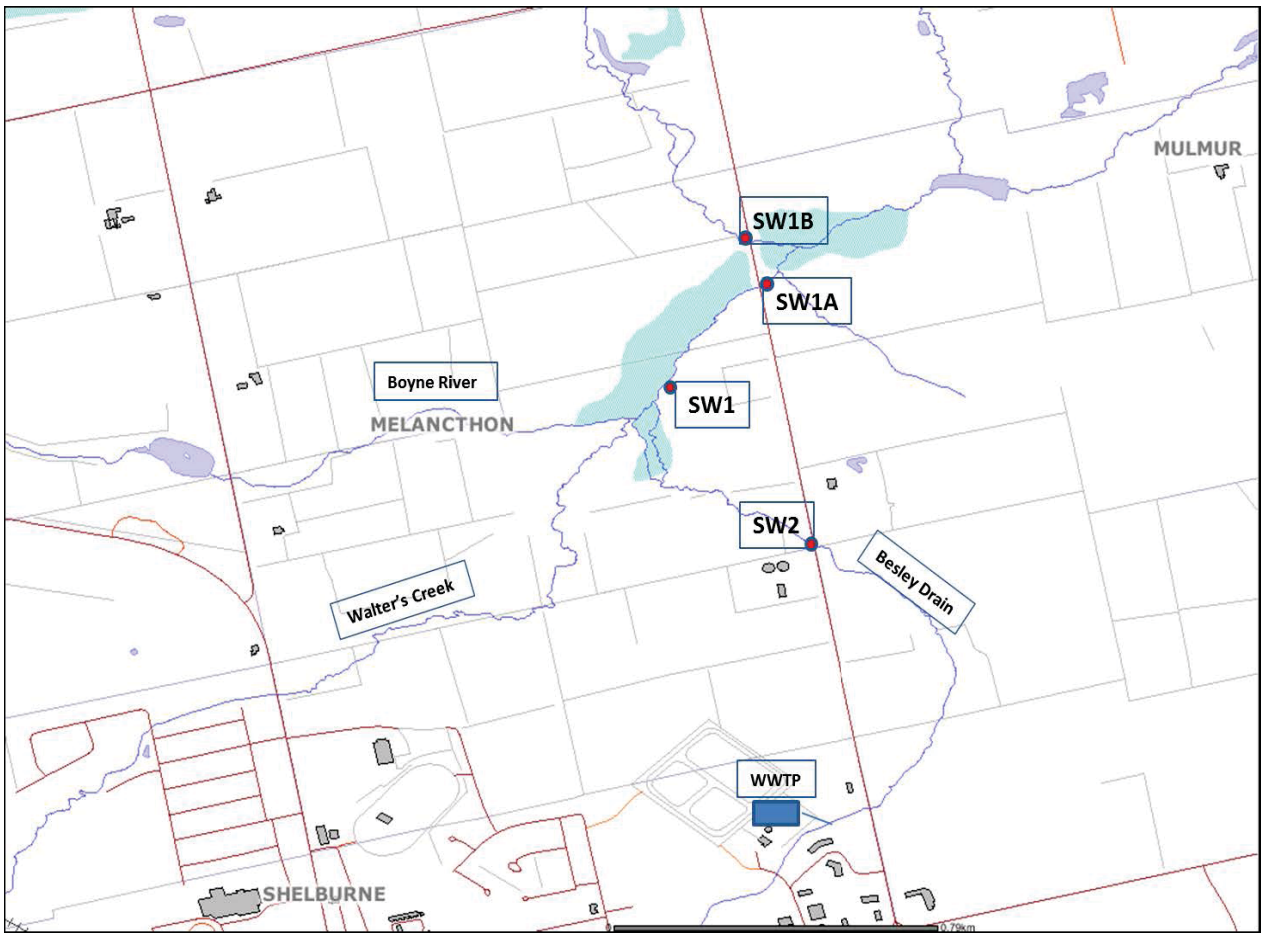


Figure F-1 2011 Summer Boyne River Sampling Locations

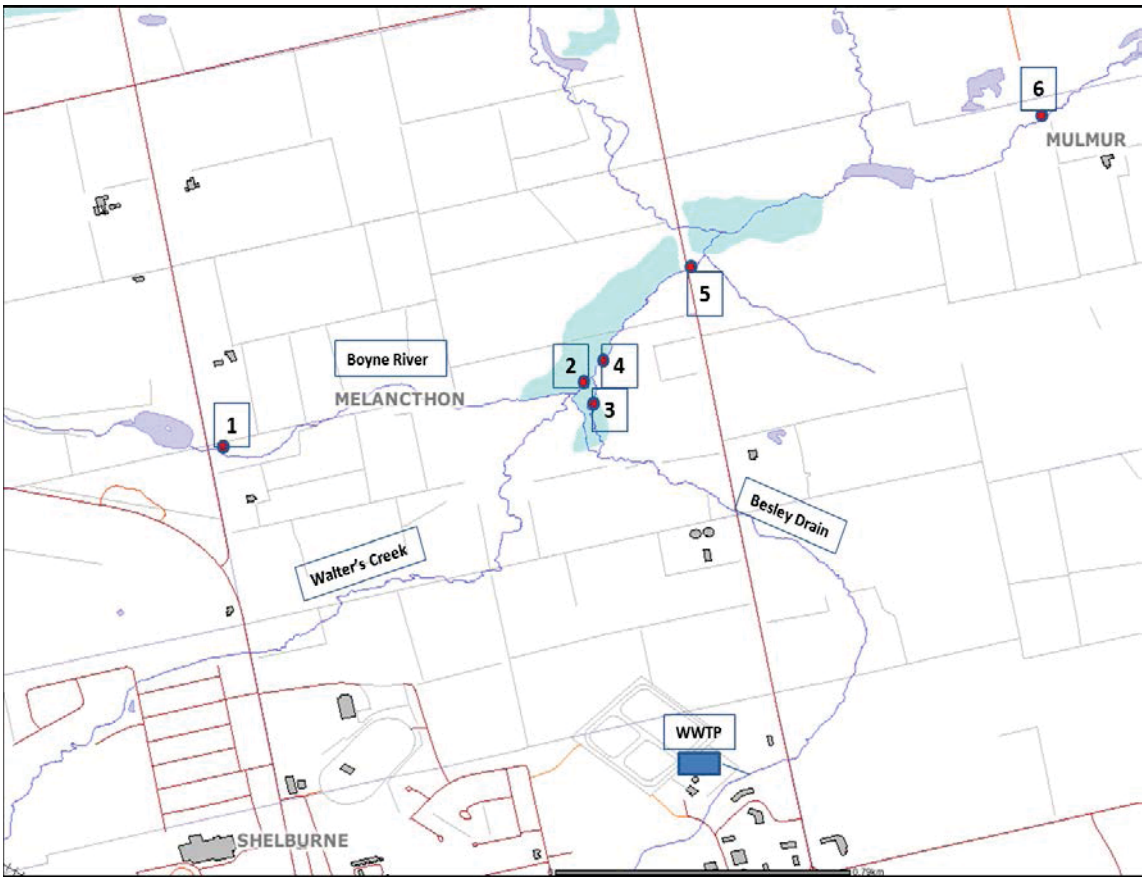


Figure F-2 2012 Summer Boyne River Sampling Locations



Figure F-3 2014 – 2016 WSP Boyne River sampling locations

Concentration Exceeds PWQOs
3: NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth;

Parameter [1]	Stream Location	Sample ID, Sample Date													
		Walters Creek at HWY 10													
	WSP				001	100 (duplicate of 001)	001	001	001	001	001	001	001	001	001
	Genivar	7	7	7											
	Town of Shelburne														
	PWQOs [2]	5-Jul-12	24-Jul-12	23-Aug-12	23-Sep-15	23-Sep-15	7-Oct-15	11-Nov-15	17-Dec-15	25-Jan-16	17-Feb-16	22-Mar-16	21-Apr-16	19-May-16	23-Jun-16
FIELD PARAMETERS															
pH		8.21	8.13	8.11	8.08	8.08	7.70	7.94	8.16	7.99	7.82	7.81	7.82	7.12	7.10
Conductivity (uS/cm)					681	681	547	583	667	788	983	1012	701	624	549
Temperature (degrees C)		16.4	20.1	17.8	12.7	12.7	11.4	8.8	5.6	3.9	3.5	3.6	9.6	12.1	15.4
Dissolved Oxygen		13.7	9	N.D.	6.7	6.7	8.4								
MICROBIOLOGY															
Escherichia coli (CFU/100mL)	**100**	**264**	**386**	96	**152**	**170**	72	60	12	1	4	2	18	**15000**	**300**
Total Coliforms (CFU/100mL)		>400	>200000	>4000	NDOGT	NDOGT	8300	10500	3300	2000	1600	800	1800	16200	12200
METALS & INORGANICS															
BOD (5)					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Suspended Solids					<10	<10	22	<10	<10	<10	<10	<10	<10	<10	<10
Total Kjeldahl Nitrogen		0.45	0.32	0.15	0.26	<0.10	0.63	0.66	0.49	0.54	1.91	1.12	1.34	0.89	0.64
Dissolved Organic Carbon					1.7	1.8	3.4	8.2	3	3.5	2.8	3.8	3.9	4.5	2.1
Chromium VI	**0.005**						<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
Electrical Conductivity (uS/cm)					726	782	722	579	648	801	960	665	714	739	808
pH (pH units)	**6.5-8.5**				8.28	8.3	8.05	7.99	8.09	8.3	8.07	8.23	8.25	8.29	7.99
Saturation pH					7.04	6.95	6.94	7.18	7.07	6.94	6.96	7.06	7	7.02	6.92
Langlier Index					1.24	1.35	1.11	0.81	1.02	1.36	1.11	1.17	1.25	1.27	1.07
Total Hardness (as CaCO3)					303	330	317	262	280	321	319	269	293	273	332
Total Dissolved Solids					442	436	406	360	416	442	552	342	382	398	466
Alkalinity (as CaCO3)					220	247	260	184	221	259	265	234	249	255	262
Bicarbonate (as CaCO3)					220	244	260	184	221	257	265	234	249	255	262
Carbonate (as CaCO3)					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Hydroxide (as CaCO3)					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Fluoride					<0.25	<0.10	<0.25	<0.1	<0.25	<0.10	<0.10	<0.10	<0.25	<0.25	<0.25
Chloride		44	39.2	42.8	59.8	63	69.2	32.5	56.5	80.9	154	61.6	68.1	78.3	91.5
Nitrate as N		5.3	5.1	5.1	5.99	6.33	6.1	1.29	1.64	4.01	5.01	3.36	3.54	3.89	6.11
Nitrite as N					<0.25	<0.10	<0.25	<0.1	<0.25	<0.25	<0.25	<0.10	<0.25	<0.25	<0.25
Bromide					<0.25	0.15	<0.25	<0.1	<0.25	<0.25	<0.25	<0.10	<0.25	<0.25	<0.25
Sulphate					17.7	18.8	17.7	68.3	42.7	26.8	29.1	21.3	22.7	22.1	20.9
Ortho Phosphate as P					<0.50	<0.20	<0.5	0.27	<0.5	0.649	<0.50	<0.20	<0.50	<0.50	<0.50
Reactive Silica					9.78	9.8	9.31	5.97	6.83	8.01	7.94	5.71	5.49	5.35	8.32
Ammonia as N		<0.01	<0.01	<0.01	<0.02	<0.02	0.029	0.042	<0.02	0.235	1.97	0.6	0.61	0.23	0.31
Ammonia-Un-ionized (calculated)	**0.02**	<0.001	0.001	<0.001	0.001	0.001	<0.001	0.001	<0.001	0.003	0.014	0.004	0.007	0.001	0.001
Total Phosphorus	**0.03**	**0.03**	0.02	0.01	**0.04**	**0.04**	**0.1**	**0.038**	0.016	0.015	0.014	0.01	0.01	0.03	0.01
Total Organic Carbon					2.6	2.1	3.2	8.5	6.3	3.6	2.9	4.1	3.9	5.1	2.2
Colour (TCU)					<5	<5	7	37	25	11	9	15	14	19	6
Turbidity (NTU)		3.1	2	1.4	14.2	1.7	4.8	3.1	3.2	1.5	1.3	3.3	4	3.4	1.0
Calcium					87.5	97.2	94	80	85.4	96.9	94.9	81.6	87.5	79.6	95.7
Magnesium					20.6	21.1	19.9	15	16.1	19.3	19.9	15.9	18	18.1	22.5
Sodium					29.1	29.4	25.4	17.5	25.4	40.1	75.5	30.1	36.6	34.3	36.8
Potassium					1.5	1.53	1.76	4.45	2.35	1.67	1.61	1.71	1.69	1.78	1.23
Aluminum (dissolved)	**0.075**				<0.004	0.005	<0.004	0.011	<0.004	<0.004	<0.004	<0.004	0.006	0.057	<0.004
Antimony	**0.020**				<0.003	<0.003	<0.003	<0.003	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003
Arsenic	**0.1**				<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium					0.03	0.028	0.0345	0.025	0.0286	0.0293	0.0342	0.029	0.025	0.034	0.029
Beryllium	**0.011**				<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	**0.20**				0.014	0.012	0.013	0.016	0.013	0.011	0.014	0.015	0.014	0.013	0.013
Cadmium	**0.0002**				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium					<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0038	<0.003	<0.003	<0.003	<0.003
Cobalt	**0.0009**				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**0.005**				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	**0.3**				0.15	0.07	0.295	0.09	0.063	0.037	0.071	0.06	0.05	0.08	<0.01
Lead	**0.005**				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese					0.046	0.038	0.0786	0.0212	0.0158	0.0542	0.0735	0.021	0.023	0.029	0.021
Dissolved Mercury	**0.0002**				<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	**0.04**				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	**0.025**				0.004	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium	**0.1**				<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silver	**0.0001**				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium					0.166	0.157	0.162	0.123	0.154	0.157	0.162	0.145	0.164	0.164	0.176
Thallium	**0.0003**				<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Tin					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium					<0.002	<0.002	0.0042	0.004	0.0034	0.0025	<0.002	0.002	<0.002	0.002	<0.002
Tungsten	**0.03**				<0.010	<0.010	<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	**0.005**				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	**0.006**				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	**0.02**				<0.005	<0.005	0.0064	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Zirconium	**0.004**				<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cation Sum (meq/L)					7.37	7.91	7.48	6.11	6.75	8.23	9.84	6.78	7.53	7.02	8.28
Anion Sum (meq/L)					6.88	7.56	7.96	6.11	7.02	8.31	10.6	7.1	7.63	8.05	8.69
% Difference/ Ion Balance (%)					3.4	2.24	3.1	0	1.9	0.5	3.8	2.32	0.6	6.84	2.41

Concentration Exceeds PWQOs
3: NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth;

Parameter [1]	Stream Location	Besley Drain U/S of Confluence												
	WSP				002	002	002	002	002	002	002	002	002	002
	Genivar	11	11	11										
	Town of Shelburne													
	PWQOs [2]	5-Jul-12	24-Jul-12	23-Aug-12	23-Sep-15	7-Oct-15	11-Nov-15	17-Dec-15	25-Jan-16	17-Feb-16	22-Mar-16	21-Apr-16	19-May-16	23-Jun-16
FIELD PARAMETERS														
pH		8.36	8.19	8.3	8.10	8.20	8.10	8.25	7.93	7.76	7.89	7.79	7.97	8.03
Conductivity (uS/cm)					692	1135	973	1188	1330	1012	1222	1200	1162	1281
Temperature (degrees C)		22.8	21.5	19.9	14.5	15.6	10.3	7.4	5.9	2.4	4.1	11.3	14.2	18.2
Dissolved Oxygen		9.5	8.6	N.D.	7.7	9.5								
MICROBIOLOGY														
Escherichia coli (CFU/100mL)	100	282	130	98	372	290	220	100	4	24	2	16	10	264
Total Coliforms (CFU/100mL)		>400	>200000	>4000	NDOGT	10500	16000	6000	2900	3000	1000	2800	1500	10500
METALS & INORGANICS														
BOD (5)					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Suspended Solids					<10	<10	13	<10	<10	<10	<10	<10	<10	<10
Total Kjeldahl Nitrogen		0.99	1.14	0.72	0.7	<0.10	0.86	<0.10	0.68	1.06	1.14	0.83	1.26	7.1
Dissolved Organic Carbon					4.3	6.4	7.0	5.2	5.3	5.0	3.9	5.2	6.0	0.98
Chromium VI	0.005					<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
Electrical Conductivity (uS/cm)					1590	1530	1020	1230	1440	1610	1280	1310	1350	1470
pH (pH units)	6.5-8.5				8.33	8.19	8.16	8.18	8.27	8.22	8.25	8.23	8.28	8.17
Saturation pH					7.08	7.21	7.16	6.97	6.91	6.91	6.92	6.98	6.95	7.00
Langlier Index					1.25	0.98	1	1.21	1.36	1.31	1.33	1.25	1.33	1.17
Total Hardness (as CaCO3)					330	328	268	314	339	360	349	285	319	301
Total Dissolved Solids					878	862	552	734	766	944	664	708	708	816
Alkalinity (as CaCO3)					201	150	202	265	279	273	268	285	273	266
Bicarbonate (as CaCO3)					197	150	202	265	279	273	268	285	273	266
Carbonate (as CaCO3)					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Hydroxide (as CaCO3)					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Fluoride					<0.25	<0.25	0.196	<0.25	0.42	<0.10	<0.25	<0.25	<0.25	<0.25
Chloride		234	228	257	246	293	148	193	237	354	208	216	240	290
Nitrate as N		16.1	18.1	13.4	21.1	21.2	9.24	11.1	5	16.3	11.3	4.88	4.15	1.10
Nitrite as N					<0.25	<0.25	<0.1	<0.25	<0.25	<0.50	<0.25	<0.25	<0.25	<0.25
Bromide					<0.25	<0.25	<0.1	<0.25	<0.25	<0.50	<0.25	<0.25	<0.25	<0.25
Sulphate					105	108	54.2	69.2	92.6	85.1	61.7	66.1	92.4	113
Ortho Phosphate as P					<0.50	<0.5	<0.2	<0.5	<0.50	<1.0	<0.50	<0.50	<0.50	<0.50
Reactive Silica					11.9	11.1	7.33	8.23	10.6	8.11	5.21	5.34	5.77	3.53
Ammonia as N		<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	0.095	1.04	1.14	0.03	0.25	0.14
Ammonia-Un-ionized (calculated)	0.02	0.001	0.001	0.001	0.001	0.001	<0.001	0.001	0.001	0.006	0.010	<0.001	0.006	0.005
Total Phosphorus	0.03	0.06	0.09	0.04	0.08	0.067	0.065	0.031	0.033	0.038	0.01	0.02	0.05	0.04
Total Organic Carbon					5.2	6	7.1	5.4	5.4	5	4.4	5.2	6.4	7.4
Colour (TCU)					19	22	33	17	14	14	14	13	19	24
Turbidity (NTU)		4.8	8.9	2	3.2	3.6	13	4.4	1	0.8	1.8	2.8	3.8	1.4
Calcium					85	84.7	76.8	91.5	90.6	100	101	74.2	86.6	73.7
Magnesium					28.6	28.4	18.6	20.8	27.5	26.9	23.4	24.3	24.9	28.4
Sodium					181	182	105	104	152	199	116	143	143	177
Potassium					12.6	13	7.36	6.35	8.44	7.77	5.63	7.26	9.14	12.9
Aluminum (dissolved)	0.075				0.037	0.0528	0.0294	0.024	0.0537	0.0309	0.032	0.043	0.093	0.027
Antimony	0.020				0.004	0.0046	<0.003	0.0022	0.0027	0.0024	<0.003	<0.003	<0.003	0.004
Arsenic	0.1				<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium					0.053	0.0561	0.0372	0.0511	0.045	0.0614	0.053	0.044	0.051	0.046
Beryllium	0.011				<0.001	<0.0005	<0.0005	<0.0005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	0.20				0.139	0.15	0.066	0.065	0.084	0.089	0.07	0.075	0.078	0.120
Cadmium	0.0002				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium					<0.003	<0.003	0.0062	<0.003	<0.003	0.0032	<0.003	<0.003	<0.003	<0.003
Cobalt	0.0009				0.0007	0.001	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	0.0006	0.0006	0.0008
Copper	0.005				0.004	0.0052	0.0046	0.0078	0.002	0.0031	0.003	0.003	0.003	0.002
Iron	0.3				0.04	0.059	0.183	0.051	<0.01	0.265	0.03	0.06	0.09	<0.01
Lead	0.005				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Manganese					0.007	0.0111	0.0167	0.0197	0.0168	0.0262	0.021	0.019	0.025	0.008
Dissolved Mercury	0.0002				<0.0001	<0.00001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.04				0.012	0.022	0.0054	0.0041	0.0072	0.0063	0.005	0.009	0.011	0.012
Nickel	0.025				0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium	0.1				<0.004	0.004	<0.004	<0.004	<0.004	0.0044	<0.004	<0.004	<0.004	<0.004
Silver	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium					0.278	0.24	0.155	0.222	0.23	0.252	0.228	0.232	0.218	0.224
Thallium	0.0003				<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Tin					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium					0.004	0.0042	0.0073	0.0028	<0.002	0.0025	<0.002	0.003	0.003	0.002
Tungsten	0.03				<0.010	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	0.005				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	0.006				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	0.02				0.03	0.04	0.01	0.02	0.03	0.03	0.02	0.02	0.027	0.105
Zirconium	0.004				<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cation Sum (meq/L)					14.8	14.8	10.1	11	13.6	16.1	12.2	12.1	12.8	14.0
Anion Sum (meq/L)					14.7	15	10	13	14.6	18.4	13.3	13.5	14.4	15.9
% Difference/ Ion Balance (%)					0.456	0.7	0.5	8.4	3.4	6.5	4.23	5.5	5.90	6.28

Concentration Exceeds PWQOs
3: NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth;

Parameter [1]	Stream Location	U/S of Confluence									
	WSP	003	003	003	003	003	003	003	003	003	003
	Genivar										
	Town of Shelburne										
	PWQOs [2]	23-Sep-15	7-Oct-15	11-Nov-15	17-Dec-15	25-Jan-16	17-Feb-16	22-Mar-16	21-Apr-16	19-May-16	23-Jun-16
FIELD PARAMETERS											
pH		8.14	8.10	7.95	8.14	8.01	8.00	7.91	7.92	7.77	7.72
Conductivity (uS/cm)		699	542	604	668	688	798	596	595	514	624
Temperature (degrees C)		10.5	12.4	7.9	5.3	3.1	2.5	3.2	9.6	11.9	16.1
Dissolved Oxygen		7.9	9.9								
MICROBIOLOGY											
Escherichia coli (CFU/100mL)	**100**	84	48	**900**	**120**	2	**600**	**800**	**36**	**206**	**280**
Total Coliforms (CFU/100mL)		NDOGT	4000	11000	3300	3200	9000	1100	700	1400	9700
METALS & INORGANICS											
BOD (5)		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Suspended Solids		<10	<10	12	<10	<10	<10	<10	<10	<10	<10
Total Kjeldahl Nitrogen		0.34	0.32	0.79	0.67	0.59	0.82	3.55	1.47	1.18	3.8
Dissolved Organic Carbon		2.6	3.6	6.3	5.5	4.2	3.4	3.9	3.6	4.4	0.85
Chromium VI	**0.005**		<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
Electrical Conductivity (uS/cm)		749	718	597	652	690	752	585	602	671	684
pH (pH units)	**6.5-8.5**	8.37	8.26	8.18	8.13	8.22	8.12	8.17	8.17	8.29	8.17
Saturation pH		7	7.08	7.14	7.02	6.96	6.97	7.08	7.08	7.04	7.07
Langlier Index		1.37	1.18	1.04	1.11	1.26	1.15	1.09	1.09	1.25	1.10
Total Hardness (as CaCO3)		295	299	246	277	302	299	249	258	263	273
Total Dissolved Solids		398	400	332	386	350	424	296	316	358	386
Alkalinity (as CaCO3)		246	202	216	248	261	259	225	236	249	227
Bicarbonate (as CaCO3)		241	202	216	248	261	259	225	236	249	227
Carbonate (as CaCO3)		5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Hydroxide (as CaCO3)		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Fluoride		<0.05	<0.25	<0.1	<0.25	<0.10	<0.10	<0.10	<0.25	<0.25	<0.10
Chloride		65	81.9	47.1	54.8	48.8	92.3	43.4	48.8	63.2	78.9
Nitrate as N		2.98	3.21	1.07	1.57	2.5	3.55	3.27	2.82	2.44	2.96
Nitrite as N		<0.05	<0.25	<0.1	<0.25	<0.25	<0.05	<0.10	<0.25	<0.25	<0.10
Bromide		0.91	<0.25	<0.1	<0.25	<0.25	<0.05	<0.10	<0.25	<0.25	<0.10
Sulphate		17.2	17.4	27.1	26	19.9	20.1	15.2	14.8	16.8	19.4
Ortho Phosphate as P		<0.10	<0.5	<0.2	<0.5	0.568	<0.1	<0.20	<0.50	<0.50	<0.20
Reactive Silica		5.98	5.93	5.89	6.26	6.55	5.33	4.5	3.84	4.28	4.39
Ammonia as N		<0.02	<0.02	0.2	0.111	0.224	0.121	3.24	0.85	0.83	0.43
Ammonia-Un-ionized (calculated)	**0.02**	0.001	0.001	0.003	0.002	0.002	0.001	**0.03**	0.013	0.010	0.007
Total Phosphorus	**0.03**	0.02	0.019	**0.038**	0.013	0.012	0.012	<0.01	<0.01	0.01	0.02
Total Organic Carbon		3.1	3.5	6.5	5.6	4.8	3.6	4	3.6	4.7	3.9
Colour (TCU)		6	9	27	20	12	10	14	11	18	11
Turbidity (NTU)		5.5	4.7	14.4	2.9	<0.5	0.5	1.3	1.3	1.4	1.0
Calcium		82.4	84.1	72.1	82.1	88.3	87.3	73.4	75.1	74.8	72.9
Magnesium		21.6	21.5	15.9	17.5	19.7	19.7	15.9	17.1	18.5	22.0
Sodium		37.7	36.5	27.6	29	27.8	47.4	22.3	26.6	30.8	38.0
Potassium		2.4	2.44	2.83	2.04	1.84	1.81	1.56	1.66	1.84	1.67
Aluminum (dissolved)	**0.075**	0.006	0.0041	0.0087	0.0171	<0.004	<0.004	<0.004	0.009	0.033	<0.004
Antimony	**0.020**	<0.003	<0.003	<0.003	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003
Arsenic	**0.1**	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium		0.026	0.0291	0.0228	0.0216	0.0226	0.0228	0.021	0.018	0.023	0.023
Beryllium	**0.011**	<0.001	<0.0005	<0.0005	<0.0005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	**0.20**	0.013	0.013	0.013	<0.01	<0.01	0.01	0.012	0.013	0.011	0.013
Cadmium	**0.0002**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium		<0.003	<0.003	0.003	<0.003	<0.003	0.0038	<0.003	<0.003	<0.003	<0.003
Cobalt	**0.0009**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**0.005**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	**0.3**	0.07	0.071	0.263	0.032	<0.01	<0.01	0.01	0.01	0.05	0.04
Lead	**0.005**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese		0.017	0.016	0.0207	0.0106	0.0099	0.008	0.009	0.009	0.016	0.011
Dissolved Mercury	**0.0002**	<0.0001	<0.00001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	**0.04**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.005	<0.002	<0.002
Nickel	**0.025**	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium	**0.1**	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silver	**0.0001**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium		0.143	0.136	0.107	0.117	0.123	0.117	0.112	0.115	0.129	0.139
Thallium	**0.0003**	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Tin		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium		<0.002	<0.002	0.0106	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Tungsten	**0.03**	<0.010	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	**0.005**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	**0.006**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	**0.02**	0.005	0.01	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005
Zirconium	**0.004**	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cation Sum (meq/L)		7.59	7.62	6.19	6.86	7.3	8.1	6.21	6.42	6.70	7.17
Anion Sum (meq/L)		7.32	6.94	6.29	7.16	7.19	8.46	6.27	6.61	7.29	7.38
% Difference/ Ion Balance (%)		1.79	4.6	0.8	2.1	0.8	2.2	0.48	1.5	4.18	1.42

Concentration Exceeds PWQOs
3: NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth;

Parameter [1]	Stream Location	Main Boyne River U/S of Confluence												
	WSP				004	004	004	004	004	004	004	004	004	004
	Genivar	10	10	10										
	Town of Shelburne													
	PWQOs [2]	5-Jul-12	24-Jul-12	23-Aug-12	23-Sep-15	7-Oct-15	11-Nov-15	17-Dec-15	25-Jan-16	17-Feb-16	22-Mar-16	21-Apr-16	19-May-16	23-Jun-16
FIELD PARAMETERS														
pH		8.26	8.19	8.16	8.11	8.15	7.88	8.19	7.94	7.99	7.84	7.97	7.71	7.63
Conductivity (uS/cm)					702	540	691	651	640	622	527	523	530	594
Temperature (degrees C)		19.9	19.1	17.0	11.5	12.7	7.9	5.4	3.6	2.8	3.9	10.2	12.2	16.7
Dissolved Oxygen		7.9	8.5	N.D.	7.7	9.6								
MICROBIOLOGY														
Escherichia coli (CFU/100mL)	100	240	432	16	14	30	46	6	2	2	2	4	16	64
Total Coliforms (CFU/100mL)		>400	>200000	>4000	NDOGT	2000	4000	1200	2800	14500	900	260	1000	8500
METALS & INORGANICS														
BOD (5)					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Suspended Solids					<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total Kjeldahl Nitrogen		0.43	0.48	0.37	0.44	0.33	0.78	0.98	0.29	3.42	0.93	0.93	0.79	4.6
Dissolved Organic Carbon					3	3.7	6.1	5.4	4.6	3.7	3.3	3.6	4.5	0.86
Chromium VI	0.005					<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.005	0.001	<0.001
Electrical Conductivity (uS/cm)					738	718	691	632	640	586	521	524	617	595
pH (pH units)	6.5-8.5				8.36	8.23	8.33	8.16	8.22	8.1	8.1	8.2	8.29	8.08
Saturation pH					7.04	7.1	6.99	7.03	6.99	7	7.12	7.09	7.07	7.20
Langlier Index					1.32	1.13	1.34	1.13	1.23	1.1	0.98	1.11	1.22	0.88
Total Hardness (as CaCO3)					275	279	286	274	290	282	232	243	251	227
Total Dissolved Solids					382	388	378	378	338	342	290	282	322	312
Alkalinity (as CaCO3)					242	206	258	247	258	257	220	225	244	203
Bicarbonate (as CaCO3)					237	206	253	247	258	257	220	225	244	203
Carbonate (as CaCO3)					<5	<5	5.38	<5	<5	<5	<5	<5	<5	<5
Hydroxide (as CaCO3)					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Fluoride					<0.05	<0.25	<0.1	<0.25	<0.10	<0.10	<0.05	<0.25	<0.10	<0.10
Chloride		65.2	82.3	78	66.6	89.4	59.4	47.8	39.5	39	28.2	31	49.6	66.7
Nitrate as N		2.6	1.8	1.9	2.06	2.29	1.15	1.69	2.4	3.46	3.31	2.91	2.56	1.84
Nitrite as N					<0.05	<0.25	<0.1	<0.25	<0.10	<0.05	<0.05	<0.25	<0.10	<0.10
Bromide					<0.05	<0.25	<0.1	<0.25	<0.10	<0.05	<0.05	<0.25	<0.10	<0.10
Sulphate					15.8	15.4	20.8	20.6	17.4	16.2	12.1	11.4	13.9	15.9
Ortho Phosphate as P					<0.10	<0.5	<0.2	<0.5	<0.50	<0.1	<0.10	<0.50	<0.20	<0.20
Reactive Silica					4.02	3.88	6.43	6.04	5.87	5.65	4.06	3.26	4.12	2.75
Ammonia as N		<0.01	<0.01	<0.01	<0.02	0.182	0.252	0.116	<0.02	2.39	0.53	0.24	0.17	0.42
Ammonia-Un-ionized (calculated)	0.02	0.001	0.001	0.000	0.001	0.006	0.003	0.002	0.000	0.024	0.004	0.004	0.002	0.005
Total Phosphorus	0.03	<0.01	0.02	0.01	<0.01	<0.01	0.021	0.01	<0.01	0.014	<0.01	<0.01	<0.01	0.01
Total Organic Carbon					3.4	3.6	6.1	5.5	4.7	3.8	3.7	3.7	4.8	4.7
Colour (TCU)					8	10	20	19	13	11	14	13	16	14
Turbidity (NTU)		2.2	1.4	1.6	<0.5	<0.5	1.6	<0.5	<0.5	<0.5	2	1	0.8	0.7
Calcium					74.9	76.4	81.9	80.4	85.2	82.4	68.3	70.6	71.3	56.8
Magnesium					21.3	21.5	19.9	17.8	18.7	18.4	15	16.2	17.7	20.6
Sodium					40.7	42.4	35.2	26.3	22	19.9	14.8	17.4	24.2	34.2
Potassium					2.84	2.9	2.37	1.87	1.88	1.85	1.5	1.68	1.77	1.90
Aluminum (dissolved)	0.075				0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.006	0.017	<0.004
Antimony	0.020				<0.003	<0.003	<0.003	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003
Arsenic	0.1				<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium					0.025	0.0272	0.0237	0.021	0.0185	0.0207	0.017	0.014	0.018	0.014
Beryllium	0.011				<0.001	<0.0005	<0.0005	<0.0005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	0.20				0.012	0.014	0.012	<0.01	<0.01	0.01	0.01	<0.010	<0.010	0.011
Cadmium	0.0002				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium					<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	0.0009				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	0.005				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.050	<0.002
Iron	0.3				0.02	0.045	0.068	<0.01	<0.01	0.025	<0.01	<0.01	0.03	0.09
Lead	0.005				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese					0.006	0.0101	0.0193	0.0089	0.0075	0.0077	0.009	0.01	0.016	0.011
Dissolved Mercury	0.0002				<0.0001	<0.00001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.04				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	0.025				<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium	0.1				<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silver	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium					0.126	0.122	0.108	0.11	0.0996	0.11	0.094	0.092	0.108	0.106
Thallium	0.0003				<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Tin					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Tungsten	0.03				<0.010	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	0.005				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	0.006				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	0.02				0.006	0.0142	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.010	<0.005
Zirconium	0.004				<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cation Sum (meq/L)					7.33	7.51	7.34	6.68	6.8	6.71	5.36	5.67	6.13	6.09
Anion Sum (meq/L)					7.19	7.13	7.35	6.84	6.81	6.82	5.68	5.82	6.75	6.40
% Difference/ Ion Balance (%)					0.953	2.6	0.1	1.2	0.1	0.8	2.89	1.3	4.86	2.48

Concentration Exceeds PWQOs
3: NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth;

Parameter [1]	Stream Location	Walters Creek U/S of Confluence											
	WSP				005	005	005	005	005	005	005	005	005
	Genivar	8	8	8									
	Town of Shelburne												
	PWQOs [2]	5-Jul-12	24-Jul-12	23-Aug-12	23-Sep-15	11-Nov-15	17-Dec-15	25-Jan-16	17-Feb-16	22-Mar-16	21-Apr-16	19-May-16	23-Jun-16
FIELD PARAMETERS													
pH		8.36	8.18	8.24	8.10	7.99	8.13	7.91	7.89	7.87	7.89	7.86	7.75
Conductivity (uS/cm)					713	526	702	839	1619	768	631	649	674
Temperature (degrees C)		22.3	20.4	16.8	10.4	7.9	5.2	1.9	1.6	1.9	9.4	11.8	15.1
Dissolved Oxygen		8.1	8.4	N.D.	8.0								
MICROBIOLOGY													
Escherichia coli (CFU/100mL)	100	104	258	114	184	1900	380	32	3200	3500	132	300	500
Total Coliforms (CFU/100mL)		>400	>200000	>4000	NDOGT	13500	4500	1600	4500	4300	2500	1100	14000
METALS & INORGANICS													
BOD (5)					<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Suspended Solids					<10	15	<10	<10	<10	<10	<10	<10	<10
Total Kjeldahl Nitrogen		0.21	0.51	0.14	<0.10	0.59	0.6	0.43	0.76	1.74	1.45	0.76	2.5
Dissolved Organic Carbon					2	6.7	5.7	3.3	2.9	3.4	3.7	4.1	0.63
Chromium VI	0.005					<0.005	<0.005	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
Electrical Conductivity (uS/cm)					778	518	690	841	1600	761	779	762	840
pH (pH units)	6.5-8.5				8.35	8.12	8.19	8.23	8.12	8.24	8.3	8.34	8.21
Saturation pH					6.95	7.26	7.06	6.89	6.89	7	6.96	7.00	6.89
Langlier Index					1.4	0.86	1.13	1.34	1.23	1.24	1.34	1.34	1.32
Total Hardness (as CaCO3)					325	212	281	340	366	287	302	283	344
Total Dissolved Solids					398	298	424	428	886	394	420	398	480
Alkalinity (as CaCO3)					248	177	222	276	281	250	263	255	274
Bicarbonate (as CaCO3)					243	177	222	276	281	250	263	245	274
Carbonate (as CaCO3)					5	<5	<5	<5	<5	<5	<5	10	<5
Hydroxide (as CaCO3)					<5	<5	<5	<5	<5	<5	<5	<5	<5
Fluoride					<0.10	<0.1	<0.25	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25
Chloride		38.6	38.5	49.5	65.2	35.7	69.9	85.6	369	80.9	84.8	87.1	98.4
Nitrate as N		3	2.9	3.2	4.57	1.02	1.45	2.93	3.93	2.69	2.66	2.75	4.84
Nitrite as N					<0.10	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Bromide					1.73	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Sulphate					19.5	33.8	38.5	27.1	32.5	22.4	22.6	23.6	25.6
Ortho Phosphate as P					<0.20	<0.2	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Reactive Silica					8.95	5.36	6.99	8.13	8.24	5.95	4.9	4.45	7.10
Ammonia as N		<0.01	<0.01	<0.01	<0.02	0.306	<0.02	0.025	0.157	1.32	0.65	0.09	0.30
Ammonia-Un-ionized (calculated)	0.02	0.001	0.001	0.001	<0.001	0.005	<0.001	<0.001	0.001	0.009	0.009	0.001	0.005
Total Phosphorus	0.03	<0.01	0.02	0.01	0.02	0.051	0.024	0.015	0.017	<0.01	<0.01	<0.01	0.02
Total Organic Carbon					2.2	6.8	5.7	3.300	3.000	3.700	3.800	4.6	2.5
Colour (TCU)					6	33	22	9	8	14	14	19	10
Turbidity (NTU)		5.3	2.8	2.4	0.8	25.7	7.2	1.1	1.2	2.9	1	1.4	0.7
Calcium					94.1	63.5	84.5	99.8	107	85.2	88.8	81.7	97.8
Magnesium					21.8	12.9	17	22	24.1	18	19.6	19.2	24.2
Sodium					32.3	22.2	33.8	45.4	195	41.8	46.9	40.7	40.8
Potassium					1.73	3.21	2.3	1.59	1.76	1.7	1.66	1.88	1.19
Aluminum (dissolved)	0.075				0.006	0.0115	<0.004	<0.004	<0.004	<0.004	<0.004	0.042	<0.004
Antimony	0.020				<0.003	<0.003	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003
Arsenic	0.1				<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium					0.026	0.0226	0.0242	0.0297	0.0425	0.03	0.024	0.032	0.032
Beryllium	0.011				<001	<0.0005	<0.0005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	0.20				0.013	0.015	0.011	0.012	0.016	0.014	0.013	0.013	0.017
Cadmium	0.0002				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium					<0.003	<0.003	0.0031	<0.003	0.0057	<0.003	<0.003	<0.003	<0.003
Cobalt	0.0009				<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	0.005				<0.002	0.0023	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	0.3				<0.01	0.239	0.086	0.016	0.036	0.03	<0.01	0.04	<0.01
Lead	0.005				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese					0.006	0.0237	0.0158	0.0147	0.0123	0.009	0.007	0.010	0.008
Dissolved Mercury	0.0002				<0.0001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.04				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	0.025				0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium	0.1				<0.004	<0.004	<0.004	<0.004	0.005	<0.004	<0.004	<0.004	<0.004
Silver	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium					0.156	0.117	0.135	0.16	0.194	0.159	0.152	0.170	0.186
Thallium	0.0003				<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Tin					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium					<0.002	0.0094	0.0041	<0.002	<0.002	<0.002	0.002	<0.002	<0.002
Tungsten	0.03				<0.010	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	0.005				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	0.006				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	0.02				<0.005	0.0064	<0.005	0.005	0.0067	<0.005	<0.005	<0.005	0.005
Zirconium	0.004				<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cation Sum (meq/L)					7.94	5.3	7.15	8.81	15.9	7.69	8.17	7.48	8.70
Anion Sum (meq/L)					7.53	5.32	7.32	8.71	17	7.94	8.31	8.24	9.13
% Difference/ Ion Balance (%)					2.64	0.2	1.2	0.6	3.4	1.6	0.8	4.84	2.44

Concentration Exceeds PWQOs
3: NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth;

Parameter [1]	Stream Location	D/S of Confluence																
	WSP								006	006	006	006	006	006	006	006	006	006
	Genivar					12	12	12										
	Town of Shelburne	SW1	SW1	SW1	SW1													
	PWQOs [2]	20-May-11	20-Jun-11	20-Jul-11	14-Sep-11	5-Jul-12	24-Jul-12	23-Aug-12	23-Sep-15	7-Oct-15	11-Nov-15	17-Dec-15	25-Jan-16	17-Feb-16	22-Mar-16	21-Apr-16	19-May-16	23-Jun-16
FIELD PARAMETERS																		
pH		8.15	7.65	8.27	8.05	8.34	8.19	8.26	8.12	8.13	7.97	8.01	7.98	8.03	8.01	7.84	7.91	7.82
Conductivity (uS/cm)									1048	948	770	893	994	1166	845	854	814	959
Temperature (degrees C)			19.3	24.8	15.4	21.9	21.0	18.2	11.6	14.8	8.8	6.1	4.3	2.4	3.4	10.1	13.6	17.8
Dissolved Oxygen						9.2	8.9	N.D.	7.7	9.7								
MICROBIOLOGY																		
Escherichia coli (CFU/100mL)	**100**					**210**	**212**	62	**360**	**230**	**1000**	**240**	4	**300**	**216**	**40**	**110**	**150**
Total Coliforms (CFU/100mL)						>400	>200000	>4000	NDOGT	6500	12500	3500	2100	1500	700	1500	1500	11000
METALS & INORGANICS																		
BOD (5)			<3	<3	<3				<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Suspended Solids		5	<3	4	4				<10	10	12	<10	<10	<10	<10	<10	<10	<10
Total Kjeldahl Nitrogen		0.62	0.67	0.74	0.61	0.75	0.98	0.48	<0.10	0.77	0.8	0.48	0.69	1.71	1.06	1.44	1.24	5.2
Dissolved Organic Carbon									4	5.6	6.7	5.3	4.6	3.9	3.9	4.4	4.7	5.18
Chromium VI	**0.005**									<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
Electrical Conductivity (uS/cm)									1300	1260	782	903	1040	1140	854	893	945	1120
pH (pH units)	**6.5-8.5**								8.32	8.22	8.17	8.21	8.26	8.12	8.21	8.25	8.33	8.22
Saturation pH									7.07	7.04	7.14	7	6.97	6.96	7.01	6.96	6.98	7.01
Langlier Index									1.25	1.18	1.03	1.21	1.29	1.16	1.2	1.29	1.35	1.21
Total Hardness (as CaCO3)									315	321	254	309	312	316	291	296	291	288
Total Dissolved Solids									742	712	432	530	522	670	444	476	498	594
Alkalinity (as CaCO3)									210	221	208	250	269	270	245	266	260	260
Bicarbonate (as CaCO3)									208	221	208	250	269	270	245	266	255	260
Carbonate (as CaCO3)									<5	<5	<5	<5	<5	<5	<5	<5	5	<5
Hydroxide (as CaCO3)									<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Fluoride									<0.25	<0.25	0.113	<0.25	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25
Chloride		45.5	104	147	152	154	186	160	180	226	90.7	115	150	189	103	118	132	192
Nitrate as N		1.8	5.3	4.7	7.3	9.7	13.3	7.4	15	15.5	4.6	5.69	3.72	8.07	6.06	3.65	3.08	2.00
Nitrite as N									<0.25	<0.25	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Bromide									<0.25	<0.25	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.50	<0.25
Sulphate									74.9	79.5	38.7	44.7	51.4	43.6	31.6	34.4	47.7	69.3
Ortho Phosphate as P									<0.50	<0.5	<0.2	<0.5	<0.50	<0.50	<0.50	<0.50	<0.10	<0.50
Reactive Silica									9.45	9.41	6.44	7.15	7.99	7.05	4.74	4.35	4.86	3.61
Ammonia as N		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	0.082	0.047	<0.02	0.02	0.921	0.6	0.61	0.90	4.65
Ammonia-Un-ionized (calculated)	**0.02**		<0.001	0.001	<0.001	0.001	0.001	0.001	0.001	0.003	0.001	<0.001	<0.001	0.010	0.007	0.008	0.018	**0.10**
Total Phosphorus	**0.03**	**0.03**	0.02	**0.03**	0.02	**0.04**	**0.07**	0.02	**0.05**	**0.05**	**0.05**	0.02	0.02	0.02	0.01	0.01	0.02	0.03
Total Organic Carbon									4.3	5.3	6.9	5.5	4.8	4.2	3.9	4.4	5.4	5.7
Colour (TCU)									18	18	27	20	13	11	13	12	18	19
Turbidity (NTU)						3.4	6.4	2.1	3.4	3.9	14.2	3.7	0.7	0.8	2.1	1.8	1.9	1.4
Calcium									82.9	85.2	73.9	90.9	87.5	90.1	85.3	85	81.1	74.3
Magnesium									26.3	26.3	16.9	19.9	22.6	22	19	20.4	21.4	25.0
Sodium									130	136	61.3	66.6	83.9	107	58.4	73.5	76.4	110
Potassium									9.3	9.57	4.84	4.2	4.74	4.14	3.01	3.9	4.85	7.55
Aluminum (dissolved)	**0.075**								0.022	0.0376	0.0179	0.0106	0.0259	0.012	0.012	0.018	0.057	0.013
Antimony	**0.020**								<0.003	0.0034	<0.003	0.001	0.0015	0.0011	<0.003	<0.003	<0.003	<0.003
Arsenic	**0.1**								<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium									0.038	0.0505	0.0289	0.036	0.0362	0.0406	0.032	0.028	0.034	0.035
Beryllium	**0.011**								<0.001	<0.0005	<0.0005	<0.0005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	**0.20**								0.089	0.113	0.036	0.033	0.049	0.044	0.031	0.034	0.034	0.067
Cadmium	**0.0002**								<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium									<0.003	<0.003	0.0042	<0.003	<0.003	0.0055	<0.003	<0.003	<0.003	<0.003
Cobalt	**0.0009**								<0.0005	0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	**0.005**								0.003	0.0033	0.003	0.0032	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	**0.3**								0.06	0.059	0.216	0.059	0.015	0.048	0.03	0.02	0.06	<0.01
Lead	**0.005**								<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese									0.007	0.0101	0.019	0.0163	0.0148	0.0168	0.014	0.012	0.018	0.008
Dissolved Mercury	**0.0002**								<0.0001	<0.00001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	**0.04**								0.008	0.0159	0.0028	0.002	0.0037	0.0029	<0.002	0.003	0.005	0.007
Nickel	**0.025**								0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium	**0.1**								<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silver	**0.0001**								<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium									0.207	0.21	0.126	0.172	0.179	0.18	0.153	0.164	0.169	0.182
Thallium	**0.0003**								<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Tin									<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium									0.003	0.0032	0.0114	0.0026	<0.002	<0.002	<0.002	0.002	0.003	<0.002
Tungsten	**0.03**								<0.010	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	**0.005**								<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	**0.006**								<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	**0.02**								0.018	**0.03**	0.01	0.01	0.02	0.01	0.01	0.01	0.015	**0.023**
Zirconium	**0.004**								<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cation Sum (meq/L)									12.2	12.6	7.87	9.18	10	11.1	8.48	9.26	9.32	11.1
Anion Sum (meq/L)									11.9	13.6	7.86	9.58	10.9	12.2	8.9	9.63	10.1	12.2
% Difference/ Ion Balance (%)									1.17	3.7	0.1	2.1	4.5	4.6	2.39	1.9	4.20	4.85

Concentration Exceeds PWQOs
3: NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth;

Parameter [1]	Stream Location	Boyne River at M-M Townline																			Boyne River at	
	WSP				007	007	007	100 (duplicate of 007)	007	100 (duplicate of 007)	007	100 (duplicate of 007)	007	100 (duplicate of 007)	007	007	100 (duplicate of 007)	007	100 (duplicate of 007)	007	100 (duplicate of 007)		
	Genivar	14	14	14																		
	Town of Shelburne																				SW1A	SW1A
	PWQOs [2]	5-Jul-12	24-Jul-12	23-Aug-12	23-Sep-15	7-Oct-15	11-Nov-15	11-Nov-15	17-Dec-15	17-Dec-15	25-Jan-16	25-Jan-16	17-Feb-16	17-Feb-16	22-Mar-16	21-Apr-16	21-Apr-16	19-May-16	19-May-16	23-Jun-16	23-Jun-16	20-May-11	20-Jun-11
FIELD PARAMETERS																						
pH		8.27	8.34	8.38	8.14	8.19	7.91	7.91	8.13	8.13	7.94	7.94	8.23	8.23	8.19	7.94	7.94	7.51	7.51	8.09	8.09	8.10	7.73
Conductivity (uS/cm)					981	705	625	625	711	711	773	773	825	825	627	574	574	581	581	782	782		
Temperature (degrees C)		22.0	24.7	20.1	10.2	12.3	7.7	7.7	5.5	5.5	2.0	2.0	0.5	0.5	1.8	9.2	9.2	13.1	13.1	17.9	17.9		18.1
Dissolved Oxygen		10.2	11.4	N.D.	7.8	11.0																	
MICROBIOLOGY																							
Escherichia coli (CFU/100mL)	100	190	254	306	380	1000	300	700	66	60	<1	<1	62	41	24	18	34	120	92	144	140		
Total Coliforms (CFU/100mL)		>400	>200000	>4000	NDOGT	4300	11500	10500	3600	3500	3300	3000	2000	1200	400	1200	1200	1100	1900	4000	4300		
METALS & INORGANICS																							
BOD (5)					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		<3
Total Suspended Solids					<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<3	21
Total Kjeldahl Nitrogen		0.78	0.88	0.65	<0.10	0.63	0.57	0.59	0.83	0.64	0.75	0.6	0.87	1.87	1.35	1.95	1.62	0.42	0.53	6.4	6.5	0.58	0.63
Dissolved Organic Carbon					4.6	6.1	6.8	6.9	5.5	5.6	4.9	4.8	3.9	3.9	4.5	5.1	5.1	5.60	5.7	1.01	0.90		
Chromium VI	0.005					<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001		
Electrical Conductivity (uS/cm)					1020	1260	625	622	703	706	766	766	777	785	610	586	585	670	690	899	893		
pH (pH units)	6.5-8.5				8.39	8.25	8.22	8.28	8.21	8.24	8.24	8.26	8.13	8.17	8.19	8.24	8.28	8.32	8.33	8.19	8.21		
Saturation pH					7.07	7.07	7.13	7.13	7.01	7.01	6.94	6.95	6.96	6.97	7.09	7.08	7.07	7.04	7.02	7.03	7.03		
Langlier Index					1.32	1.18	1.09	1.15	1.2	1.23	1.3	1.31	1.17	1.2	1.1	1.16	1.21	1.28	1.31	1.16	1.18		
Total Hardness (as CaCO3)					295	319	249	249	288	288	312	308	305	305	256	252	260	261	263	277	276		
Total Dissolved Solids					566	712	342	356	426	418	392	396	432	424	306	318	312	358	366	492	488		
Alkalinity (as CaCO3)					224	209	215	217	246	246	267	266	263	254	232	238	237	254	261	247	247		
Bicarbonate (as CaCO3)					217	209	215	217	246	246	267	266	263	254	232	238	237	250	257	247	247		
Carbonate (as CaCO3)					7	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
Hydroxide (as CaCO3)					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
Fluoride					<0.25	<0.25	<0.1	<0.1	<0.25	<0.25	<0.10	<0.10	<0.10	<0.10	<0.10	<0.25	<0.25	<0.10	<0.10	<0.25	<0.25		
Chloride		121	149	150	118	223	52.7	52.2	66.1	64.8	63.9	64	91.6	90.1	46	41.6	41.8	62.4	67.8	130	129	72.0	145
Nitrate as N		7.6	10.1	6	8.73	15.2	1.56	1.52	2.45	2.43	2.51	2.51	4.82	4.75	3.16	1.91	1.92	1.75	1.85	1.19	1.22	2.8	7.6
Nitrite as N					<0.25	<0.25	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.10	<0.25	<0.25	<0.10	<0.10	<0.25	<0.25		
Bromide					<0.25	<0.25	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.10	<0.25	<0.25	<0.10	<0.10	<0.25	<0.25		
Sulphate					52.1	76.4	26.7	26.7	30.8	30.3	29.6	29.5	28.7	28.2	18.7	16.1	16.4	21.6	23.5	48.6	48.7		
Ortho Phosphate as P					<0.50	<0.5	<0.2	<0.2	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.20	<0.50	<0.50	<0.20	<0.20	<0.50	<0.50		
Reactive Silica					6.86	9.45	5.52	5.43	6.36	5.82	7.00	7.08	6.57	6.44	4.18	2.31	2.34	3.13	3.29	4.10	4.05		
Ammonia as N		<0.01	<0.01	<0.01	<0.02	0.05	<0.02	0.14	0.035	<0.02	0.2	0.061	0.228	1.77	0.75	1.12	1.1	<0.02	<0.02	0.43	0.33	<0.01	<0.01
Ammonia-Un-ionized (calculated)	0.02	0.001	0.001	0.001	0.001	0.002	<0.001	0.002	0.001	<0.001	0.002	0.001	0.003	0.025	0.011	0.017	0.016	<0.001	<0.001	0.017	0.013		<0.001
Total Phosphorus	0.03	0.02	0.03	0.02	0.02	0.05	0.03	0.03	0.01	0.02	0.02	0.02	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.03	0.03	0.02
Total Organic Carbon					4.7	5.5	7.1	7	6.1	6.2	5.0	5.0	4.0	4.1	4.5	5.3	5.2	5.9	6.5	6.5	6.5		
Colour (TCU)					19	19	30	32	23	23	15.0	15.0	13.0	13.0	17.0	20.0	21.0	23	25	29	24		
Turbidity (NTU)		2.3	2.1	4.8	0.8	4.3	5.6	5.2	2.3	2.3	0.8	0.8	1.0	1.1	2.6	1.4	1.7	1.2	1.4	1.3	1.5		
Calcium					80.2	84.5	74	73.4	86.2	86.3	90.8	89.8	89.4	89.4	76.5	74.7	77.4	75.7	75.9	73.5	73.1		
Magnesium					23.1	26.2	15.7	15.9	17.6	17.7	20.6	20.3	19.9	19.9	15.7	15.8	16.3	17.5	17.8	22.6	22.7		
Sodium					84.9	135	32	33.1	35.1	35	40.3	41.1	50.6	50.2	23.8	25	25.1	32.2	35.7	74.3	75.7		
Potassium					6.43	9.68	3.25	3.3	2.19	2.19	2.65	2.66	2.53	2.55	1.79	2.03	2.11	2.12	2.37	5.26	5.25		
Aluminum (dissolved)	0.075				0.005	0.0373	0.0083	0.008	<0.004	<0.004	0.0068	0.0067	<0.004	0.0042	<0.004	0.006	0.007	0.021	0.061	<0.004	<0.004		
Antimony	0.020				<0.003	0.0032	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003		
Arsenic	0.1				<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003		
Barium					0.036	0.0474	0.0212	0.024	0.0237	0.0205	0.0258	0.0258	0.0292	0.0294	0.025	0.021	0.022	0.026	0.028	0.031	0.029		
Beryllium	0.011				<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Boron	0.20				0.067	0.11	0.018	0.019	0.013	0.012	0.022	0.021	0.021	0.022	0.017	0.015	0.015	0.015	0.017	0.050	0.050		
Cadmium	0.0002				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Chromium					<0.003	<0.003	0.0033	0.0033	0.0032	<0.003	<0.003	<0.003	0.0041	0.0039	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003		
Cobalt	0.0009				<0.0005	0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
Copper	0.005				<0.002	0.0035	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
Iron	0.3				0.02	0.074	0.13	0.15	0.034	0.032	0.034	0.032	0.058	0.054	0.04	0.02	0.03	0.05	0.11	0.06	0.05		
Lead	0.005				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Manganese					0.006	0.0096	0.0158	0.0179	0.0125	0.0115	0.0164	0.0162	0.0228	0.023	0.014	0.025	0.024	0.019	0.032	0.028	0.027		
Dissolved Mercury	0.0002				<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Molybdenum	0.04				0.005	0.0152	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.005	0.005		
Nickel	0.025				0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003		
Selenium	0.1				<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004		
Silver	0.0001				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Strontium					0.191	0.205	0.1	0.114	0.12	0.109	0.135	0.132	0.135	0.134	0.117	0.116	0.116	0.131	0.139	0.165	0.163		
Thallium	0.0003				<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003		
Tin					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
Titanium					<0.002	0.0025	0.0073	0.0074	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002		
Tungsten	0.03				<0.010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		
Uranium	0.005				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
Vanadium	0.006				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
Zinc	0.02				0.013	0.03	<0.005	<0.005	<0.005	<0.005	0.01	0.01	0.01	0.01	<0.005	<0.005	<0.005	0.006	0.008	0.013	0.013		
Zirconium	0.004				<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004		
Cation Sum (meq/L)					9.76	12.5	6.46	6.51	7.34	7.34	8.06	8.01	8.38	8.48	6.25	6.25	6.43	6.67	6.87	8.92	8.96		
Anion Sum (meq/L)					9.52	13.1	6.45	6.48	7.6	7.55	7.94	7.92	8.79	8.55	6.55	6.4	6.4	7.41	7.75	9.70	9.68		
% Difference/ Ion Balance (%)					1.26	2.5	0.1	0.2	1.8	1.4	0.8	0.6	2.3	0.4	2.39	1.2	0.3	5.26	6.07	4.19	3.83		

Concentration Exceeds PWQOs
3: NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth;

Parameter [1]	Stream Location	County Rd. 124		North Branch Boyne River at County Rd.124				Besley Drain at County Rd.124 (North crossing)				Besley Drain U/S of WWTP			Besley Drain at County Rd.11	Besley Drain at County Rd.124 (South crossing)			Besley Drain at County Rd.124 (North crossing)			Main Boyne River at 3	
	WSP																						
	Genivar											3	3	3	4	5	5	5	6	6	6	9	9
	Town of Shelburne	SW1A	SW1A	SW1B	SW1B	SW1B	SW1B	SW2	SW2	SW2	SW2												
	PWQOs [2]	20-Jul-11	14-Sep-11	20-May-11	20-Jun-11	20-Jul-11	14-Sep-11	20-May-11	20-Jun-11	20-Jul-11	14-Sep-11	5-Jul-12	24-Jul-12	23-Aug-12	5-Jul-12	5-Jul-12	24-Jul-12	23-Aug-12	5-Jul-12	24-Jul-12	23-Aug-12	5-Jul-12	24-Jul-12
FIELD PARAMETERS																							
pH		8.27	8.05	8.11	7.76	8.29	8.12	8.06	7.67	8.13	7.94	8.06	7.97	8.09	8.01	8.13	7.98	8.03	8.27	8.12	8.19	8.29	8.37
Conductivity (uS/cm)																							
Temperature (degrees C)		23.4	14.3		22.8	26.5	16.2		18.5	23.3	17.0	18.3	21.9	18.1	18.2	21.9	21.9	20.0	22.1	22.3	19.0	24.7	24.8
Dissolved Oxygen												8.3	8.4	N.D.	2.4	8.1	7.4	N.D.	9.1	8.5	N.D.	8.9	4.4
MICROBIOLOGY																							
Escherichia coli (CFU/100mL)	**100**											**>400**	84	**>400**	10	**112**	**196**	**172**	**>400**	**294**	**160**	84	26
Total Coliforms (CFU/100mL)												>400	>200000	>4000	>400	>400	>200000	>4000	>400	>200000	>4000	>400	>200000
METALS & INORGANICS																							
BOD (5)		<3	<3		<3	<3	<3		<3	3	<3												
Total Suspended Solids		<3	<3	4	<3	<3	3	6	<3	3	6												
Total Kjeldahl Nitrogen		0.74	0.55	0.53	0.52	0.53	0.45	0.81	0.72	0.97	0.52	0.39	0.61	0.21	1.08	1	1.1	0.56	1.04	1.1	0.64	0.79	0.82
Dissolved Organic Carbon																							
Chromium VI	**0.005**																						
Electrical Conductivity (uS/cm)																							
pH (pH units)	**6.5-8.5**																						
Saturation pH																							
Langlier Index																							
Total Hardness (as CaCO3)																							
Total Dissolved Solids																							
Alkalinity (as CaCO3)																							
Bicarbonate (as CaCO3)																							
Carbonate (as CaCO3)																							
Hydroxide (as CaCO3)																							
Fluoride																							
Chloride		167	171	22.9	23.4	24.2	25.6	127	244	262	2550	194	180	199	608	220	241	239	221	251	243	88.2	105
Nitrate as N		5.5	8.7	0.9	0.9	0.2	0.1	6.0	15.6	8.4	15.8	2.4	2	2.5	0.1	14.3	20.2	10.5	13.7	24	11.7	0.6	0.2
Nitrite as N																							
Bromide																							
Sulphate																							
Ortho Phosphate as P																							
Reactive Silica																							
Ammonia as N		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	0.02	<0.01	<0.01	0.03	0.06	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.03
Ammonia-Un-ionized (calculated)	**0.02**	0.001	<0.001		<0.001	0.001	<0.001		<0.001	0.001	<0.001	<0.001	0.001	0.002		0.001	<0.001	<0.001	0.001	0.001	0.001	0.003	0.003
Total Phosphorus	**0.03**	**0.03**	0.02	0.02	0.01	0.02	0.01	**0.04**	**0.03**	**0.06**	**0.04**	0.02	**0.05**	0.01	**0.08**	**0.06**	**0.06**	**0.03**	**0.19**	**0.07**	**0.04**	0.02	**0.03**
Total Organic Carbon																							
Colour (TCU)																							
Turbidity (NTU)												3.2	5.5	2.4	17.2	2.7	2.9	2.1	53.8	4.6	2.5	3.1	2.3
Calcium																							
Magnesium																							
Sodium																							
Potassium																							
Aluminum (dissolved)	**0.075**																						
Antimony	**0.020**																						
Arsenic	**0.1**																						
Barium																							
Beryllium	**0.011**																						
Boron	**0.20**																						
Cadmium	**0.0002**																						
Chromium																							
Cobalt	**0.0009**																						
Copper	**0.005**																						
Iron	**0.3**																						
Lead	**0.005**																						
Manganese																							
Dissolved Mercury	**0.0002**																						
Molybdenum	**0.04**																						
Nickel	**0.025**																						
Selenium	**0.1**																						
Silver	**0.0001**																						
Strontium																							
Thallium	**0.0003**																						
Tin																							
Titanium																							
Tungsten	**0.03**																						
Uranium	**0.005**																						
Vanadium	**0.006**																						
Zinc	**0.02**																						
Zirconium	**0.004**																						
Cation Sum (meq/L)																							
Anion Sum (meq/L)																							
% Difference/ Ion Balance (%)																							

Concentration Exceeds PWQOs
3: NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth;

Parameter [1]	Stream Location	rd Line	Boyne River at County Rd.124			North Branch Boyne River at County Rd.124	Unnamed North Tributary at 5th Sideroad
	WSP						
	Genivar	9	13	13	13	15	16
	Town of Shelburne						
	PWQOs [2]	23-Aug-12	5-Jul-12	24-Jul-12	23-Aug-12	5-Jul-12	5-Jul-12
FIELD PARAMETERS							
pH		8.27	8.36	8.32	8.37	8.28	8.11
Conductivity (uS/cm)							
Temperature (degrees C)		21.8	21.7	23.1	18.8	21.4	22.6
Dissolved Oxygen		N.D.	11.5	9.6	N.D.	8.0	5.0
MICROBIOLOGY							
Escherichia coli (CFU/100mL)	**100**	42	**174**	**268**	64	**194**	**108**
Total Coliforms (CFU/100mL)		>4000	>400	>200000	>4000	>400	>400
METALS & INORGANICS							
BOD (5)							
Total Suspended Solids							
Total Kjeldahl Nitrogen		0.73	0.73	0.96	0.55	0.63	0.97
Dissolved Organic Carbon							
Chromium VI	**0.005**						
Electrical Conductivity (uS/cm)							
pH (pH units)	**6.5-8.5**						
Saturation pH							
Langlier Index							
Total Hardness (as CaCO3)							
Total Dissolved Solids							
Alkalinity (as CaCO3)							
Bicarbonate (as CaCO3)							
Carbonate (as CaCO3)							
Hydroxide (as CaCO3)							
Fluoride							
Chloride		96.1	140	167	167	26.4	14
Nitrate as N		0.5	8.5	10.6	7.7	0.2	0.1
Nitrite as N							
Bromide							
Sulphate							
Ortho Phosphate as P							
Reactive Silica							
Ammonia as N		<0.01	<0.01	<0.01	<0.01	<0.01	0.07
Ammonia-Un-ionized (calculated)	**0.02**	0.001	0.001	0.001	0.001	0.001	0.004
Total Phosphorus	**0.03**	**0.03**	**0.03**	**0.06**	0.02	0.01	**0.03**
Total Organic Carbon							
Colour (TCU)							
Turbidity (NTU)		2.7	3.2	5.4	1.9	2.9	5.6
Calcium							
Magnesium							
Sodium							
Potassium							
Aluminum (dissolved)	**0.075**						
Antimony	**0.020**						
Arsenic	**0.1**						
Barium							
Beryllium	**0.011**						
Boron	**0.20**						
Cadmium	**0.0002**						
Chromium							
Cobalt	**0.0009**						
Copper	**0.005**						
Iron	**0.3**						
Lead	**0.005**						
Manganese							
Dissolved Mercury	**0.0002**						
Molybdenum	**0.04**						
Nickel	**0.025**						
Selenium	**0.1**						
Silver	**0.0001**						
Strontium							
Thallium	**0.0003**						
Tin							
Titanium							
Tungsten	**0.03**						
Uranium	**0.005**						
Vanadium	**0.006**						
Zinc	**0.02**						
Zirconium	**0.004**						
Cation Sum (meq/L)							
Anion Sum (meq/L)							
% Difference/ Ion Balance (%)							

S. BURNETT & ASSOCIATES LIMITED
ENGINEERING & ENVIRONMENTAL

Appendix E

S. Burnett and Associates Revised Assimilative Capacity Technical Memorandum, March 2020

**Ministry of the Environment,
Conservation and Parks
Drinking Water and Environmental
Compliance Division
West Central Region**

**119 King Street West, 12th Floor
Hamilton, Ontario L8P 4Y7
Tel.: 905 521-7607
Fax: 905 521-7820**

**Ministère de l'Environnement de la
Protection de la nature et des Parcs
Division de la conformité en matière
d'eau potable et d'environnement
Direction régionale du Centre-Ouest**

**119 rue King Ouest, 12e étage
Hamilton (Ontario) L8P 4Y7
Tél.: 905 521-7607
Téléc.: 905 521-7820**

July 16, 2019

MEMORANDUM

TO: Stephen Burnett P.Eng
S. Burnett & Associates Limited

FROM: Barbara Slattery
Environmental Assessment and Planning Coordinator

RE: Shelburne WPCP Assimilative Capacity Study Review (August 15, 2016 Report)

As requested, the 2016 report has been reviewed. This report was a revision of the earlier report of February 6, 2016 which had been reviewed by ministry staff and identified several shortcomings as to the 7Q20 analysis, background water quality assessment, assimilative capacity assessment, effluent criteria determination and the implication of groundwater water takings on the assimilative capacity of the receiving stream. The revised report attempted to address those shortcomings with additional data and supporting analysis but still the report has some deficiencies. The results of our review of the revised report are summarized below with a recommendation to resubmit once the following points have been addressed:

(1) Field data collected up to now appear to be adequate, no additional field data will be required, except dissolved oxygen of the receiving water as described in item #5 below.

(2) 7Q20 analysis, background water quality assessment and policy designation of the receiving water are satisfactory.

(3) At 7Q20 low flow condition, 82% of the river flow would be comprised of effluent discharged from the WPCP at the confluence of Besley Drain where assimilative capacity of the river is very limited. This location is the headwaters of the Boyne River where cool and coldwater fisheries exist. To protect these fisheries, their habitats, spawning and rearing grounds an excellent quality effluent will be required, otherwise discharge should be routed further downstream via a pipe where the river has greater potential to assimilate waste loads.

(4) The proposed effluent criteria for TSS and E.coli as presented in Table 6-1 of the report are acceptable.

(5) $cBOD_5$ criterion as proposed is not supported by the analysis. A supporting analysis is required to understand the effects of the BOD loads on dissolved oxygen of the receiving water. It is recommended to consider oxygen demands of the aquatic plants and sediments in addition to wastewater oxygen demand to predict oxygen deficit in the river. A cursory level analysis indicates dissolved oxygen in the river would deplete below aquatic protection guidelines for a long distance before it returns to normal.

As part of the analysis, please consider a $cBOD_5$ concentration of 2.5 mg/L as a representative 75^{th} percentile background concentration of the receiving water. The lab detection limit of $cBOD_5$ analysis was 5 mg/L, which prohibits us from knowing the true BOD concentrations in the Boyne River if they are below 5 mg/L. All lab results were reported as <5 mg/L. Under this circumstance, it is recommended to use half (2.5 mg/L) of the detection limit as a representative $cBOD_5$ concentration of the receiving water.

It was further noted that a limited amount of DO data was available to calculate a representative DO concentration of the receiving water. To overcome this data gap, a worst-case scenario can be considered, or additional data could be collected in the field including diurnal variation of DO, and a 25^{th} percentile concentration can be calculated and used as a background value for further analysis. Please note for establishing a background representative value of dissolved oxygen, a 25^{th} concentration is used unlike the 75^{th} concentration used for other parameters.

(6) Nitrate appears to be a parameter of concern in the discharge, and an effluent criterion will be required for this parameter to protect aquatic life. Background 75^{th} percentile concentration of nitrate-nitrogen in the Boyne River is 3.4 mg/L, which is slightly higher than the long-term aquatic life protection value of 3 mg/L. The Boyne River is a Policy 2 receiver in terms of nitrate, all necessary measures will be required not to degrade water quality further for this parameter. The 75^{th} percentile concentration of nitrate-nitrogen in Besley Drain upstream of the confluence was 16.3 mg/L, and downstream of the confluence in the Boyne River was 8.1 mg/L. Two kilometres downstream at M-M Townline that concentration was 5.1 mg/L. This data suggests that the WPCP discharge is negatively impacting nitrate-nitrogen concentration in the river and would cause further degradation as a result of the proposed increased discharge rate from 3,420 m^3/day to 4,400 m^3/day. To protect aquatic life nitrate-nitrogen shall be regulated in the discharge, and effluent criteria for this parameter should be developed considering the assimilative capacity of the river.

(7) The proposed effluent criteria for total NH_3-N was not supported by an assimilative capacity assessment of the receiving water. A typical mixing zone analysis using CORMIX will not be required here as more than 80% of the river flow is treated effluent discharged via the 2-km long Besley Drain. Instead, it would be more appropriate to undertake a 1-D water quality analysis coupled with hydrodynamic model to predict concentration distribution of NH_3-N along the river length and to find a distance where water quality returns to the background level (i.e., using QUAL2K or HEC-RAS or any other tool appropriate for this analysis).

(8) Please note, there was an error in understanding PWQO of unionized NH_3 versus PWQO of unionized NH_3-N. The PWQO for unionized NH_3 is 20 ug/L and for unionized NH_3-N that value should be 16.5 ug/L. Molecular weight of one molecule of NH_3 is 17g, and the molecular weight of one molecule of nitrogen is 14g, therefore the molecular weight of one molecule of

NH-N would be (14/17)* 20 = 16.5 ug/L. Please note all lab results of nitrogen analysis presented in the appendices of the report were reported as NH_3-N, NO_3-N, etc. Please apply this correction for all NH_3-N calculations. Accordingly, the 75th percentile background concentration of unionized NH-N in the Boyne River should be 7.74 ug/L instead of 9.4 ug/L considered in the analysis.

(9) The proposed total phosphorus (TP) effluent criterion was not supported by detaiedl analysis of the receiving water. A simple mass balance analysis indicated, fully mixed concentration of TP in the receiving water exceeded PWQO by almost 3 times. The river has very limited dilution potential and it is therefore important to know concentration distribution of TP along the river length and the distance downstream where it returns to background. Please undertake a similar analysis for TP as recommended for ammonia considering all influencing factors.

(10) Effluent criteria for pH as an objective should be between 6.5 to 8.5 and limit should be between 6 to 9.

(11) Please discuss impact of groundwater takings on the assimilative capacity of the receiving water (refer to item #9 of Michael Spencer's memo of May 30, 2016).

(12) As part of the discussion in s.3.2 of the report, it was mentioned that the Ministry required a minimum dilution ratio of 20:1 for near field. Please note, this dilution ratio is applicable for discharges to the Great Lakes but not here.

Should you require any clarification of or wish to discuss any of these comments and recommendations, it will be more expeditious to contact Mohammad Sajjad Khan directly either by calling Sajjad at (905) 521-7607 or by email. At Mohammad.khan@ontario.ca

With regards,



Barbara Slattery
EA/Planning Coordinator

Ministry of the Environment and Climate Change
West Central Region

119 King Street West
12th Floor
Hamilton, Ontario L8P 4Y7
Tel.: 905 521-7640
Fax: 905 521-7820

Ministère de l'Environnement et de l'Action en matière de changement climatique
Direction regionale du Centre-Quest

119 rue King Quest
12e étage
Hamilton (Ontario) L8P 4Y7
Tél. : 905 521-7640
Téléc. : 905 521-7820

Ontario

June 2, 2016

Ms Michelle Albert, P.Eng.
WSP Canada Inc.
600 Cochrane Drive, 5th Floor
Markham, Ontario L3R 5K3 Canada

RE: Town of Shelburne Water Pollution Control Plant
Assimilative Capacity Study
ECA No. 9972-7FYJUB
Boyne River, County of Dufferin

We have completed our review of the *Shelburne Water Pollution Control Plant – Assimilative Capacity Study Review, Technical Memorandum, WSP, February 8, 2016* and offer the following comments for your consideration and action.

Boyne River Receiver Water Quantity

Section 2.1 Boyne River Flow Data in the Technical Memorandum did not determine the receiver 7Q20 low flows in the Boyne River upstream of the Besley Drain confluence as outlined in the Ministry document "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters" and the additional guidance provided in the December 10, 2012 Ministry review memorandum (which we assume you have access to).

For continuous effluent discharges, monthly 7Q20 low flows are typically determined as the basic design flows in the receiver to complete the assimilative capacity assessment and develop effluent requirements. Previous historical assimilative capacity assessments had prorated flows using the Water Survey of Canada gauging station in the Boyne River at Earl Rowe Park (Station No. 02ED102) minus the WPCP effluent flows. As well, streamflow measurements collected upstream of the confluence could also be used to further refine the correlation between the location upstream of the confluence and the Water Survey of Canada station. The *Technical Memorandum* did not determine the monthly 7Q20 low flows at the Water Survey of Canada station did not determine prorated monthly 7Q20 low flows upstream of the confluence location (Station No. 3) and did not use the collected steamflow measurements from August 2014 to September 2015 upstream of the confluence location (Station No.3) to further refine the correlation.

Boyne River Receiver Background Water Quality

The receiver background water quality of the Boyne River just upstream of the confluence of the Besley Drain was not appropriately determined as outlined in the Ministry document "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters" and the additional guidance provided in the December 10, 2012 Ministry review memo. Normally the 75th percentile of surface water quality data is used to determine background water quality for the contaminants of concern. Typical contaminants of concern include total suspended solids, BOD, total phosphorus, total ammonia nitrogen, field pH, field temperature, un-ionized ammonia (calculated with field pH and field temperature), nitrate and the associated water quality indicator dissolved oxygen. There is no Provincial Water Quality Objective for nitrate, however, Environment Canada's Canadian Water Quality Guideline for nitrate can be used.

The December 10, 2012 Ministry review memorandum provided further guidance that a surface water quality sampling station dataset requires a minimum of 5 samples. However, 16 samples or more were preferred since the Ministry generally accepts the 75th percentile for background water quality determination. The Technical Memorandum identified that the worst case water quality condition was used since the dataset was not statistically significant which is generally acceptable. However, the receiver background water quality was not appropriately determined as follows:

(a) The receiver background water quality location ideally should be on the Boyne River just upstream of the confluence of Besley Drain, but just downstream of the confluence of Walters Creek. Based on Figure 2-2, there was no receiver background water quality location sampled in the summer of 2011. Based on Figure 2-4, Station No. 3 (u/s of Besley Drain confluence with combined flows of Walter Creek and Boyne River) is the receiver background water quality location.

    It is not clear whether an ideal receiver background water quality location was sampled during the summer of 2012. Figure 2-3 shows Station No. 2 (main Boyne at confluence) just upstream of the confluence of Besley Drain. However, the same location in Figure 1 in the November 2012 Genivar Assimilative Capacity Study (seems to be identified as Station No. 10 main Boyne at confluence) is shown as upstream of the Walters Creek confluence. This discrepancy should be clarified.

(b) There was no receiver background water quality discussion or assessment for total suspended solids, BOD, total ammonia, un-ionized ammonia, nitrate, pH and temperature. As well, water quality data listed in Tables 2-3 (summer 2012) and 2-4 (fall 2015) did not include total suspended solids (2015), BOD (2015), total ammonia, un-ionized ammonia, nitrate, field pH (lab pH was listed) and dissolved oxygen.

(c) The Technical Memorandum did not determine the background water quality Policy status for un-ionized ammonia.

(d) Appendix F did not contain the November 11, 2015 water quality sampling results.

(e) In Appendix F, there are no field parameters (pH, conductivity, temperature, dissolved oxygen) listed for the October 7, 2015 sampling at Station No. 3.

(f) In Appendix F, the 2015 water quality results for total suspended solids and BOD results were all less than the method detection limits. However, the method detection limits were too high to appropriately evaluate the results. The method detection limit for total suspended solids was listed as 10 mg/L which was higher than the ECA effluent objective (4 mg/L) and limit (5 mg/L). The method detection limit for BOD was listed as 5 mg/L which was higher than the ECA effluent objective (4 mg/L) and the same as the effluent limit. For comparison purposes, the Ministry's standard surface water quality method detection limit for total suspended solids is 2.5 mg/L and for BOD is 1 mg/L. As a further comparison, the Municipal Industrial Strategy for Abatement (MISA) method detection limit for total suspended solids is 3 mg/L and for BOD is 2 mg/L.

(g) Based on the Technical Memorandum, the summer of 2012 (assuming Station No. 2 is an ideal background location) and the fall of 2015 (assuming the missing November 11, 2015 results are available) provided the following dataset:

Parameter	2012 Stn. No. 2 Results	2015 Stn. No. 3 Results
pH (field)	3	2
Temperature (field)	3	2
Dissolved oxygen	3	2
Total suspended solids	0	0 since mdl too high
BOD	0	0 since mdl too high
Total phosphorus	3	3
Nitrate	3	3
Total ammonia nitrogen	3	3
Un-ionized ammonia	3	3

Overall, the water quality dataset is not sufficient to determine receiver background water quality.

(h) Based on our files, during a June 20, 2014 meeting between the Town, WSP and the Ministry, there appears to have been an action item to submit a detailed sampling work plan to the Ministry following the meeting. As well, a Sampling Program presentation during the meeting identified that monthly water quality sampling would be completed for one complete year (July 2014 to July 2015). A detailed workplan was not submitted to the Ministry for review and an additional one year of sampling to augment existing data was not completed. As well, it is our recollection that the Ministry offered to assist in the collection and analysis of surface water quality samples to provide a larger

dataset for the assessment. However, the Ministry was not contacted to coordinate any additional sampling.

Assimilative Capacity Assessment

In Section 2.3 Analysis of TP Assimilative Capacity of the Boyne River, the total phosphorus discussion is an existing receiver impact assessment not an assimilative capacity for the proposed expansion. A simple assimilative capacity assessment would determine and assess the resultant total phosphorus concentrations with a mixing zone mass balance calculation based on monthly receiver 7Q20 low flows, receiver background water quality, proposed effluent flow rate and proposed effluent criteria (objective and limit). The assimilative capacity assessment would also determine whether the resultant total phosphorus concentrations meet the Ministry's surface water quality Policy 2 requirements. More complex assimilative capacity assessments involve modelling.

Finally, the Technical Memorandum did not assess the following:

a) the assimilative capacity of the receiver for total suspended solids, BOD, pH and nitrate as outlined in the Ministry document "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters".

b) the assimilative capacity of the receiver for un-ionized ammonia and whether the resultant ammonia concentrations and loadings would meet the Ministry's surface water quality Policy requirements as outlined in the Ministry document "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters".

c) the dissolved oxygen/BOD relationship.

d) the diurnal oxygen cycle. The December 10, 2012 Ministry review memorandum identified that the discussion of dissolved oxygen needed to be expanded.

Proposed Effluent Criteria

In Section 4 Proposed New Effluent Criteria for the Expanded Plant, the Technical Memorandum did not propose and assess effluent objectives for design conformance and effluent limits (concentrations and loadings) to demonstrate compliance for total suspended solids, BOD and total ammonia nitrogen as outlined in the Ministry document "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters".

Well Field Capacity Assessment

It should be noted that the Ministry recently accepted the Town's "Terms of Reference for Well Field Capacity Assessment and Proposed Groundwater and Surface Water Monitoring Plan" (Banks/Burnett, May 2016) under Permit to Take Water No. 5632-A4JLLD subject to

changes/additions as provided in a May 16, 2016 letter from Belinda Koblik, Director Section 34, *Ontario Water Resources Act*. The well field capacity assessment incorporates monitoring watercourses for any impacts on streamflows that may effect the assimilative capacity of the receiver.

In order to move this project forward, we are willing to meet with you to further explain the requirements and expectations for conducting an assimilative capacity assessment that demonstrates the feasibility of an expansion of this facility. If you have minor questions or points of clarification, please contact Michael Spencer, the Hydrologist responsible for this file directly either at Michael.spencer@ontario.ca or by calling (905) 521-7734.

Yours truly,



Barbara Slattery
EA/Planning Coordinator

cc Wendy Wingate, GDO (Via Email only)

Ministry of the Environment and Climate Change
West Central Region

119 King Street West
12th Floor
Hamilton, Ontario L8P 4Y7
Tel.: 905 521-7640
Fax: 905 521-7820

Ministère de l'Environnement et de l'Action en matière de changement climatique
Direction régionale du Centre-Ouest

119 rue King Ouest
12e étage
Hamilton (Ontario) L8P 4Y7
Tél. : 905 521-7640
Téléc. : 905 521-7820

Ontario

May 30, 2016

MEMORANDUM

To: Barbara Slattery
Environmental Planner and Environmental Assessment Coordinator
Technical Support Section

From: Michael Spencer
Hydrologist
Technical Support Section

RE: Town of Shelburne Water Pollution Control Plant
Assimilative Capacity Study
ECA No. 9972-7FYJUB
Boyne River, County of Dufferin

As requested, I have reviewed the following document for surface water issues:

> Shelburne Water Pollution Control Plant – Assimilative Capacity Study Review, Technical Memorandum, WSP, February 8, 2016.

Background

The Town of Shelburne Water Pollution Control Plant (WPCP) currently operates under ECA No. 9972-7FYJUB issued on August 12, 2008 with a rated capacity of 3420 m^3/day. The Town has proposed an expansion to an average daily flow of 4400 m^3/day.

The Shelburne WPCP discharges to Besley Drain which is considered a dry ditch receiver (watercourses that go dry seasonally). The Besley Drain flows into the Boyne River which is considered the continuously flowing secondary receiver for the assimilative capacity assessment.

The Technical Memorandum (WSP, Feb. 8, 2016) identified that the objective was to update the December 13, 2013 Draft Technical Memorandum for the Assimilative Capacity Study Review of Shelburne WPCP (WSP) in which the Ministry requested additional data collection and analysis.

The Ministry previously provided written comments in a December 10, 2012 review memorandum from Paul Odom, Surface Water Group leader for the document "Town of Shelburne Wastewater Treatment Plant, Draft Assimilative Capacity Study, Genivar Inc., November 2012".

Comments

Based on my review of the Technical Memorandum (WSP, Feb. 8, 2016), I have the following comments:

Boyne River Receiver Water Quantity

1. Section 2.1 Boyne River Flow Data in the Technical Memorandum did not determine the receiver 7Q20 low flows in the Boyne River upstream of the Besley Drain confluence as outlined in the Ministry document "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters" and the additional guidance provided in the December 10, 2012 Ministry review memorandum. For continuous effluent discharges, monthly 7Q20 low flows are typically determined as the basic design flows in the receiver to complete the assimilative capacity assessment and develop effluent requirements. Previous historical assimilative capacity assessments had prorated flows using the Water Survey of Canada gauging station in the Boyne River at Earl Rowe Park (Station No. 02ED102) minus the WPCP effluent flows. As well, streamflow measurements collected upstream of the confluence could also be used to further refine the correlation between the location upstream of the confluence and the Water Survey of Canada station. The Technical Memorandum did not determine the monthly 7Q20 low flows at the Water Survey of Canada station, did not determine prorated monthly 7Q20 lows flows upstream of the confluence location (Station No. 3) and did not use the collected steamflow measurements from August 2014 to September 2015 upstream of the confluence location (Station No.3) to further refine the correlation.

Boyne River Receiver Background Water Quality

2. The receiver background water quality of the Boyne River just upstream of the confluence of the Besley Drain was not appropriately determined as outlined in the Ministry document "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters" and the additional guidance provided in the December 10, 2012 Ministry review memo. Normally the 75th percentile of surface water quality data is used to determine background water quality for the contaminants of concern. Typical contaminants of concern include total suspended solids, BOD, total phosphorus, total ammonia nitrogen, field pH, field temperature, un-ionized ammonia (calculated with field pH and field temperature), nitrate and the associated water quality indicator dissolved oxygen. There is no Provincial Water Quality Objective for nitrate, however, Environment Canada's Canadian Water Quality Guideline for nitrate can be used.

   The December 10, 2012 Ministry review memorandum provided further guidance that a surface water quality sampling station dataset requires a minimum of 5 samples. However, 16 samples or more were preferred since the Ministry generally accepts the 75th percentile for background water quality determination. The Technical Memorandum identified that the worst case water quality condition was used since the dataset was not

statistically significant which is generally acceptable. However, the receiver background water quality was not appropriately determined as follows:

(a) The receiver background water quality location ideally should be on the Boyne River just upstream of the confluence of Besley Drain, but just downstream of the confluence of Walters Creek. Based on Figure 2-2, there was no receiver background water quality location sampled in the summer of 2011. Based on Figure 2-4, Station No. 3 (u/s of Besley Drain confluence with combined flows of Walter Creek and Boyne River) is the receiver background water quality location.

It is not clear whether an ideal receiver background water quality location was sampled during the summer of 2012. Figure 2-3 shows Station No. 2 (main Boyne at confluence) just upstream of the confluence of Besley Drain. However, the same location in Figure 1 in the November 2012 Genivar Assimilative Capacity Study (seems to be identified as Station No. 10 main Boyne at confluence) is shown as upstream of the Walters Creek confluence. This discrepancy should be clarified.

(b) There was no receiver background water quality discussion or assessment for total suspended solids, BOD, total ammonia, un-ionized ammonia, nitrate, pH and temperature. As well, water quality data listed in Tables 2-3 (summer 2012) and 2-4 (fall 2015) did not include total suspended solids (2015), BOD (2015), total ammonia, un-ionized ammonia, nitrate, field pH (lab pH was listed) and dissolved oxygen.

(c) The Technical Memorandum did not determine the background water quality Policy status for un-ionized ammonia.

(d) Appendix F did not contain the November 11, 2015 water quality sampling results.

(e) In Appendix F, there are no field parameters (pH, conductivity, temperature, dissolved oxygen) listed for the October 7, 2015 sampling at Station No. 3.

(f) In Appendix F, the 2015 water quality results for total suspended solids and BOD results were all less than the method detection limits, however, the method detection limits were too high to appropriately evaluate the results. The method detection limit for total suspended solids was listed as 10 mg/L which was higher than the ECA effluent objective (4 mg/L) and limit (5 mg/L). The method detection limit for BOD was listed as 5 mg/L which was higher than the ECA effluent objective (4 mg/L) and the same as the effluent limit. For comparison purposes, the Ministry's standard surface water quality method detection limit for total suspended solids is 2.5 mg/L and for BOD is 1 mg/L. As a further comparison, the Municipal Industrial Strategy for Abatement (MISA) method detection limit for total suspended solids is 3 mg/L and for BOD is 2 mg/L.

(g) Based on the Technical Memorandum, the summer of 2012 (assuming Station No. 2 is an ideal background location) and the fall of 2015 (assuming the missing November 11, 2015 results are available) provided the following dataset:

Parameter	2012 Stn No. 2 Results	2015 Stn No. 3 Results
pH (field)	3	2
Temperature (field)	3	2
Dissolved oxygen	3	2
Total suspended solids	0	0 since mdl too high
BOD	0	0 since mdl too high
Total phosphorus	3	3
Nitrate	3	3
Total ammonia nitrogen	3	3
Un-ionized ammonia	3	3

Overall, the water quality dataset is not sufficient to determine receiver background water quality.

(h) Based on our files, during a June 20, 2014 meeting between the Town, WSP and the Ministry, it is my understanding that there was an action item to submit a detailed sampling work plan to the Ministry following the meeting. As well, a Samping Program presentation during the meeting identified that monthly water quality sampling would be completed for one complete year (July 2014 to July 2015). A detailed workplan was not submitted to the Ministry for review and an additional one year of sampling was not completed. As well, it is my understanding that the Ministry offered to assist in the collection and analysis of surface water quality samples to provide a larger dataset for the assessment. However, the Ministry was not contacted to coordinate additional sampling.

Assimilative Capacity Assessment

3. In Section 2.3 Analysis of TP Assimilative Capacity of the Boyne River, the total phosphorus discussion is an existing receiver impact assessment not an assimilative capacity for the proposed expansion. A simple assimilative capacity assessment would determine and assess the resultant total phosphorus concentrations with a mixing zone mass balance calculation based on monthly receiver 7Q20 low flows, receiver background water quality, proposed effluent flow rate and proposed effluent criteria (objective and limit). The assimilative capacity assessment would also determine whether the resultant total phosphorus concentrations meet the Ministry's surface water quality Policy 2 requirements. More complex assimilative capacity assessments involve modelling.

4. The Technical Memorandum did not assess the assimilative capacity of the receiver for total suspended solids, BOD, pH and nitrate as outlined in the Ministry document "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters".

5. The Technical Memorandum did not assess the assimilative capacity of the receiver for un-ionized ammonia and whether the resultant ammonia concentrations and loadings would meet the Ministry's surface water quality Policy requirements as outlined in the

Ministry document "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters".

6. The Technical Memorandum did not assess the dissolved oxygen/BOD relationship.

7. The Technical Memorandum did not assess the diurnal oxygen cycle. The December 10, 2012 Ministry review memorandum identified that the discussion of dissolved oxygen needed to be expanded.

Proposed Effluent Criteria

8. In Section 4 Proposed New Effluent Criteria for the Expanded Plant, the Technical Memorandum did not propose and assess effluent objectives for design conformance and effluent limits (concentrations and loadings) for compliance for total suspended solids, BOD and total ammonia nitrogen as outlined in the Ministry document "Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters".

Well Field Capacity Assessment

9. It should be noted that the Ministry recently accepted the Town's "Terms of Reference for Well Field Capacity Assessment and Proposed Groundwater and Surface Water Monitoring Plan" (Banks/Burnett, May 2016) under Permit to Take Water No. 5632-A4JLLD subject to changes/additions as provided in a May 16, 2016 letter from Belinda Koblik, Director Section 34, *Ontario Water Resources Act*. The well field capacity assessment incorporates monitoring watercourses for any impacts on streamflows that may effect the assimilative capacity of the receiver.

If you have any questions, please feel free to contact me.

Michael Spencer
Hydrologist
Technical Support Section

cc: B. Koblik, P. Odom, TSS

IDS Ref. No. 2547-A6YLKR, TSS No.
File H-04-BO-32-01

Limitations: The purpose of the preceding review is to provide advice to the Ministry of the Environment regarding surface water impacts based on a review of the information provided in the above referenced documents. The conclusions, opinions and recommendations of the reviewer are based on information provided by others, except where otherwise noted. The Ministry cannot guarantee that the information that is provided by others is accurate or complete. A lack of specific comment by the reviewer is not to be construed as endorsing the content or views expressed in the reviewed material.

S. BURNETT & ASSOCIATES LIMITED
ENGINEERING & ENVIRONMENTAL

TECHNICAL MEMORANDUM

Date:	March 23, 2020	**Project No:**	M16018
Project Name:	Town of Shelburne, Water Pollution Control Plant		
Re:	Assimilative Capacity Study Modelling and Comment Disposition		
To:	Barb Slattery	**Email:**	barbara.slattery@ontario.ca
Company:	Ministry of Environment, Conservation and Parks		
From:	Ian Callum, M.Sc., PMP, Senior Environmental Project Manager		
cc:	Stephen Burnett, P.Eng., Principal, S. Burnett & Associates Limited		

1. INTRODUCTION

The Town of Shelburne Water Pollution Control Plant (WPCP) is currently operating at close to capacity and to accommodate planned growth projections, needs to be expanded. On December 13, 2013, WSP submitted a Draft Technical Memorandum for the Assimilative Capacity Study Review of Shelburne WPCP, followed by the completion of a second submission dated August 15, 2016, which was not formally submitted to the Ministry of Environment, Conservation and Parks (MECP). The WSP August 15, 2016 submission was submitted by SBA for review in 2018 following a meeting between MECP, SBA and the Town of Shelburne. Comments on the 2016 report were provided by the MECP in a July 16, 2019 memorandum. To address MECP comments, S. Burnett & Associates Limited (SBA) undertook modelling of the Boyne River using the QUAL2K model with support from Hutchinson Environmental Sciences. A comment disposition table showing how each MECP comment from the July 16, 2019 memorandum was addressed is provided in Section 5 of this technical memorandum.

Since MECP comments were provided, population growth predictions for the Town of Shelburne have been revised, with a 2041 predicted population increasing from 13,000 to 15,100. To accommodate this growth, the capacity of the WPCP needs to increase to 5,100 m^3/day. Modeling and recommended effluent limits in this memorandum reflect the new WPCP capacity.

QUAL2K is a one-dimensional (1-D) river and stream water quality model, supported by the United States Environmental Protection Agency (US EPA), which is typically used to assess the environmental impact of pollution discharges along rivers. A wide range of water quality parameters and chemical and biological pollutants within the river can be modelled, including temperature, pH, dissolved oxygen (DO), carbonaceous biochemical oxygen demand (CBOD), nitrogen species, phosphorus species, and suspended solids.

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Since QUAL2K is a 1-D model, the model assumes that all point source inputs (such as the outfall from the WPCP) are instantaneously mixed laterally and vertically at each point in the river. Variation in each water quality parameter modeled occurs only longitudinally (in the x-direction along the length of the river) and is computed as water is transported out of each reach and into the next. The QUAL2K model is known as a far-field model since its water quality predictions apply beyond the point in which the effluent is fully mixed with the river, also known as the far-field. The QUAL2K model considers a large variety of water quality and physical parameters and processes and thus is both more complex and more precise regarding the fate of pollutants in the river.

The outfall for the Shelburne WPCP discharges to the Besley Drain, approximately 2 km prior to its confluence with the Boyne River at WSP Station #3. Under 7Q20 low flow conditions, 82% of the flow at WSP Station #3 is from the WPCP. Thus, for the purposes of modelling, it was conservatively assumed that no dilution occurs in the Besley Drain and it was modelled as a point source.

The nearest Environment Canada Water Survey of Canada monitoring location in the Boyne River is at Earl Rowe Park near Allison (WSC Station #02ED102). To make use of the water quality records from this location, it was selected as the modelling end point, resulting in a total model length of about 32.4 km that starts 10 m U/S of the confluence with the Besley Drain. Based on the terrain details, the modeled section of Boyne River was subdivided into 40 reaches.

2. QUAL2K CALIBRATION

Before modeling of the Boyne River using 7Q20 flow conditions, the QUAL2K model was calibrated using water quality monitoring data and known flow rates. Water quality data for incoming headwater (WSP Station #3 data) and Besley Drain (WSP Station #2) were used as inputs, while flow rates were calculated as a percentage of flow rates at WSC Station #02ED102, located 32.4 km downstream of the Besley Drain / Boyne River confluence.

Given that the desired model output are concentrations under 7Q20 flow conditions, which occurs in August, and considering that August data was limited, data from September 23, 2015 was used for model calibration.

Monitoring data from WSP Station #7, located 2 km downstream of the Besley Drain / Boyne River confluence was compared to model predictions to assess model performance during model calibration.

Considering that MECP review comments related to dissolved oxygen (DO), $cBOD_5$, total phosphorous (TP), ammonia (NH3-N), and nitrate (NO3-N) concentrations, these parameters were used for model calibration.

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The initial model run using QUAL2K default rates predicted the following parameter concentrations:

TABLE 1 - WATER QUALITY AT 2090 M D/S THE CONFLUENCE BEFORE CALIBRATION

Data		DO, mg/L	TP, mg/L	NO3-N, mg/L	NH3-N (UIA-N), mg/L	NH3-N + NH4-N, mg/L
Sep-23-2015	Actual	7.8	0.020	8.73	0.001	0.010
	Predicted	12.0	0.029	0.562	0.0068	0.0395

Based on table above, the following observations were made regarding the initial model run:

1. Predicted DO levels were slightly higher than actual levels;
2. Predicted NO3-N level were significantly lower than actual levels, indicating that model rates that influence nitrification required adjustment;
3. Predicted TP levels were slightly higher than actual levels, indicating that the phosphorous settling rate had to increased; and,
4. Predicted total ammonia levels were higher than actual levels. At the same time predicted total ammonia levels were lower than actual levels.

Considering the above observations, the following model inputs changes were made:

In the “Rates” section:

1. Maximum phytoplankton growth rate was changed to 5.0 day^{-1};
2. Organic N hydrolysis rate was changed from the default to 3 day^{-1};
3. Sedimentation denitrification transfer coefficient was set to zero; and,
4. Inorganic P settling rate is set as 0.12 day^{-1}.

In the “Reach rates” section:

1. The reaeration rate was changed from 0.2 day^{-1} to 0.8 day^{-1}. (The typical range is from 0.4 day^{-1} to 1.5 day^{-1} as per J. L. Schnoor “Environmental Modelling. Fate and Transport of Pollutants in Water, Air and Soil”.)

In the “Light and Heat” section:

1. The atmospheric turbidity coefficient was changed from 2=clear (default) to 3; and,
2. The atmospheric transmission coefficient was changed from 0.80 (default) to 0.70.

In the “Air Temperature” section:

1. Air temperatures were changed from monthly actual average temperature on September 23, 2015 (based on timeanddate.com/weather).

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In the "Shade" section:

1. Given that the Boyne River passes through a forested area, "Shade" was changed to 100%.

With the above changes, the model was re-run, resulting in the following predicted parameter concentrations.

TABLE 2 - WATER QUALITY AT 2 KM D/S THE CONFLUENCE AFTER CALIBRATION

Data		DO, mg/L	TP, mg/L	NO3-N, mg/L	NH3-N (UIA-N), mg/L	NH3-N + NH4-N, mg/L
Sep-23-2015	Actual	7.8	0.020	8.73	0.001	0.010
	Predicted	9.16000	0.01982	6.50549	0.00063	0.01158

Given the relatively good agreement between predicted and actual measured parameter concentrations, the model was considered calibrated.

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3. 7Q20 FLOW QUAL2K MODELLING

3.1. MODEL INPUTS

After calibrating the model, the model was run using actual 7Q20 flows. The main Boyne River input parameters for the QUAL2K modeling are summarized in Table 3. The average August 2015 air temperature for Shelburne, ON was used.

TABLE 3 - BOYNE RIVER MODEL INPUT PARAMETERS FOR QUAL2K FAR-FIELD ASSIMILATION MODELLING

Parameter	Unit	Value	Rationale
Headwater Flow	***m3/s***	**0.0110**	7Q20 U/S confluence of Boyne River & Besley Drain (WSP's Station #3 data)
Diffuse Inflow	***m3/s***	**0.2690**	Assumed as gradual increasing of Boyne River flow between the confluence and WSC Station #02ED102
Temperature	***°C***	**11.60**	WSP Station #3 data for August
Spec Conductivity	***umhos***	**0.64**	WSP Station #3 data for August
Dissolved Oxygen	***mg/L***	**7.47**	Calculated 25th percentile for Boyne River (see Appendix A for details)
CBOD fast	***mgO2/L***	**2.50**	75th percentile background concentration of Boyne River
Ammonia N	***ugN/L***	**270.00**	Calculated based on UIA-N 75-th percentile background concentration of Boyne River (see Appendix C for details)
Nitrate N	***ugN/L***	**3,400.00**	75th percentile background concentration of Boyne River
Inorganic P	***ugP/L***	**20.00**	75th percentile background concentration of Boyne River
Alkalinity	***mgCaCO3/L***	**258.00**	WSP Station #3 data for August
pH	**—**	**8.14**	WSP Station #3 data for August

To allow comparison, the model was run using the (2) two following scenarios:

1. **Scenario 1:** Currently permitted WPCP discharge limits with a treated effluent flow of 3,420 m^3/day; and,
2. **Scenario 2:** Recommended WPCP discharge limits with a future treated effluent flow of 5,100 m^3/day.

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Scenario 1 and 2 Besley Drain inputs are provided in Table 4 and 5, respectively. Given that at 7Q20 low flow conditions 82% of the flow in the Besley Drain originates from the WPCP, it has been conservatively assumed that no dilution occurs in the Besley Drain prior to its confluence with the Boyne River.

TABLE 4 - BESLEY DRAIN CURRENT SCENARIO MODEL INPUT PARAMETERS FOR QUAL2K FAR-FIELD ASSIMILATION MODELLING

Parameter	Details	Unit	Value	Rationale
Point	***Inflow***	***m^3/s***	**0.0396**	WPCP effluent with daily flow of 3,420 m^3/day
Temperature	***mean***	***°C***	**19.90**	WSP Station #2 data for August
Specific Conductance	***mean***	***umhos***	**0.69**	WSP Station #2 data for August
Dissolved Oxygen	***mean***	***mg/L***	**7.87**	Calculated 25th percentile for Besley Drain (see Appendix B for details)
Fast CBOD	***mean***	***mgO2/L***	**5.00**	Current WPCP effluent discharge limit
Ammonia N	***mean***	***ugN/L***	**800.00**	Current / Predicted WPCP discharge limit for summer months
Nitrate + Nitrite N	***mean***	***ugN/L***	**16,300.00**	75th percentile background concentration of Besley Drain
Inorganic P	***mean***	***ugP/L***	**250.00**	Current WPCP discharge limit
Alkalinity	***mean***	***mgCaCO3/L***	**320.00**	Used WSP's Station #2 data
pH	***mean***	***s.u.***	**8.30**	WSP Station #2 data for August

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TABLE 5 - BESLEY DRAIN FUTURE SCENARIO MODEL INPUT PARAMETERS FOR QUAL2K FAR-FIELD ASSIMILATION MODELLING

Parameter	Details	Unit	Value	Rationale
Point	***Inflow***	***m^3/s***	**0.0590**	WPCP effluent with daily flow of 5,100 m^3/day
Temperature	***mean***	***°C***	**19.90**	WSP Station #2 data for August
Specific Conductance	***mean***	***umhos***	**0.69**	WSP Station #2 data for August
Dissolved Oxygen	***mean***	***mg/L***	**7.87**	Calculated 25th percentile for Besley Drain (see Appendix B for details)
Fast CBOD	***mean***	***mgO2/L***	**5.00**	Proposed WPCP effluent discharge limit
Ammonia N	***mean***	***ugN/L***	**800.00**	Current / Predicted WPCP discharge limit for summer months
Nitrate + Nitrite N	***mean***	***ugN/L***	**16,300.00**	75^{th} percentile background concentration of Besley Drain
Inorganic P	***mean***	***ugP/L***	**120.00**	Proposed WPCP discharge limit
Alkalinity	***mean***	***mgCaCO3/L***	**320.00**	Used WSP's Station #2 data
pH	***mean***	***s.u.***	**8.30**	WSP Station #2 data for August

The far-field modelling was limited to 7Q20 flow conditions, as they represent "worst-case" conditions for dissolved oxygen, $cBOD_5$, total phosphorous, nitrate and ammonia contributions to the Boyne from the WPCP, given that this is the lowest level of dilution over a 20-year period. Additionally, increased water temperatures in summer months would result in increased speciation of ammonia in its unionized form. Sedimentation denitrification transfer coefficient was set to 0.2 day-1 as the QUAL2K model did not allow using "zero" rate with 7Q20 low flow.

3.2. SIMULATION RESULTS

This section summarizes the modelling results for parameters that were discussed in the MECP memorandum dated July 16, 2019, and include dissolved oxygen, $cBOD_5$, total phosphorous, nitrate and ammonia.

Output modeling curves for dissolved oxygen, total phosphorous, nitrate and unionized ammonia (NH3-N) concentrations in the Boyne River under 7Q20 flow and WPCP effluent flow of 3,420 m^3/day and 5,100 m^3/day are provided in Appendix D, respectively. For each parameter, the rationale for target concentrations is provided in Table 6.

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TABLE 6 - RATIONALE FOR PARAMETER TARGET CONCENTRATION IN BOYNE RIVER

Parameter	Target Concentration (mg/L)	Rationale
Dissolved Oxygen	>4.0	Provincial Drinking Water Quality (PWQO) limit at temperatures of 20 and 25°C.
$cBOD_5$	<2.5	75th percentile background based on half of the lab detection limit of 5 mg/L.
Total Phosphorous	<0.030	PWQO limit
NO3-N	<3.0	Long-term Canadian Water Quality Guideline for Protection of Aquatic Life
Unionized NH3-N	<0.0165	PWQO limit

Table 7 below shows the downstream distance in the Boyne River after the confluence with the Besley Drain where concentrations return to the target concentrations outlined in Table 6.

TABLE 7 - SUMMARY OF QUAL2K FAR-FIELD PREDICTIONS FOR 7Q20 FLOW

Parameter	Targeted Concentrations for Boyne River, mg/L	Dissipated Zone D/S the Confluence, km	
		WPCP Effluent Flow of 3,420 m^3/day (Current Scenario)	WPCP Effluent Flow of 5,100 m^3/day (Future Scenario)
DO	>4.0	n/a*	n/a*
$cBOD_5$	<2.5	0.1	7.0
TP	<0.030	9.9	7.3
NO3-N	<3.0	6.7	15.8
Unionized NH3-N	<0.0165	2.6	21.6

*concentrations of DO never fall below the target concentration.

For DO, the model input concentration in Besley Drain remained unchanged at 7.87 mg/L, based on the 25th percentile value. Increasing the flow rate to 5,100 m^3/day increased did not result in a decrease in DO levels in the Boyne river and levels remained above the target level of 4.0 mg/L.

For $cBOD_5$, the model input concentration in Besley Drain remained unchanged at 5 mg/L, based on the WPCP effluent limit. Increasing the flow rate to 5,100 m^3/day increased the distance from the Besley Drain / Boyne River confluence before the target concentration of 2.5 mg/L was reached from 0.1 to 7.0 km.

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For TP, although the flow from the WPCP increased from 3,420 to 5,100 m^3/day, with the proposed decrease in the effluent limit from 0.25 mg/L to 0.12 mg/L resulted in a shorter required distance from the Besley Drain / Boyne River confluence before the target concentration of 0.030 mg/L was reached. The 0.12 mg/L effluent limit was the limit proposed in the August 15, 2016 WSP submission, and given that that it resulted in a shorter attenuation distance, no further modelling of different effluent concentrations was undertaken.

For unionized NO3-N, the model input concentration in Besley Drain remained unchanged at 16.3 mg/L, based on the 75th percentile value. Increasing the flow rate to 5,100 m^3/day increased the distance from the Besley Drain / Boyne River confluence before the target concentration of 3.0 mg/L was reached from 6.7 to 15.8 km.

For total ammonia nitrogen, the model input concentration in the Besley Drain remained unchanged at 0.8 mg/L, which is the current effluent limit, and limit proposed by WSP. Increasing the flow rate to 5,100 m^3/day increased the distance from the Besley Drain / Boyne River confluence before the target concentration of unionized NH3-N, of 0.0165 mg/L was reached from 2.6 to 21.6 km. Unionized NH3-N is the fraction of total ammonia nitrogen that at higher concentrations is toxic to aquatic life, which is why a target concentration was set for unionized NH3-N rather than for total NH3-N.

4. Proposed Limits

The following sections discuss recommended limits for parameters that were highlighted in the MECP memorandum dated July 16, 2019 as requiring more supporting evidence, including dissolved oxygen, total phosphorous, nitrate and ammonia. A summary table then shows recommended limits for all WPCP parameters.

4.1. Dissolved Oxygen/$cBOD_5$

The WPCP currently limits $cBOD_5$ in effluent to 5 mg/L and does not have a limit for DO. Given that $cBOD_5$ levels directly affect DO levels, they were considered together. Although the increase in WPCP flow resulted in an additional 1.5 km downstream of the Besley / Boyne confluence before $cBOD_5$ levels dropped below the target 2.5 mg/L, DO levels after the confluence remained above the target 4.0 mg/L. Accordingly, the same WPCP 5 mg/L $cBOD_5$ limit is recommended, as it will cause very limited impact on aquatic life in the Boyne river.

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4.2. Total Phosphorous

Modelling confirmed that reducing the WPCP TP effluent limit from 0.25 mg/L to 0.12 mg/L resulted in shorter distance from the Besley Drain / Boyne River confluence before the target concentration of 0.030 mg/L was reached at the proposed 5,100 m^3/day flow rate. Accordingly, a WPCP limit of 0.12 mg/L is recommended.

4.3. Nitrate (NO3-N)

Currently, there are no limits on WPCP nitrate effluent. Increasing the flow rate of the WPCP resulted in a greater distance after the Besley Drain / Boyne River confluence before the target concentration of 3.0 mg/L was reached. Therefore, the model was run again several times to determine the maximum WPCP nitrate effluent limit that would result in the same or better attenuation in the Boyne River. Modelling confirmed that a nitrate limit of 10.0 mg/L with a flow rate of 5,100 m^3/day would result in nitrate concentrations of 3.0 mg/L 6.0 km downstream of the Besley Drain / Boyne River confluence. As this is shorter than the 6.7 km attenuation distance required at the current WPCP flow rate of 3,420 mg/L, a nitrate objective of 10.0 mg/L and a limit of 13.0 mg/L is recommended.

4.4. Ammonia

Increasing the flow rate of the WPCP resulted in a greater distance after the Besley Drain / Boyne River confluence before the target unionized NH3-N concentration of 0.0165 mg/L was reached. Therefore, the model was run again several times to determine the maximum WPCP ammonia effluent limit that would result in the same or better attenuation in the Boyne River. Modelling confirmed that a summer total ammonia nitrogen limit of 0.35 mg/L with a flow rate of 5,100 m^3/day would require 3.1 km downstream of the Besley Drain / Boyne River confluence before the target unionized NO3-N concentration of 0.0165 mg/L was reached. As this distance was within a kilometre of the current attenuation distance, a nitrate objective of 0.35 is recommended for between June 1 and September 30. Given that the current limit for October 1 to May 31 is three times the current June 1 to September 30 limit, an objective of 1.1 mg/L is recommended for October 1 to May 31. The model also showed that ammonia concentrations were sensitive to changes in effluent limits, with effluent concentrations of 0.5 mg/L requiring 8.9 km before attenuation. In consideration of this sensitivity, a limit of 0.4 mg/L is recommended for the summer window.

Between 2014 and 2019, average WPCP ammonia effluent concentrations ranged from 0.14 to 0.80 mg/L, with maximum annual concentrations between 0.4 and 9.8. To achieve an effluent objective of 0.35 mg/L, the WPCP may need to incorporate membrane technology. Supplier ammonia effluent concentration guarantees for membrane technology range from 0.3 to 0.5 mg/L, indicating that these objectives and limits will push current best technology levels.

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4.5. Summary of Recommended WPCP Effluent Limits

Table 8 summarizes the recommended WPCP effluent limits for a flow rate of 5,100 m^3/day with previously approved effluent limits at a flow rate of 3,420 m^3/day provided for comparison purposes.

TABLE 8 - SUMMARY OF RECOMMENDED WPCP EFFLUENT LIMITS

Parameter	Current 3,420 m^3/Day Flow		Recommended Objective at 5,100 m^3/Day	
	Objective (mg/L)	Compliance Limit (mg/L)	Objective (mg/L)	Compliance Limit (mg/L)
$cBOD_5$	4	5.0	4	5.0
TP	0.12	0.25	0.09	0.12
NO3-N	—	—	10.0	13.0
Total Ammonia as N (Oct 1 – May 31)	2.0	2.4	1.1	1.2
Total Ammonia as N (June 1 to Sept 30)	0.5	0.8	0.35	0.4
Total Suspended Solids	4.0	5.0	4.0	5.0
pH	6.0-9.5	6.0-9.5	6.0-9.0	6.0-9.5
E. coli	100 organisms/100 mL	—	100 organisms/100 mL	—

5. Impact of Groundwater Takings

Groundwater takings from municipal wells in and around the Town of Shelburne have been on-going prior to the beginning of the Assimilative Capacity Study, and any effects on the local watercourses would already have been occurring prior to the initiation of the ACS.

The well field capacity assessment was undertaken as required by Conditions 4.2 and 4.3 of the Permit to Take Water 5632-A4JLLD. All groundwater monitoring wells, shallow piezometers and surface water monitoring stations were monitored from July 2016 to October 2018 to monitor for changes in water level. The Well Field Capacity Assessment pumping tests and surface water monitoring has shown that water levels in Walters Creek, a tributary of the Boyne River, are not affected by current municipal water production.

The Well Field Capacity Assessment report is anticipated to be completed in early 2020 and will be sent to the MECP for review and comment by Banks Groundwater Engineering.

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6. Disposition of Comments from MECP Memorandum

Table 9 summarizes how comments from the July 16, 2019 MECP Memorandum have been addressed in this Memorandum.

TABLE 9 – SUMMARY OF DISPOSITION OF MECP MEMORANDUM COMMENTS

MECP Comment	Resolution
(1) Field data collected up to now appear to be adequate, no additional field data will be required, except dissolved oxygen of the receiving water as described in Item No. 5 below.	No action required.
(2) 7Q20 analysis, background water quality assessment and policy designation of the receiving water are satisfactory.	No action required.
(3) At 7Q20 low flow condition, 82% of the river flow would be comprised of effluent discharged from the WPCP at the confluence of Besley Drain where assimilative capacity of the river is very limited. This location is the headwaters of the Boyne River where cool and coldwater fisheries exist. To protect these fisheries, their habitats, spawning and rearing grounds an excellent quality effluent will be required, otherwise discharge should be routed further downstream via a pipe where the river has greater potential to assimilate waste loads.	No action required.
(4) The proposed effluent criteria for TSS and E.coli as presented in Table 6-1 of the report are acceptable.	No action required.
(5) $cBOD_5$ criterion as proposed is not supported by the analysis. A supporting analysis is required to understand the effects of the BOD loads on dissolved oxygen of the receiving water. It is recommended to consider oxygen demands of the aquatic plants and sediments in addition to wastewater oxygen demand to predict oxygen deficit in the river. A cursory level analysis indicates dissolved oxygen in the river would	Modelling undertaken using QUAL2K which concluded that a $cBOD_5$ limit of 5.0 mg/L at the increased WPCP flow rate of 5,100 m^3/day results in an additional 1.5 km of distance from the Boyne / Besley confluence before $cBOD_5$ concentration attenuate to 2.5 mg/L. However, given that dissolved oxygen concentrations remained above the target 4.0 mg/L downstream of the confluence, it is

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MECP Comment	Resolution
deplete below aquatic protection guidelines for a long distance before it returns to normal. As part of the analysis, please consider a $cBOD_5$ concentration of 2.5 mg/L as a representative 75th percentile background concentration of the receiving water. The lab detection limit of $cBOD_5$ analysis was 5 mg/L, which prohibits us from knowing the true BOD concentrations in the Boyne River if they are below 5 mg/L. All lab results were reported as <5 mg/L. Under this circumstance, it is recommended to use half (2.5 mg/L) of the detection limit as a representative $cBOD_5$ concentration of the receiving water. It was further noted that a limited amount of DO data was available to calculate a representative DO concentration of the receiving water. To overcome this data gap, a worst-case scenario can be considered, or additional data could be collected in the field including diurnal variation of DO, and a 25th percentile concentration can be calculated and used as a background value for further analysis. Please note for establishing a background representative value of dissolved oxygen, a 25th concentration is used unlike the 75th concentration used for other parameters.	recommended that the $cBOD_5$ of limit of 5.0 mg/L be retained.
(6) Nitrate appears to be a parameter of concern in the discharge, and an effluent criterion will be required for this parameter to protect aquatic life. Background 75th percentile concentration of nitrate-nitrogen in the Boyne River is 3.4 mg/L, which is slightly higher than the long-term aquatic life protection value of 3 mg/L. The Boyne River is a Policy 2 receiver in terms of nitrate, all necessary measures will be required not to degrade water quality further for this parameter. The 75th percentile concentration of nitrate-nitrogen in Besley Drain upstream of the	Modelling undertaken using QUAL2K which concluded that a nitrate objective of 10.0 mg/L with a flow rate of 5,100 m^3/day would require 6.0 km downstream of the Besley Drain / Boyne River confluence before the target concentration of 3.0 mg/L was reached. As this is shorter than the 6.7 km attenuation distance required at the current WPCP flow rate of 3,420 mg/L, a nitrate objective of 10.0 mg/L is recommended.

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MECP Comment	Resolution
confluence was 16.3 mg/L, and downstream of the confluence in the Boyne River was 8.1 mg/L. Two (2) kilometres downstream at M-M Townline that concentration was 5.1 mg/L. This data suggests that the WPCP discharge is negatively impacting nitrate-nitrogen concentration in the river and would cause further degradation as a result of the proposed increased discharge rate from 3,420 m^3/day to 4,400 m^3/day. To protect aquatic life nitrate-nitrogen shall be regulated in the discharge, and effluent criteria for this parameter should be developed considering the assimilative capacity of the river.	
(7) The proposed effluent criteria for total NH_3-N was not supported by an assimilative capacity assessment of the receiving water. A typical mixing zone analysis using CORMIX will not be required here as more than 80% of the river flow is treated effluent discharged via the 2 km long Besley Drain. Instead, it would be more appropriate to undertake a 1-D water quality analysis coupled with hydrodynamic model to predict concentration distribution of NH_3-N along the river length and to find a distance where water quality returns to the background level (i.e., using QUAL2K or HEC-RAS or any other tool appropriate for this analysis).	Modelling undertaken using QUAL2K which concluded that a total ammonia nitrogen objective of 0.35 mg/L with a flow rate of 5,100 m^3/day would require 3.1 km downstream of the Besley Drain / Boyne River confluence before the target unionized NO3-N concentration of 0.0165 mg/L was reached. As this distance is within 1 km of the 2.6 km attenuation distance required at a WPCP flow rate of 3,420 mg/L, a nitrate objective of 0.35 mg/L is recommended for between June 1 and September 30.
(8) Please note, there was an error in understanding PWQO of unionized NH_3 versus PWQO of unionized NH_3-N. The PWQO for unionized NH_3 is 20 ug/L and for unionized NH_3-N that value should be 16.5 ug/L. Molecular weight of one molecule of NH_3 is 17g, and the molecular weight of one molecule of nitrogen is 14g, therefore the molecular weight of one molecule of NH-N would be (14/17)*20 = 16.5 ug/L. Please note all lab results of nitrogen analysis presented in the	Correction has been applied.

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MECP Comment	Resolution
appendices of the report were reported as NH_3-N, NO_3-N, etc. Please apply this correction for all NH_3-N calculations. Accordingly, the 75th percentile background concentration of unionized NH-N in the Boyne River should be 7.74 ug/L instead of 9.4 ug/L considered in the analysis.	
(9) The proposed total phosphorus (TP) effluent criterion was not supported by detailed analysis of the receiving water. A simple mass balance analysis indicated, fully mixed concentration of TP in the receiving water exceeded PWQO by almost 3 times. The river has very limited dilution potential and it is therefore important to know concentration distribution of TP along the river length and the distance downstream where it returns to background. Please undertake a similar analysis for TP as recommended for ammonia considering all influencing factors.	Modelling undertaken using QUAL2K which concluded reducing the WPCP TP effluent limit from 0.25 mg/L to 0.12 mg/L resulted in shorter distance from the Besley Drain / Boyne River confluence before the target concentration of 0.030 mg/L was reached at the proposed 5,100 m^3/day flow rate. Accordingly, a WPCP limit of 0.12 mg/L is recommended.
(10) Effluent criteria for pH as an objective should be between 6.5 to 8.5 and limit should be between 6 to 9.	Acknowledged. No additional action required.
(11) Please discuss impact of groundwater takings on the assimilative capacity of the receiving water (refer to item #9 of Michael Spencer's memo of May 30, 2016).	Groundwater takings from municipal wells in and around the Town of Shelburne have been on-going prior to the beginning of the Assimilative Capacity Study, and any effects on the local watercourses would already have been occurring prior to the initiation of the ACS. The Well Field Capacity Assessment report is anticipated to be completed in early 2020 and will be sent to the MECP for review and comment by Banks Groundwater Engineering.

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MECP Comment	Resolution
(12)As part of the discussion in s.3.2 of the report, it was mentioned that the Ministry required a minimum dilution ratio of 20:1 for near field. Please note, this dilution ratio is applicable for discharges to the Great Lakes but not here.	Noted. No action required.

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Appendix A

Boyne River Background Dissolved Oxygen 25th Percentile Calculation

Boyne River Background DO 25th Percentile Calculation

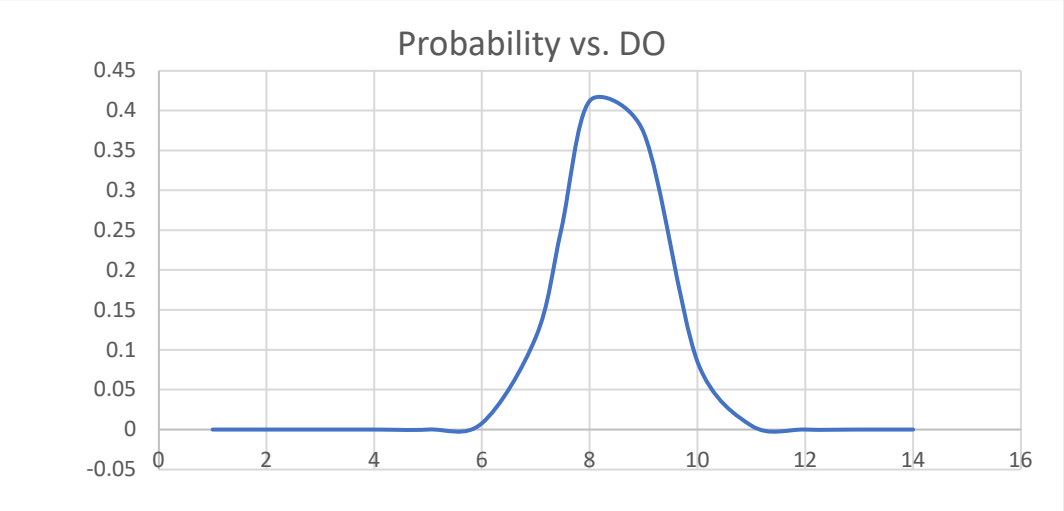
Used DO levels (mg/l) - WSP Station #3:

7.9 at 19.9 C on Jul. 5, 2012
8.5 at 19.1 C on Jul. 24, 2012
7.7 at 11.5 C on Sep. 23, 2015
9.6 at 12.7 C on Oct. 7, 2015

Calculated stat. parameters:

σ	**0.85391256**
E	**8.425**
2*σ^2	1.45833333
σ*SQRT(2*Pi)	2.14044388

DO	Probability
1	1.7914E-17
2	2.3841E-13
3	8.0521E-10
4	6.9016E-07
5	0.00015013
6	0.00828736
7	0.11610069
7.47	**0.24998935**
8	0.41277298
9	0.37243081
10	0.08527816
11	0.00495551
12	7.308E-05
13	2.735E-07
14	2.5977E-10



Appendix B

Besley Drain Dissolved Oxygen 25th Percentile Calculation

Besley Drain DO 25th Percentile Calculation

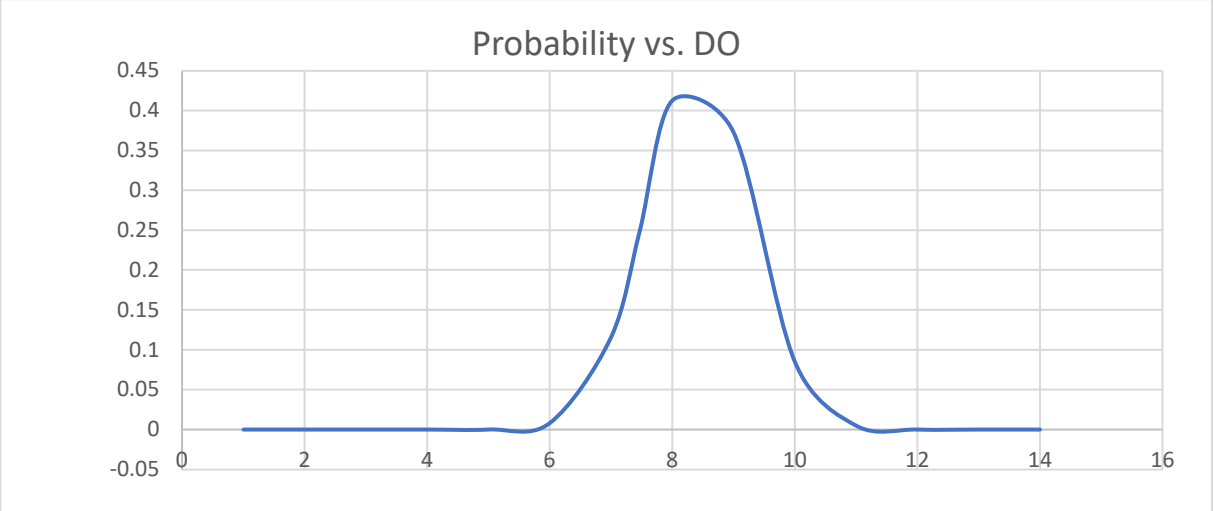
Used DO levels (mg/l) - WSP Station #2:

9.5 at 22.8 C on Jul. 5, 2012
8.6 at 21.5 C on Jul. 24, 2012
7.7 at 14.5 C on Sep. 23, 2015
9.5 at 15.6 C on Oct. 7, 2015

Calculated stat. parameters:

σ	**0.861684397**
E	**8.825**
2*σ^2	1.485
σ*SQRT(2*Pi)	2.159924999

DO	Probability
1	5.75791E-19
2	1.10732E-14
3	5.53907E-11
4	7.20694E-08
5	2.43903E-05
6	0.00214702
7	0.049159456
7.87	**0.250532139**
8	0.292772533
9	0.45352982
10	0.182739999
11	0.019151978
12	0.000522091
13	3.70195E-06
14	6.82759E-09



Appendix C

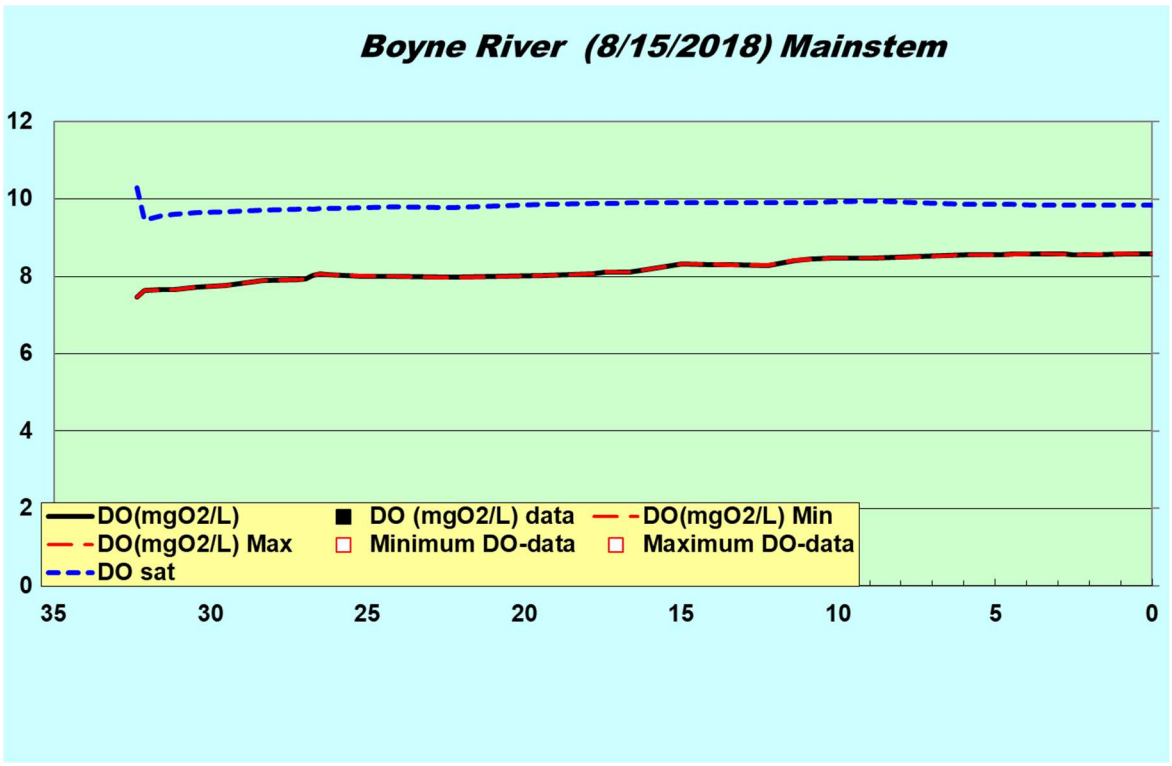
Boyne River Background NH3-N 75th Percentile Calculation

Boyne River Background NH3-N 75th Percentile Calculation

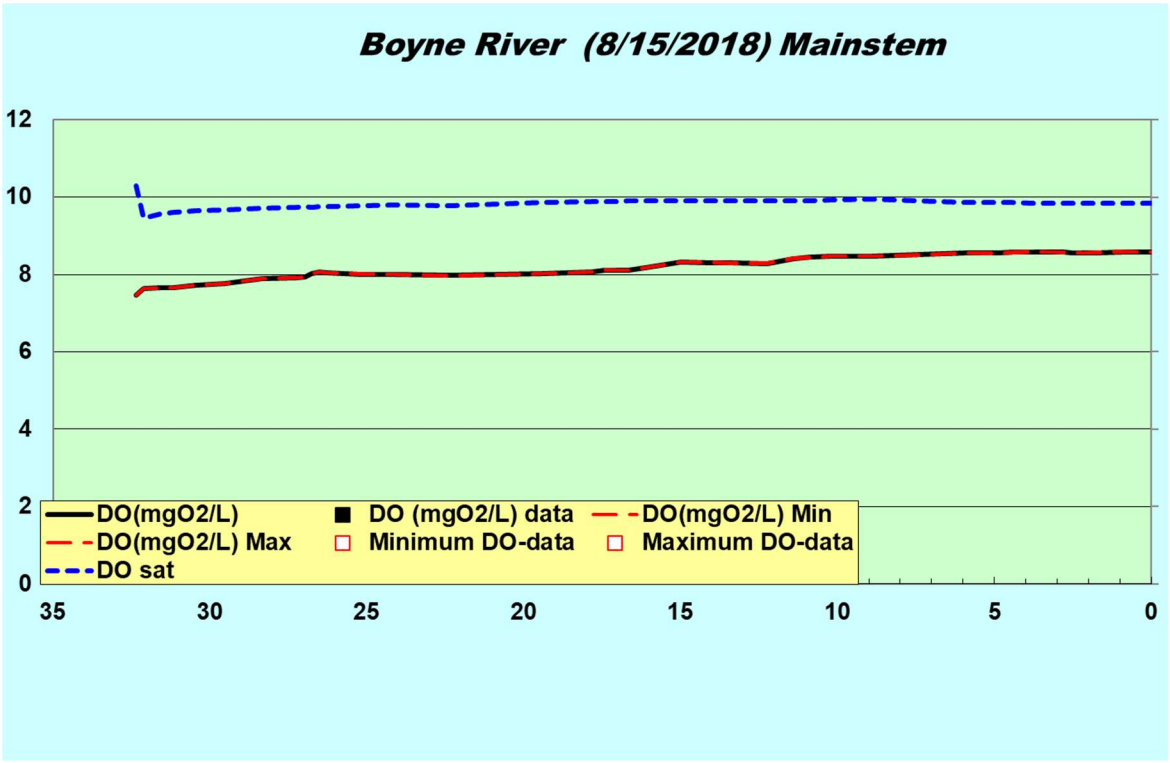
Parameter	Formula for Calculation	Value
pH		8.14
t, C		11.6
T, K	T = t + 273.16	284.8
pKa	pKa = 0.09018+2729.92/T	9.677
UIA fraction of NH3	UIA fraction = 1 / (10^(pKa-pH) + 1)	0.0282
UIA-N 75th Percentile in Boyne River, mg/L		0.00774
NH3-N 75th Percentile in Boyne River, mg/L	**NH3-N = UIA-N / UIA fraction**	**0.27**

Appendix D

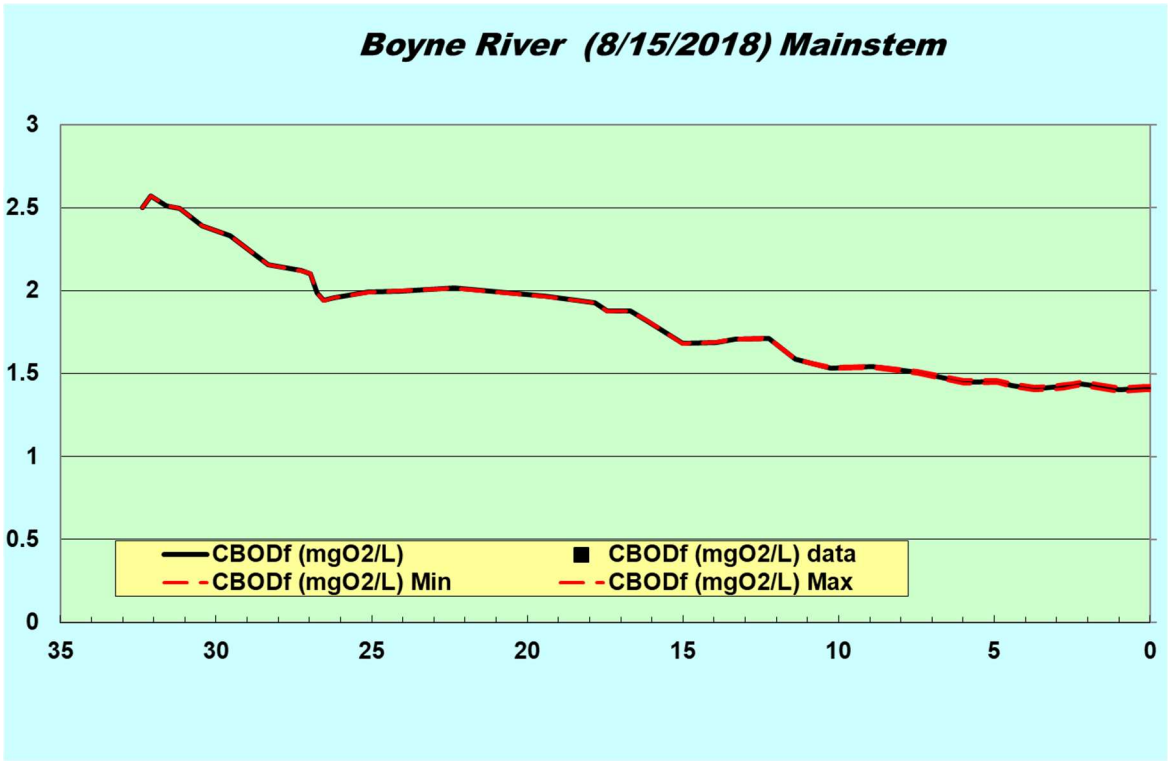
Modelling Output Curves for WPCP Effluence Flows



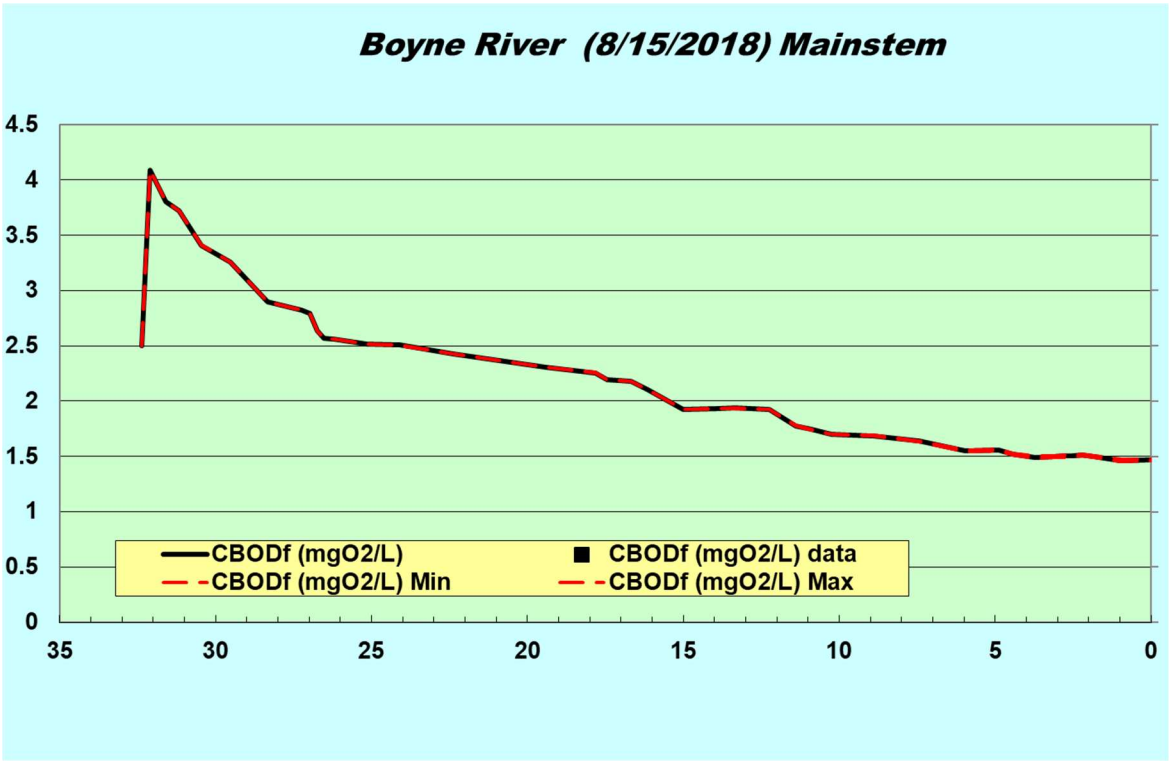
Dissolved Oxygen Levels in Boyne River with WPCP Flow of 3420 m^3/day



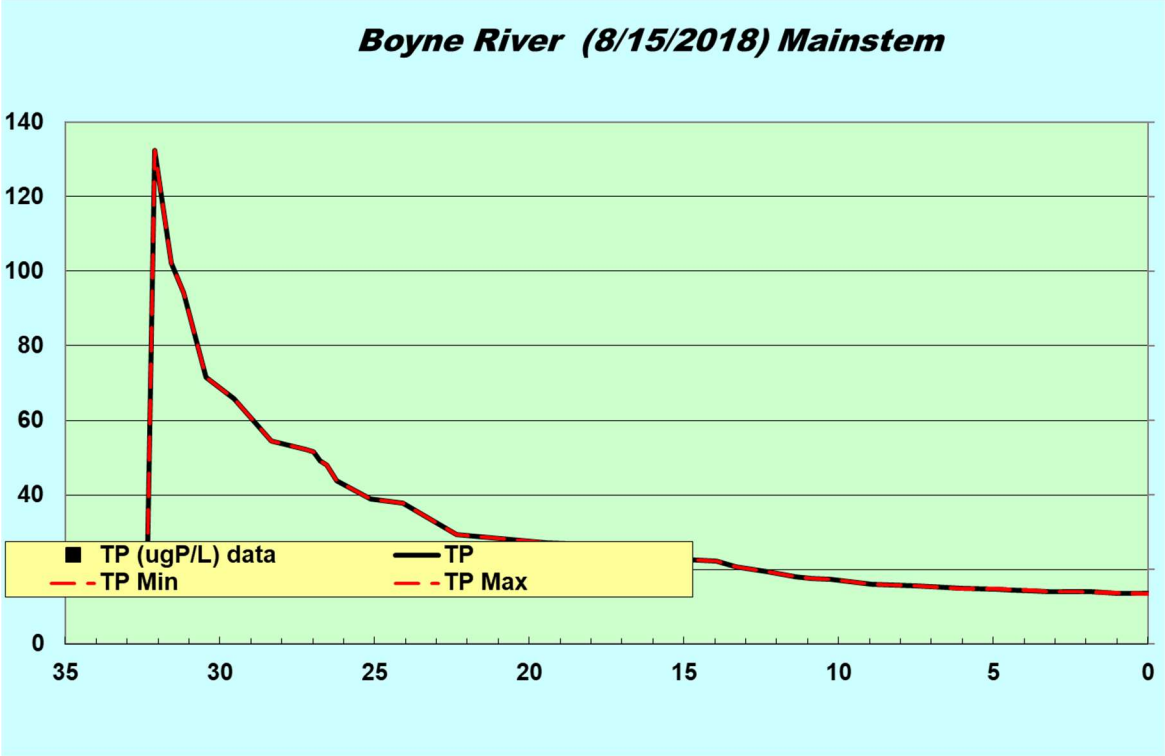
Dissolved Oxygen Levels in Boyne River with WPCP Flow of 5100 m^3/day



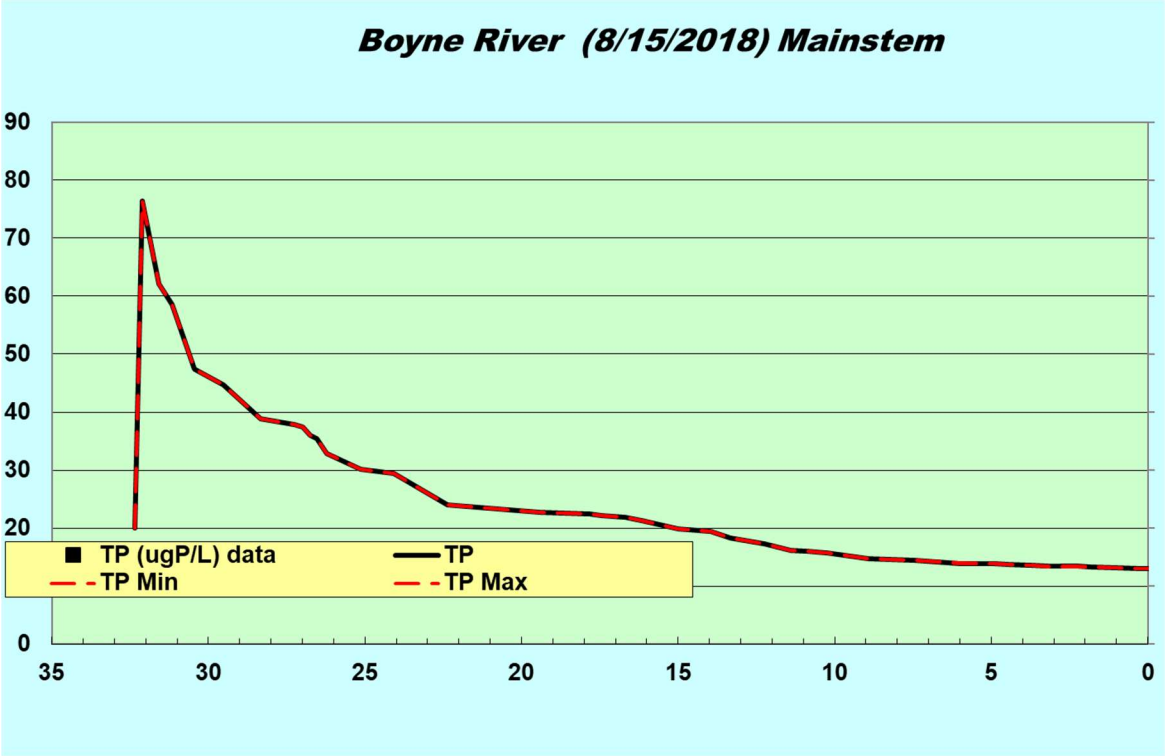
$cBOD_5$ Levels in Boyne River with WPCP Flow of 3420 m^3/day



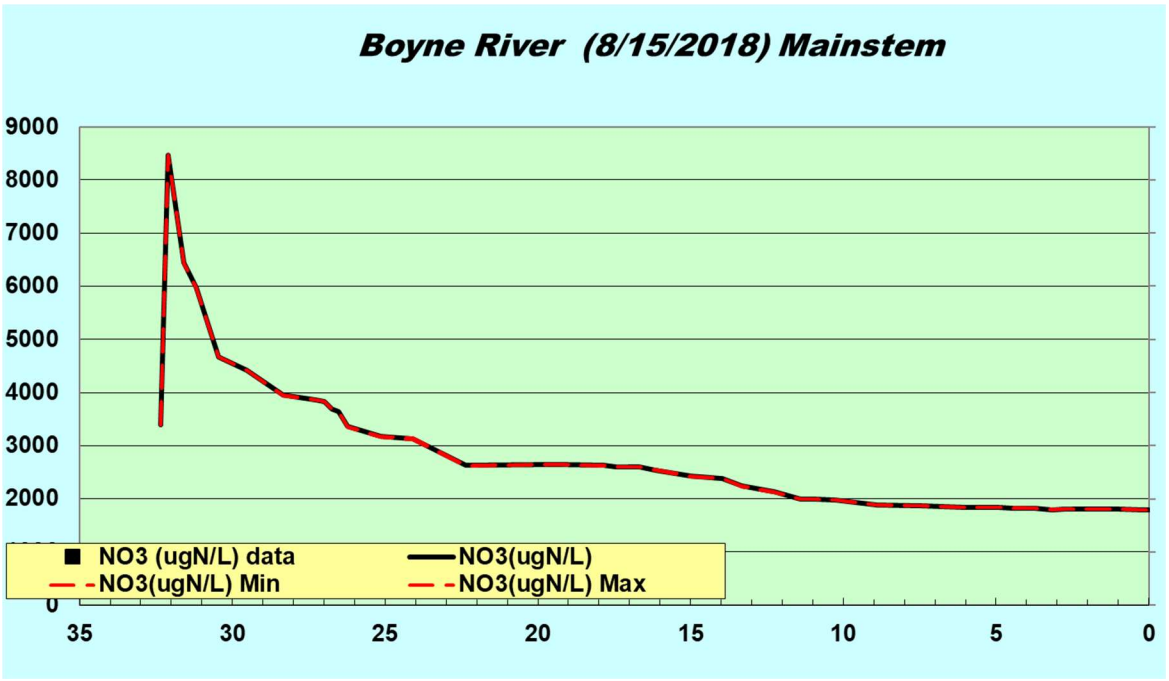
$cBOD_5$ Levels in Boyne River with WPCP Flow of 5100 m^3/day



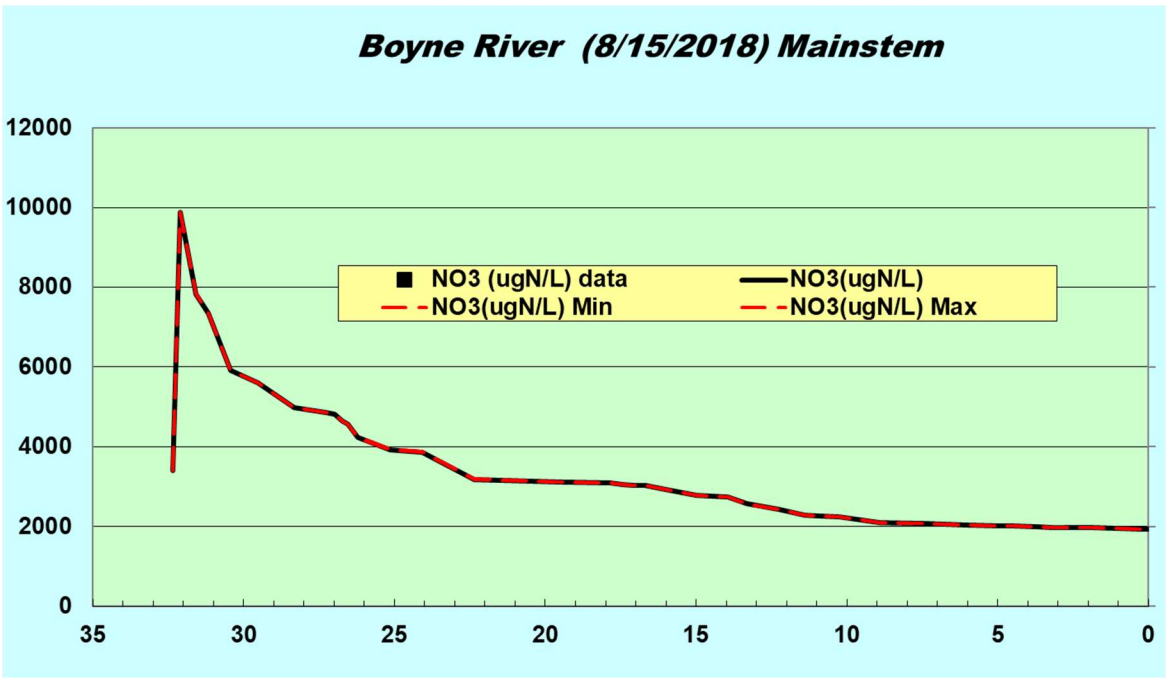
Total Phosphorous Levels in Boyne River with WPCP Flow of 3420 m^3/day



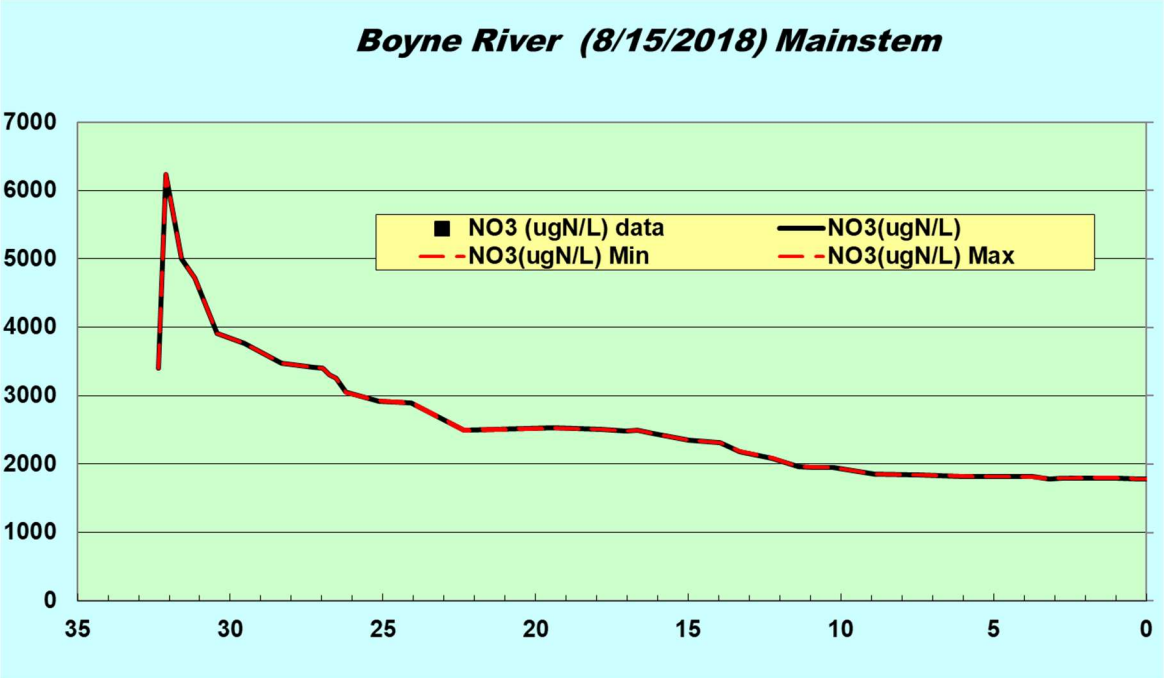
Total Phosphorous Levels in Boyne River with WPCP Flow of 5100 m^3/day



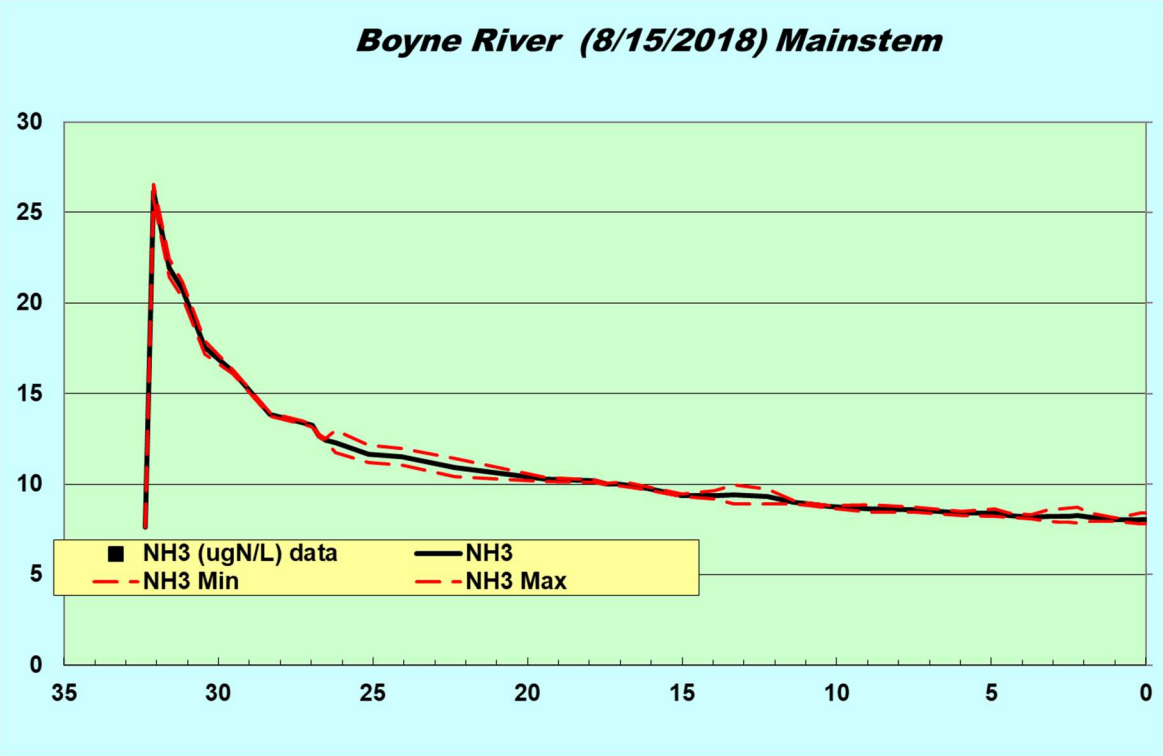
Nitrate Levels in Boyne River with WPCP Flow of 3420 m^3/day and 16.3 mg/L Nitrate Limit from WPCP



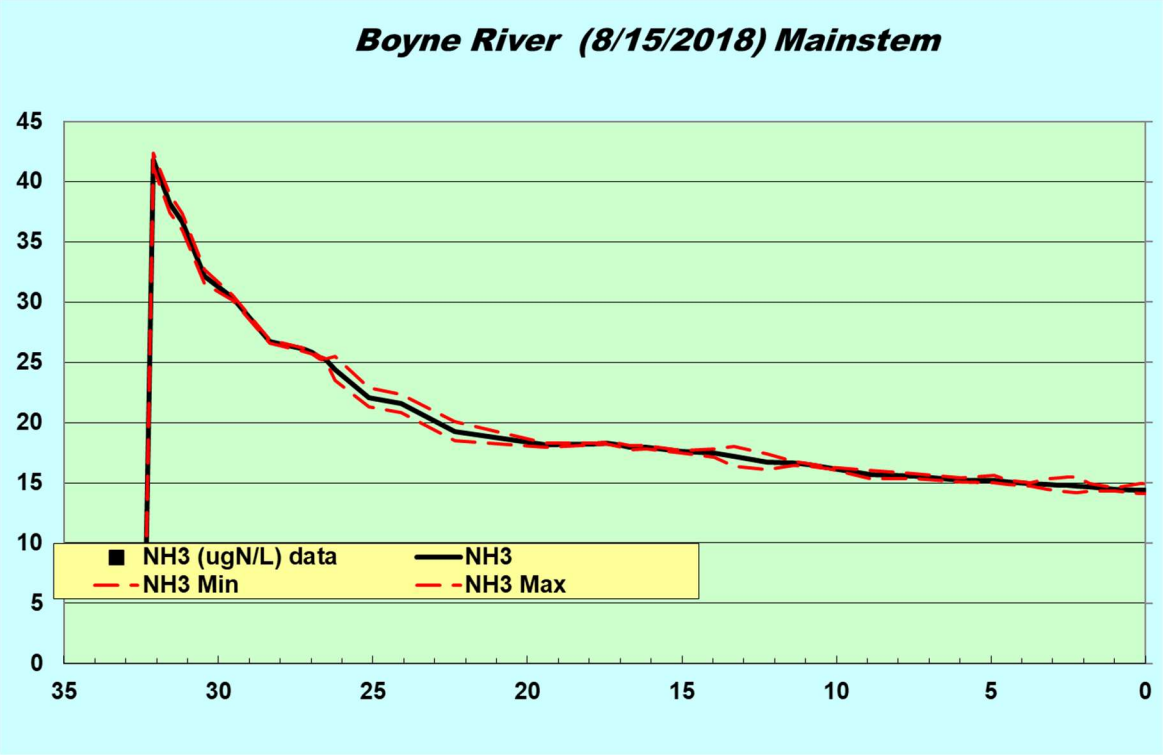
Nitrate Levels in Boyne River with WPCP Flow of 5100 m^3/day and 16.3 mg/L Nitrate Limit from WPCP



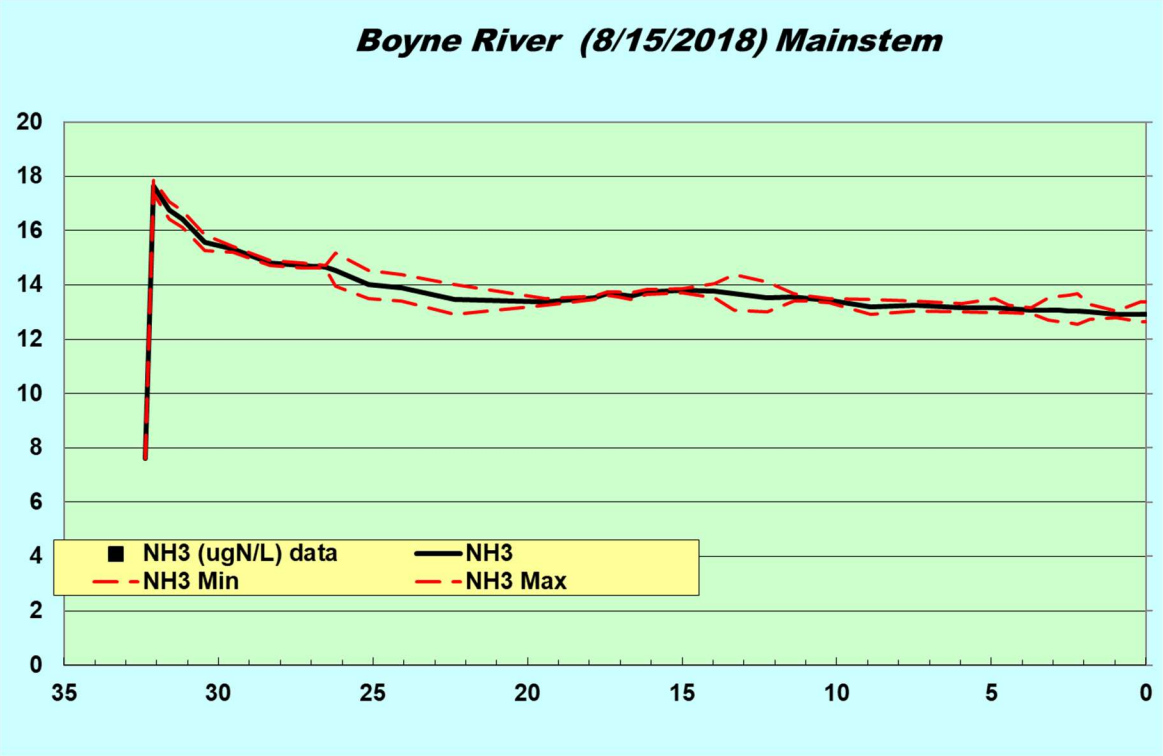
Nitrate Levels in Boyne River with WPCP Flow of 5100 m^3/day and 10.0 mg/L Nitrate Limit from WPCP



Ammonia Levels in Boyne River with WPCP Flow of 3420 m^3/day and 0.8 mg/L Ammonia Limit from WPCP



Ammonia Levels in Boyne River with WPCP Flow of 5100 m^3/day and 0.8 mg/L Ammonia Limit from WPCP



Ammonia Levels in Boyne River with WPCP Flow of 5100 m^3/day and 0.3 mg/L Ammonia Limit from WPCP

From: Lee Bull
To: Ian Callum; jwilloughby@shelburne.ca
Cc: Morgen Wilson
Subject: Shelburne Water Pollution Control Plant - Assimilative Capacity Study Review - NVCA ID # 42239
Date: September 21, 2020 4:02:43 PM

Good afternoon Ian

Nottawasaga Valley Conservation Authority (NVCA) staff appreciates the opportunity to provide further input into the Shelburne Water Pollution Control Plant Environmental Assessment.

NVCA staff has reviewed the following:

Documents reviewed

- Shelburne Water Pollution Control Plant – Receiving Water Assessment completed by WSP dated August 15, 2016
- Town of Shelburne, Water Pollution Control Plan – Assimilative Capacity Study Modelling and Comment Disposition completed by S. Burnett & Associates Ltd dated March 23, 2020 (project No. M16018)

Based upon our review of the above noted materials, we offer the following comments:

Background:

The Town of Shelburne is growing and will outpace the current capacity (3,420 m^3/day) of its Water Pollution Control Plant (WPCP) in the coming decade. Growth predictions out to 2041 show a population of 15,100 with a needed capacity of 5,100 m^3/d. The Town has submitted several Assimilative Capacity Studies (ACS) to the MECP in order to secure the needed increases in capacity. It is unclear to NVCA staff whether the MECP has approved any increases to date.

The largest challenge for the Town with respect to the WPCP is that its effluent receiver is the Boyne River near its headwaters. At the point of discharge, the Boyne River is very small and provides very limited, possibly negligible assimilative capacity or ability to self-clean following the reception of the wastewater. Also at the point of discharge the Boyne River is a thermally coolwater river flowing through a large unevaluated wetland environment with resident spawning and rearing habitat for brook trout and sculpin, both coldwater fishes in the immediate area. Migrating coolwater rainbow trout also find viable habitat in the area of the discharge point. The Boyne River in this area flows through a headwater wetland environment downstream toward Mulmur-Melancthon Townline approximately two kilometres downstream from the Besley-Boyne confluence. NVCA staff have concerns that the added effluent flows to the Boyne River at the point of discharge will have significant negative impacts on the wetland environment and cold/cool water watercourse and its biota.

The NVCA has been working with the Town since 2012 on the development of its Receiving Water Assessment (RWA) and ACS. The Town presented the RWA and ACS to the MECP in 2019, NVCA staff has no records of being provided

with the documents to review and provide comment. Accordingly, these comments will relate to both the 2016 RWA (submitted in 2019) and the 2020 ACS.

Comments:

Flow

1. The Boyne River at Earl Rowe Water Survey of Canada gauge was used in the pro-rated calculation of the 7Q20. There was no mention in either report that this gauge is immediately downstream of a flow-regulated reservoir. Estimations of any low-flow parameter, including 7Q20 would be biased based on reservoir management practices. It was for this reason that MOECC staff recommended using an alternate flow gauge or to do *in situ* flow monitoring to determine 7Q20 or similar flow characteristics of the receiver, following the submission of the November 2012 ACS. How has this problem been resolved? Have the managed flow regime been considered in the calculations and extrapolation to the Boyne River in the vicinity of the effluent discharge?
2. Assuming that the pro-rated values provided in the RWA are correct and acceptable, the WPCP will be producing 0.059 m^3/s of effluent flow to the Boyne River after fully upgraded. At an annual 7Q20 of 0.011 m^3/s in the Boyne River, this means that WPCP effluent will add flows 536% higher than 7Q20 baseflow or put another way effluent will account for 84% of Boyne River 7Q20 baseflow. The ACS has set up its modeling on the assumption that since 82% of Besley Drain 7Q20 flows originates from the WPCP "it has been conservatively assumed that no dilution occurs in the Besley Drain prior to its confluence with the Boyne River." Following these same assumptions, there is a disconnect behind the rationale of the Boyne River as the receiver and the Besley Drain not and that the Boyne can provide the necessary assimilation at the discharge point or within a reasonable distance of this point.

Climate Change

3. There is no consideration for climate change in the ACS, this would be particularly relevant to projections for flow (7Q20) and water temperature in a coldwater habitat environment. While future projections offer a wide range of uncertainty it is generally accepted that summers will become hotter and drier.

Mixing/Dissipation Zone

4. NVCA staff has concerns over the length of the proposed mixing/dissipation zones with respect to numerous effluent parameters (Table 1 as presented in the ACS). In general, the extreme length of the proposed mixing/dissipation zones create potentially harmful environmental damage and risk to ecosystem integrity, including sensitive spawning areas of provincially declining coldwater fish species (brook trout) in the immediate vicinity of the point of discharge, the cold-coolwater riverine habitat downstream of this point, and the large unevaluated wetland environments at the point of discharge and the downstream Boyne River Wetland (provincially significant wetland). It also has potentially negative impacts on recreational (fishing and swimming) enjoyment of the river for downstream landowners and the public.

Parameter	Target Concentration (mg/L)	Dissipation Zone D/S of Confluence, km	
		3,420 m^3/d	5,100 m^3/d
DO	>4*	n/a	n/a
$cBOD_5$	<2.5	0.1	7.0
TP	<0.030	9.9	7.3
NO3-N	<3.0	6.7	15.8
UIA	<0.0165	2.6	21.6
UIA (0.35 mg/L objective)	<0.0165	2.6	3.1

* NVCA has concerns with this target, see point #6

Other WWTP ACS within and proximal to the watershed propose more reasonable mixing/dissipation zones that present a tolerable and manageable risk, for example – Midhurst WWTP 360 m zone for UIA, Orangeville WPCP has no mixing zone for UIA, Erin WWTP has a 153 m zone for UIA.

How can the lengthy mixing/dissipation zones for Shelburne WPCP be justified in light of direction from the MECP document *Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters* Chapter 1 section 1.2.2 Policy 5:

> ***Mixing zones should be as small as possible and not interfere with beneficial uses.*** *Mixing zones are not to be used as an alternative to reasonable and practical treatment.*

And Chapter 2 section 2.4:

> *Conditions within a mixing zone* ***must not result in irreversible environmental damage, risk to ecosystem integrity*** *or risk to human health. Mixing zones* ***cannot interfere*** *with other water uses such as drinking water supply or* ***recreation****…*
>
> *As effluent loading requirements are based on careful design, so too* ***should mixing zones be carefully planned*** *on a site-specific basis including consideration of water quality, seasonal streamflow and current patterns, physical factors,* ***biotic communities and spawning areas in and adjacent to the mixing zone****, nearby water uses such as bathing beaches and drinking water intakes as well as other wastewater discharges…*
>
> *As general guidance in the design of mixing zones, the following range of concerns must be adequately addressed:*
>
> 1. ***In order to protect important aquatic communities (fish, invertebrates and plants) in the vicinity of mixing zones, no conditions within the mixing zone will be permitted which:***
>   - ***a. are acutely lethal to aquatic life;***
>   - *b.* ***cause irreversible responses which could result in detrimental post-exposure effects****;*
>   - *c. result in bioconcentration of toxic materials which are harmful to the organism or its consumer;*

d. *attract organisms to the mixing zones, resulting in a prolonged exposure;*
e. ***create a barrier to the migration of fish or other aquatic life****.*

There has been no analysis presented on the impacts of these extensive mixing zones on sensitive fish, benthic macroinvertebrate, herptefaunal populations, amongst others, or on the wetland and cold/coolwater watercourse environments as a whole. The RWA had some information on current conditions but no discussion on impacts to the ecosystem to assimilate these potential impacts or mitigative actions.

It is the opinion of NVCA staff that the mixing/dissipation zone analysis has not satisfied the requirements to be as small as possible, not interfere with beneficial uses, not result in irreversible environmental damages, not be a risk to ecosystem integrity, not harm biotic communities and spawning areas in and adjacent to the mixing zone, not cause acutely lethal conditions to aquatic life and not create a barrier to fish migration.

Dissolved Oxygen

Considering that oxygen consuming elements like cBOD and TP concentrations remain elevated above their respective targets for 7 km downstream of Besley-Boyne confluence, while passing through a wetland environment, a thorough understanding of DO dynamics should be a strong requirement of the ACS to ensure no risk to spawning zones and overall environmental integrity.

5. DO is insufficiently monitored in the RWA as only two measurements were taken. As is required in section 4.5 (*Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters*) the diurnal cycle of DO, as well as temperature and pH, needs to be addressed when making effluent limits. Without a baseline of information to work from all DO assessments about the receiver are speculative at best.
6. The ACS model was run with 4 mg/L as target. The PWQO for DO is 5 mg/L for coldwater species at 20^{o}C, however the CCME guideline for the protection of aquatic life suggests when early life stage coldwater species are present, as is found in the vicinity of the Boyne-Besley confluence (brook trout and sculpin) a limit of 9.5 mg/L should be used. The model looks like it will maintain 6-10 mg/L, which is acceptable for warmwater fish but pushing tolerance for adult coldwater fish and lethal for early life stage coldwater fish.
7. The model appears to treat DO is a single static parameter and not consider its diurnal cycling. The natural diurnal cycle of the Boyne River is not presented in the RWA or the ACS as is required in section 4.5 (*Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters*). Are the average results presented in the ACS daytime averages or nighttime lows? Have nighttime lows been considered and do they approach critical thresholds for coldwater species? If it is found that lows cannot be favourably maintained, what DO best management practices will be instituted?

cBOD$_5$

8. The model was run using a cBOD target concentration of 2.5 mg/L as the

75^{th} percentile of half of the lab detection limit of 5 mg/L. This assumption is statistically incorrect and one cannot simply take half the detection limit when confronted with unknown values. As the true value of the cBOD concentration is unknown 2.5 mg/L may be a gross overestimate or underestimate of the true concentration. Proper statistical technique requires that this data be used as a categorical variable which precludes the use of most traditional statistical tests including most models. Since categorical variables cannot be (easily) modeled it would be best to run multiple scenarios at different cBOD target concentrations from very low up to and including the detection limit. This would be the only way to describe the impacts of the true, but unknown cBOD concentrations on the receiving waters.

9. Even under the 2.5 mg/L cBOD target concentration the mixing zone will be extended from 0.1 km to 7.0 km. What are the biological impacts of such a long mixing zone on aquatic biota, the receiving cold-coolwater river and the receiving wetland environment?

Total Phosphorus

10. NVCA has a policy goal of "net zero" increase in TP to the watershed. Under current modeling presented in the RWA it is estimated that additional TP will be added to the Boyne River watershed. Why were TP loading calculations not presented? How does the Town plan on achieving "net zero" TP increases?
11. The ACS has proposed to decrease the effluent limit from 0.25 mg/L to 0.12 mg/L. Under the modeled outcome the extended length (7.3 km) of mixing zone presents a significant risk of eutrophication, algae growth and ultimately oxygen depletion to the Boyne River. Is this the technological limit? Can a shorter mixing zone be achieved with enhanced treatment technologies? What are the biological impacts of such a long mixing zone on aquatic biota, the receiving cold-coolwater river and the receiving wetland environment?
12. For comparison purposes the Town of Erin WPCP which also discharges into a small coldwater headwaters has much lower compliance objectives and limits for TP than the Shelburne WPCP. The Town of Erin WPCP has proposed a TP limit of 0.045 mg/L and an objective of 0.03 mg/L. The Town of Shelburne WPCP is proposing a TP limit of 0.12 mg/L and an objective of 0.09 mg/L. Given the sensitivity of the receiver why should Shelburne not achieve similar targets?

Nitrate-Nitrogen

13. The ACS model shows the length of the mixing zone decreases from 6.7 km to 6.0 km. Can a shorter mixing zone be achieved with alternate or improved technology? What this distance suggests is that a potentially lethal environment from direct toxic effects for aquatic/herptefauna life exists downstream of the WPCP from nearly 6 km. What are the biological impacts of such a long mixing/dissipation zone on aquatic/herptefauna biota, the receiving cold-coolwater river and the receiving wetland environment?
14. Other WPCP discharging into small coldwater headwaters have much lower compliance objectives and limits for NO3-N than the Shelburne WPCP. The Town of Erin WPCP has proposed a NO3-N limit of 5 mg/L and an objective of 4 mg/L. The Town of Shelburne WPCP is proposing a NO3-N limit of 13 mg/L and an objective of 10 mg/L. Why can Shelburne

not achieve similar targets?

Ammonia-Nitrogen

15. The ACS model suggest an effluent limit of 0.35 mg/L NH3-N which would still result in a mixing zone of 3.1 km. This extended zone means heightened risk of chronic exposure to unionized ammonia which can be lethal at higher concentrations, or affect spawning, swimming and can cause physical damage (gill lesions and kidney damage) at lower concentrations.

Temperature

16. Temperature was not modeled and the impacts of significant influx of warm effluent to 7Q20 baseflow in the cold-coolwater Boyne River have not been considered. Will the natural diurnal nighttime temperature minimums be maintained? Will the natural amplitude of the cycle be maintained? Will the daytime maximums exceed tolerance thresholds for the coldwater fish present in the system? If it is found that any/all of these cannot be favourably maintained, what temperature best management practices will be instituted?

Chloride

17. Why were chloride concentrations not considered? The CCME guideline for chloride for the protection of aquatic life is 120 mg/L. The Besley Drain regularly has measured concentrations >200 mg/L, while the Boyne River downstream of the confluence has the majority (65%) of measured concentrations >120 mg/L. Will the increase in effluent flows increase or ameliorate these concentrations with regard to the CCME guideline? If increased, how will this be mitigated?

Biological Effluent Objectives

18. The information presented in the ACS taken as is, leaves serious concerns to the long-term viability of the receiving environment and its biota. Biological Effluent Objectives should be established to ensure that coldwater fish, benthic macroinvertebrate and herptefaunal populations in the receiving wetland/coldwater watercourse environment remain unaffected by the proposed effluent increases and elongation of the mixing/dissipation zones. The program should be developed with input from the MECP, NVCA and the Town of Shelburne to ensure that sensitive receiving environment and biota are adequately protected. Annual reports should be submitted to all three parties for review and acceptance that no-harmful impacts occurred. The BEO should be based on the Before-After Control-Impact (BACI) study design, but failing that should at least include a significant period of pre-impact baseline generation. An adequate pre-impact period can be determined statistically to ensure the BEO are satisfied.

General

19. The Shelburne WWTP through the difficult situation it finds itself in with a small, coldwater habitat, wetland environment receiver calls for a WPCP whose effluent is off the highest quality afforded by the limits of technology. What about alternatives to the existing WPCP or discharge location?
20. The model inputs note the use of 100% shade. The Boyne River is

never in a 100% shade environment. Much of the area around the confluence down to the Mulmur-Melancthon Townline is open meadow marsh which does not provide shading to this level.

21. The impacts of the WPCP on the receiver have not taken into consideration the cumulative impacts of numerous developments along the watercourses in Shelburne. What impacts will these developments have on the receiver that will magnify or counteract impacts from the WPCP effluent?

We trust the foregoing is of assistance to you. Should you have any questions related to this matter, please feel free to contact the undersigned.

Sincerely,

Lee J. Bull, MCIP, RPP | Manager, Planning Services

Nottawasaga Valley Conservation Authority
8195 8th Line, Utopia, ON L0M 1T0
T 705-424-1479 ext. 231 | **F** 705-424-2115
lbull@nvca.on.ca | **nvca.on.ca**

I am currently working remotely as the Nottawasaga Valley Conservation Authority is taking preventative measures to limit the spread of COVID-19. You may experience some delays or disruptions as we follow recommendations of health professionals to slow the virus from spreading.

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TECHNICAL MEMORANDUM

Date:	October 15, 2020	**Project No:**	M16018
Project Name:	Town of Shelburne, Schedule 'C' Municipal Class EA for Increased Capacity of the Water Pollution Control Plant (WPCP)		
Re:	Draft Response to NVCA Review Comments for the Receiving Water Assessment (WSP, 2015) and Assimilative Capacity Study (SBA, 2020)		
To:	Lee Bull	**Email:**	lbull@nvca.ca
Company:	Nottawasaga Valley Conservation Authority		
From:	Ian Callum, Senior Environmental Project Manager		
cc:	Morgen Wilson, NVCA Jim Moss, Town of Shelburne Jennifer Willoughby, Town of Shelburne Deborah Sinclair, Environmental Sciences Neil Hutchinson, Environmental Sciences		

Comments:

S. Burnett & Associates Limited (SBA) has reviewed NVCA's comments concerning the Receiving Water Assessment (WSP, 2015) and Assimilative Capacity Study (SBA, 2020) documents for the Town of Shelburne, Schedule 'C' Municipal Class EA for Increased Capacity of the Water Pollution Control Plant (WPCP). For clarity, we have included NVCA's comments in ***bold italics*** followed by SBA's draft response pending further discussion with NVCA.

Comment 1: It is unclear to NVCA staff whether the MECP has approved any increases to date.

Response 1: MECP has approved the ACS as of April 30, 2020.

Flow

Comment 2: The Boyne River at Earl Rowe Water Survey of Canada gauge was used in the pro-rated calculation of the 7Q20. There was no mention in either report that this gauge is immediately downstream of a flow regulated reservoir. Estimations of any low-flow parameter, including 7Q20 would be biased based on reservoir management practices. It was for this reason that MOECC staff recommended using an alternate flow gauge or to do in situ flow monitoring to determine 7Q20 or similar flow characteristics of the receiver, following the submission of the November 2012 ACS. How has this problem been resolved? Have the managed flow regime been considered in the calculations and extrapolation to the Boyne River in the vicinity of the effluent discharge?

S. Burnett & Associates Limited, 210 Broadway, Unit 203, Orangeville, ON, L9W 5G4 T: (519) 941-2949 F: (519) 941-2036
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Response 2: Yes, SBA did use the EC station to prorate flow to determine the 7Q20, as was done in the WSP 2016 RWA.

Actual August 2015 measured flow from WSP 2016 RWA at Station 3 was 0.04 m^3/s. The RWA does not indicate a specific date of measurement, just the month. Using the August mean flow at Station 02ED102 (Earl Rowe) of 0.833 m^3/s to prorate flow at Station results in a flow rate of 0.04 m^3/s (4.8% of Station 02ED102 flow), which is the same as measured flow.

Comment 3: Assuming that the pro-rated values provided in the RWA are correct and acceptable, the WPCP will be producing 0.059 m^3/s of effluent flow to the Boyne River after fully upgraded. At an annual 7Q20 of 0.011 m^3/s in the Boyne River, this means that WPCP effluent will add flows 536% higher than 7Q20 baseflow or put another way effluent will account for 84% of Boyne River 7Q20 baseflow. The ACS has set up its modeling on the assumption that since 82% of Besley Drain 7Q20 flows originates from the WPCP "it has been conservatively assumed that no dilution occurs in the Besley Drain prior to its confluence with the Boyne River." Following these same assumptions, there is a disconnect behind the rationale of the Boyne River as the receiver and the Besley Drain not and that the Boyne can provide the necessary assimilation at the discharge point or within a reasonable distance of this point.

Response 3: The conservative assumption of no dilution in the Besley Drain is due to its being dry at times of the year and was required by MECP. This is not the case for the Boyne River.

Although the WWTP contributes most of the flow in the Boyne at the Boyne / Besley Drain confluence under 7Q20 conditions (i.e., limited dilution), this is accounted for in the model.

Climate Change

Comment 4: No climate change in ACS and its impact on 7Q20.

Response 4: We acknowledge that climate change was not considered in the ACS and are open to discussing with NVCA how this might be best accomplished, and what NVCA has observed in terms of climate change trends in the watershed.

Mixing / Dissipation Zone

Comment 5: NVCA staff has concerns over the length of the proposed mixing / dissipation zones with respect to numerous effluent parameters (Table 1 as presented in the ACS). In general, the extreme length of the proposed mixing / dissipation zones create potentially harmful environmental damage and risk to ecosystem integrity, including sensitive spawning areas of provincially declining coldwater fish species (brook trout) in the immediate vicinity of the point of discharge, the cold-coolwater riverine habitat downstream of this point, and the large unevaluated wetland environments at the point of discharge and the downstream Boyne River Wetland (provincially significant wetland). It also has

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potentially negative impacts on recreational (fishing and swimming) enjoyment of the river for downstream landowners and the public.

Response 5: Our approach was to ensure that the increase in effluent did not result in additional length to the mixing zone beyond what had already been permitted by MECP at the 3,420 m^3/day effluent discharge rate. It is worth noting that this modelling is for the limit, which is higher than the effluent objective and modelled for the worst-case scenario (7Q20).

Dissolved Oxygen

Comment 6: DO is insufficiently monitored in the RWA as only two measurements were taken. As is required in Section 4.5 (Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters) the diurnal cycle of DO, as well as temperature and pH, needs to be addressed when making effluent limits. Without a baseline of information to work from all DO assessments about the receiver are speculative at best.

Response 6: Station 3 data was supplemented with Station 4 data (4 measurements) due to limited samples at Station 2. Section 4.5 refers to considering "Seasonal and/or diurnal changes or fluctuations" when establishing background conditions. We looked at seasonal changes and considered the worst-case 7Q20 scenario.

SBA also sampled upstream of the Besley / Boyne confluence on August 23, 2019 and noted DO of 9.24 and 9.31 mg/L, although this was not included in the model.

Comment 7: (DO) The ACS model was run with 4 mg/L as target. The PWQO for DO is 5 mg/L for coldwater species at 20°C, however the CCME guideline for the protection of aquatic life suggests when early life stage coldwater species are present, as is found in the vicinity of the Boyne-Besley confluence (brook trout and sculpin) a limit of 9.5 mg/L should be used. The model looks like it will maintain 6-10 mg/L, which is acceptable for warmwater fish but pushing tolerance for adult coldwater fish and lethal for early life stage coldwater fish.

Response 7: Early stage of life for fish is not happening in August (7q20). We are meeting PWQO for cold water biota which requires 6 mg/L at 15°C (Modelled temperature at confluence is 16°C). In fact, the modelling shows an increase in DO concentrations from 7.47 mg/L to 8.53mg/L less than 500 m from the Besley/Boyne confluence, rising over 9 mg/L in 6 km from the confluence.

The model shows an increase in DO resulting from WWTP discharge above baseline (i.e., before the confluence), which is a positive impact.

Early stage fish would not be present under 7Q20 conditions.

S. Burnett & Associates Limited, 210 Broadway, Unit 203, Orangeville, ON, L9W 5G4 T: (519) 941-2949 F: (519) 941-2036
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Comment 8: The model appears to treat DO is a single static parameter and not consider its diurnal cycling. The natural diurnal cycle of the Boyne River is not presented in the RWA or the ACS as is required in Section 4.5 (Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters). Are the average results presented in the ACS daytime averages or nighttime lows? Have nighttime lows been considered and do they approach critical thresholds for coldwater species? If it is found that lows cannot be favourably maintained, what DO best management practices will be instituted?

Response 8: The model predicted DO levels based on the calibration, which was run using daytime DO measurements. The model did not consider diurnal cycling.

We will discuss with the Town including DO monitoring as part of a monitoring program. If DO levels drop below the target concentration, best management practices could include aerating the effluent to increase DO concentrations.

cBOD5

Comment 9: The model was run using a cBOD target concentration of 2.5 mg/L as the 75th percentile of half of the lab detection limit of 5 mg/L. This assumption is statistically incorrect and one cannot simply take half the detection limit when confronted with unknown values. As the true value of the cBOD concentration is unknown 2.5 mg/L may be a gross overestimate or underestimate of the true concentration. Proper statistical technique requires that this data be used as a categorical variable which precludes the use of most traditional statistical tests including most models. Since categorical variables cannot be (easily) modeled it would be best to run multiple scenarios at different cBOD target concentrations from very low up to and including the detection limit. This would be the only way to describe the impacts of the true, but unknown cBOD concentrations on the receiving waters.

Response 9: Current predicted effluent using a cBOD5 target of 2.5 mg/L maintains DO levels that meet PWQO and that are higher than prior to the Boyne / Besley confluence.

Comment 10: Even under the 2.5 mg/L cBOD target concentration the mixing zone will be extended from 0.1 km to 7.0 km. What are the biological impacts of such a long mixing zone on aquatic biota, the receiving cold-coolwater river and the receiving wetland environment?

Response 10: Current predicted effluent using a cBOD5 target of 2.5 mg/L maintains DO levels that meet PWQO and that are higher than prior to the Boyne / Besley confluence.

Total Phosphorus

Comment 11: NVCA has a policy goal of "net zero" increase in TP to the watershed. Under current modeling presented in the RWA it is estimated that additional TP will be added to the Boyne River watershed. Why were TP loading calculations not presented? How does the Town plan on achieving "net zero" TP increases?

S. Burnett & Associates Limited, 210 Broadway, Unit 203, Orangeville, ON, L9W 5G4 T: (519) 941-2949 F: (519) 941-2036
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Response 11: 0.25 mg/L TP (old limit) X 3,420,000 L/d = 855 g/day.

0.12 mg/L TP (new limit) X 5,100,000 L/d = 612 g/day.

There will be reduced maximum TP loading as a result of the new limit.

Comment 12: The ACS has proposed to decrease the effluent limit from 0.25 mg/L to 0.12 mg/L. Under the modeled outcome the extended length (7.3 km) of mixing zone presents a significant risk of eutrophication, algae growth and ultimately oxygen depletion to the Boyne River. Is this the technological limit? Can a shorter mixing zone be achieved with enhanced treatment technologies? What are the biological impacts of such a long mixing zone on aquatic biota, the receiving cold-coolwater river and the receiving wetland environment?

Response 12: Part of the issue is background TP levels. The 75th percentile TP at Station 2, U/S of the Besley / Boyne confluence is 0.065 mg/L. With the proposed effluent limit of 0.12mg/L, concentration return to 0.065mg/L in less than 1 km.

Comment 13: (TP) For comparison purposes, the Town of Erin WPCP which also discharges into a small coldwater headwaters has much lower compliance objectives and limits for TP than the Shelburne WPCP. The Town of Erin WPCP has proposed a TP limit of 0.045 mg/L and an objective of 0.03 mg/L. The Town of Shelburne WPCP is proposing a TP limit of 0.12 mg/L and an objective of 0.09 mg/L. Given the sensitivity of the receiver why should Shelburne not achieve similar targets?

Response 13: Our approach was to ensure that the increase in effluent did not result in additional length to the mixing zone beyond what had already been permitted by MECP at the 3,420 m^3/day effluent discharge rate. TP concentrations in the Boyne return to baseline in less than 1 km.

The Erin WWTP is a new build plant, and not the expansion of an existing facility, so a direct comparison is not appropriate.

Nitrate-N

Comment 14: (nitrate) The ACS model shows the length of the mixing zone decreases from 6.7 km to 6.0 km. Can a shorter mixing zone be achieved with alternate or improved technology? What this distance suggests is that a potentially lethal environment from direct toxic effects for aquatic / herptefauna life exists downstream of the WPCP from nearly 6 km. What are the biological impacts of such a long mixing / dissipation zone on aquatic / herptefauna biota, the receiving cold-coolwater river and the receiving wetland

Response 14: There is no PWQO for nitrate in Ontario. Canadian Water Quality Guidelines and US EPA Water Quality Criteria recommend 13 mg/L nitrate.

S. Burnett & Associates Limited, 210 Broadway, Unit 203, Orangeville, ON, L9W 5G4 T: (519) 941-2949 F: (519) 941-2036
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A 13 mg/L Nitrate limit represents a lower concentration than the 16.3 mg/L 75th percentile measured in the Besley drain from 2015-2016 (RWA), as does the 10 mg/L objective. Also, the dissipation zone should be reduced under non-7Q20 conditions.

Proposed effluent limits will achieve current or better than current conditions.

Comment 15: Other WPCP discharging into small coldwater headwaters have much lower compliance objectives and limits for NO3-N than the Shelburne WPCP. The Town of Erin WPCP has proposed a NO3-N limit of 5 mg/L and an objective of 4 mg/L. The Town of Shelburne WPCP is proposing a NO3-N limit of 13 mg/L and an objective of 10 mg/L. Why can Shelburne not achieve similar targets?

Response 15: There is no PWQO for nitrate in Ontario. Canadian Water Quality Guidelines and US EPA Water Quality Criteria recommend 13 mg/L nitrate.

The Erin WWTP is a new build plant, and not the expansion of an existing facility, so a direct comparison is not appropriate.

Ammonia-N

Comment 16: The ACS model suggest an effluent limit of 0.35 mg/L NH3-N which would still result in a mixing zone of 3.1 km. This extended zone means heightened risk of chronic exposure to unionized ammonia which can be lethal at higher concentrations, or affect spawning, swimming and can cause physical damage (gill lesions and kidney damage) at lower concentrations.

Response 16: Our proposed limit is at the limit of technology and is almost ½ what is allowed for Erin.

PWQO has a unionized ammonia objective of 20µg/L and CCME 19µg/L. CCME has a water guideline of 0.715 mg/L total ammonia for the protection of aquatic life. Our proposed limit is ½ of the CCME guideline.

At 15°C and pH 8, 0.35mg/L total ammonia = 0.009345 mg/L UIA. According to the Canadian Water Quality Guidelines for the Protection of Aquatic life "the reported lowest observed effect concentration for UIA in a 5-year chronic study is 0.04 mg/L.

Temperature

Comment 17: Temperature was not modeled and the impacts of significant influx of warm effluent to 7Q20 baseflow in the cold-coolwater Boyne River have not been considered. Will the natural diurnal nighttime temperature minimums be maintained? Will the natural amplitude of the cycle be maintained? Will the daytime maximums exceed tolerance thresholds for the coldwater fish present in the system? If it is found that any / all of these cannot be favourably maintained, what temperature best management practices will be instituted?

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Response 17: At 5,100 m^3/day temperature increases from 11.6 to 16°C before dropping to 14.6°C approx. 5 km downstream of the Besley / Boyne confluence. This is almost identical for 3,420 m^3/day (max 15.7°C).

Chloride

Comment 18: Why were chloride concentrations not considered? The CCME guideline for chloride for the protection of aquatic life is 120 mg/L. The Besley Drain regularly has measured concentrations >200 mg/L, while the Boyne River downstream of the confluence has the majority (65%) of measured concentrations >120 mg/L. Will the increase in effluent flows increase or ameliorate these concentrations with regard to the CCME guideline? If increased, how will this be mitigated?

Response 18: Chloride is not a requirement under PWQO and not considered a parameter of concern by MECP.

Biological Effluent Objectives

Comment 19: The information presented in the ACS taken as is, leaves serious concerns to the long-term viability of the receiving environment and its biota. Biological Effluent Objectives should be established to ensure that coldwater fish, benthic macroinvertebrate and herptefaunal populations in the receiving wetland / coldwater watercourse environment remain unaffected by the proposed effluent increases and elongation of the mixing / dissipation zones. The program should be developed with input from the MECP, NVCA and the Town of Shelburne to ensure that sensitive receiving environment and biota are adequately protected. Annual reports should be submitted to all three parties for review and acceptance that no-harmful impacts occurred. The BEO should be based on the Before-After Control-Impact (BACI) study design but failing that should at least include a significant period of pre-impact baseline generation. An adequate pre-impact period can be determined statistically to ensure the BEO are satisfied.

Response 19: The limits have been derived are based on ensuring that water quality is as good, or better than current conditions and limits have been approved by MECP as protective of aquatic life. The operator is required to report any exceedances of effluent limits to MECP and submit annual performance reports. As discussed earlier, we acknowledge that monitoring DO as part of a post-EA monitoring program is appropriate.

General

Comment 20: The Shelburne WWTP through the difficult situation it finds itself in with a small, coldwater habitat, wetland environment receiver calls for a WPCP whose effluent is off the highest quality afforded by the limits of technology. What about alternatives to the existing WPCP or discharge location?

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Response 20: Constructing a new WWTP or a 2nd WWTP to deal with the additional flow is being considered in the Class EA, as was sending wastewater to a neighbouring community. These options were not selected as the preferred alternative solution based on a weighted assessment.
We are not aware of any cost-feasible alternative discharge locations.

Comment 21: The model inputs note the use of 100% shade. The Boyne River is never in a 100% shade environment. Much of the area around the confluence down to the Mulmur-Melancthon Townline is open meadow marsh which does not provide shading to this level.

Response 21: We acknowledge that there is not 100% shade along the banks of the Boyne downstream of the Boyne / Besley confluence. However, the model was calibrated using 100% shade and accurately predicted concentrations of downstream parameters that would be impacted by temperature.

Comment 22: The impacts of the WPCP on the receiver have not taken into consideration the cumulative impacts of numerous developments along the watercourses in Shelburne. What impacts will these developments have on the receiver that will magnify or counteract impacts from the WPCP effluent?

Response 22: The Besley Drain was conservatively considered as a pipe with negligible flow and no dilution as required by MECP, therefore upstream impacts would have no impact. Future developments along the Boyne, U/S of the Besley / Boyne confluence, including Walter's Creek, will be required to meet Town of Shelburne and NVCA guidelines for Stormwater outflow. Cumulative impacts are not considered to be within the scope of this EA.

S. Burnett & Associates Limited, 210 Broadway, Unit 203, Orangeville, ON, L9W 5G4 T: (519) 941-2949 F: (519) 941-2036
www.sbaengineering.com

Shelburne WPCP Adaptive Monitoring and Stewardship Program

NVCA staff have put some notes for consideration with respect to an Adaptive Monitoring and Stewardship Program (AMSP) for the Town of Shelburne related to the Shelburne Water Pollution Control Plant expansion.

Assumptions

The notes for consideration encompass the follow assumptions:

1) The Town and the NVCA both understand that Shelburne will grow and needs expanded WPCP capacity to properly service that growth.
2) The Town and the NVCA both want the best outcomes for the health of the upper Boyne River.
3) The AMSP is to be designed as a best-efforts program and cannot do everything, resources are limited and the AMSP cannot continue in perpetuity.

Currently the WPCP operates at a current capacity of 3,420 m^3/day with growth projections showing a needed capacity of 5,100 m^3/d servicing a population of 15,100 by 2041. The NVCA has concerns that despite the Town having an MECP-approved Assimilative Capacity Study (ACS) the impacts of the capacity expansion may have detrimental impacts on the health of the living ecosystem of the Boyne River. The NVCA and the Town have agreed to open discussions on the potential for an Adaptive Monitoring and Stewardship Program for the upper Boyne River. This program would be designed with two outcomes in mind: 1) stewardship – improve the health of the upper Boyne River from impacts associated with surrounding land uses outside those of the WPCP, and 2) adaptive monitoring – measure indicators to determine early onset of detrimental impacts on the ecosystem of the upper Boyne River, and have a plan to offset impacts if they arise.

The largest challenge for the Town is that its effluent receiver is the Boyne River near its headwaters. At the point of discharge, the Boyne River is very small and provides very limited, possibly negligible assimilative capacity or ability to self-clean following the reception of the wastewater. Also at the point of discharge the Boyne River is a thermally coolwater river flowing through a large unevaluated wetland environment with resident spawning and rearing habitat for brook trout and sculpin, both coldwater fishes in the immediate area. Migrating coolwater rainbow trout also find viable habitat in the area of the discharge point. The Boyne River in this area flows through a headwater wetland environment downstream toward Mulmur-Melancthon Townline approximately two kilometres downstream from the Besley-Boyne confluence. NVCA staff are very concerned that the added effluent flows to the Boyne River at the point of discharge will have significant negative impacts on the wetland environment and cold/cool water watercourse and its biota.

Areas of Concern

The following areas of concern were noted by NVCA staff during their review of the ACS and EA. This list is a starting point for discussion.

- Flow assumptions
- Temperature
- Dissolved oxygen
- Phosphorus
- Nitrate
- Ammonia toxicity
- Impacts on local aquatic and wetland community

Adaptive Monitoring

The following timelines for sampling are proposed to capture a baseline of conditions prior to any plant modifications and for short-term and longer term impacts following upgrades. NVCA staff is unclear on how many phases are required for the plant expansion. Two different timeline Gantt Charts are presented to described the proposed monitoring schedule.

- Baseline now
- 2 years before each plant expansion phase goes live
- 2 years after each plant expansion phase goes live
- Post-plant expansion monitoring on year 5 and 10

Parameters

- Flow – gauge at CR 124 or Mulmur-Melancthon TL
- Temperature, DO, pH (if doing toxicity) – loggers US, DS & M-M TL
- Phosphorus, nitrate, ammonia, chlorides – grab samples 1 monthly US, DS & M-M TL (3 sites x 12 months + shipping)
- Benthic macroinvertebrates – once baseline, once pre-expansion, twice post-expansion, 5-year cycle (3 sites).
- Fishes – once baseline, once pre-expansion, twice post-expansion, 5-year cycle (3 sites).
- Frogs - once baseline, once pre-expansion, twice post-expansion, 5-year cycle (3 sites).

Stations

- Control station above the Besley Drain-Boyne River confluence but below the Boyne River-Walter's Creek confluence
- Impact station below the Besley Drain-Boyne River confluence, exact location to be determined but a minimum of 100 metres downstream of confluence.
- Far-field impact station at Mulmur-Melancthon Townline river crossing.
- If a continuous flow gauge is deemed necessary for the program it would be located at Dufferin Road 124 river crossing. If CR124 found to be unsuitable then Mulmur-Melancthon Townline river crossing.
- Frog monitoring would occur at 3 stations: the confluence wetland, the CR124 wetland and a local control station TBD.

Triggers

- Temperature: change in thermal regime (i.e. coolwater to warmwater), loss of diurnal recovery
- DO: nighttime low falls below threshold for coldwater species
- Total phosphorus: Impact and far-field station above PWQO of 0.03 mg/L. Impact station x% greater than control station
- Nitrate: Impact and far-field station above CCME guideline for the protection of aquatic life 3 mg/L NO3-N. Impact station x% greater than control station.
- Ammonia: Impact and far-field station above toxicity thresholds in PWQO.
- TSS: Impact and far-field station above PWQO.
- Chlorides: Impact and far-field station above PWQO.
- Benthic macroinvertebrate: significant (2 standard deviations) divergence from baseline conditions in key indicator parameters (%EPT, etc.)
- Fisheries: significant divergence from baseline conditions in key indicator parameters (presence of coldwater species (CWS), mass of CWS)
- Frogs: significant divergence from baseline or control station in key indicator parameters (loss of frog species, loss in relative frog abundance).

Parameter	Method	Now	Pre-Expansion Years	PE-2	PE-1	Plant Expansion	PE+1	PE+2	Post-Expansion Years	
Theoretical timeline (to be confimed)		2021	2022-2027	2028	2029	2030	2031	2032	2035	2040
Flow gauge	continuous logger									
Temperature	logger									
DO	logger									
pH	logger									
TP, NH4, NO3, Cl	monthly grab samples									
Benthic macroinvertebrates	kick & sweep									
Fisheries	electrofishing									
Frogs	call surveys									

Parameter	Method	Now	Pre-Expansion Years	PE1-2	PE1-1	Plant Expansion 1	PE1+1	PE1+2	Inter-Expansion Years	PE2-2	PE2-1	Plant Expansion 2	PE2+1	PE2+2	Post-Expansion Years		
Theoretical timeline (to be confirmed)		2021	2022-2027	2028	2029	2030	2031	2032	2033-2037	2038	2039	2040	2041	2042	2035	2045	2050
Flow gauge	continuous logger																
Temperature	logger																
DO	logger																
pH	logger																
TP, NH4, NO3, Cl	monthly grab samples																
Benthic macroinvertebrates	kick & sweep																
Fisheries	electrofishing																
Frogs	call surveys																

Costing

- Rough estimate for discussion purposes based on NVCA costing in 2020 dollars subject to inflation.
- Flow gauge capital costs about $20,000 with an initial operational cost of about $3,500 and subsequent annual operating costs of $1,300. A recurrence of capital costs for equipment replacement are anticipated every 10 years though variable for individual pieces.
- Non-gauge initial capital cost of about $9,000, if NVCA doing the work can share equipment for lower cost. Capital cost replacement to ensure working equipment over span of program – 2x for single phase expansion, 3x for dual phase expansion.
- Non-gauge annual operating/staffing costs of about $13,000, only occurring on sampling years – 7 sampling years for single phase expansion, 11 sampling years for dual phase expansion.

Item	Cost Category	Capital or Annual Cost	Single Phase Expansion (30 years)	Two Phase Expansion (30 years)
Flow Gauge	Capital Cost	$20,000	$60,000	$60,000
	Operation – year 1	$3,500	$3,500	$3,500
	Annual Operation	$1,500	$43,500	$43,500
Total			$107,000	$107,000
Chemistry logging (temperature, DO, pH)	Capital Cost	$9,000	$27,000	$36,000
	Annual Operation	$1,000	$7,000	$11,000
Chemistry (TP, NO3, NH4, Cl)	Annual Operation	$5,000	$35,000	$55,000
Biological Community (BMI, fish, frogs)	Annual Operation	$9,000	$54,000	$81,000
Non-Gauge Total	Capital Cost		$27,000	$36,000
	Operation		$96,000	$147,000
Grand Total			$230,000	$290,000

Stewardship

Stewardship works in the Boyne River headwaters area are proposed as enhancement or restoration projects in the vicinity of Shelburne. All proposed projects would have a direct impact on the assimilative capacity or coldwater habitat in this area that would benefit or offset impacts from the expansion of the WPCP or development within Shelburne.

- Enhanced riparian plantings through Town including along Besley Drain
- Proactively dealing with residents removing/mowing buffer zones (Town property) around Walter's Creek
- Retrofitting, where necessary, stormwater pond outlets for thermal mitigation
- Routing clean groundwater away from WPCP and storm drains and redirecting it to streams
- Ensuring past developments uphold their restoration and greening commitments
- Low Impact Development in all future developments: residential, commercial and ICI
- 3rd Line pond bypass or enhanced bottom draw to additional baseflow

- Livestock exclusion fencing of cattle pasture between 3rd and 4th Line and upstream of Mulmur-Melancthon Townline, if these fields still active
- Mulmur-Melancthon Townline dam decommissioning
- Excluding groundwater from stormwater pond of development in NW Shelburne draining into Walter's Creek
- Review of new opportunities in Town park lands and through new developments e.g. restoring Besley Drain form/function

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ENGINEERING & ENVIRONMENTAL

Appendix F

Archaeological Assessment

Print Form Clear Form

Ontario

Ministry of Tourism, Culture and Sport

Programs & Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

Criteria for Evaluating Archaeological Potential

A Checklist for the Non-Specialist

The **purpose of the checklist** is to determine:

- if a property(ies) or project area may contain archaeological resources i.e., have archaeological potential
- it includes all areas that may be impacted by project activities, including – but not limited to:
  - the main project area
  - temporary storage
  - staging and working areas
  - temporary roads and detours

Processes covered under this checklist, such as:

- *Planning Act*
- *Environmental Assessment Act*
- *Aggregates Resources Act*
- *Ontario Heritage Act* – Standards and Guidelines for Conservation of Provincial Heritage Properties

Archaeological assessment

If you are not sure how to answer one or more of the questions on the checklist, you may want to hire a licensed consultant archaeologist (see page 4 for definitions) to undertake an archaeological assessment.

The assessment will help you:

- identify, evaluate and protect archaeological resources on your property or project area
- reduce potential delays and risks to your project

Note: By law, archaeological assessments **must** be done by a licensed consultant archaeologist. Only a licensed archaeologist can assess – or alter – an archaeological site.

What to do if you:

- **find an archaeological resource**

  If you find something you think may be of archaeological value during project work, you must – by law – stop all activities immediately and contact a licensed consultant archaeologist

  The archaeologist will carry out the fieldwork in compliance with the *Ontario Heritage Act* [s.48(1)].

- **unearth a burial site**

  If you find a burial site containing human remains, you must immediately notify the appropriate authorities (i.e., police, coroner's office, and/or Registrar of Cemeteries) and comply with the *Funeral, Burial and Cremation Services Act*.

Other checklists

Please use a separate checklist for your project, if:

- you are seeking a Renewable Energy Approval under Ontario Regulation 359/09 – separate checklist
- your Parent Class EA document has an approved screening criteria (as referenced in Question 1)

Please refer to the Instructions pages when completing this form.

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Project or Property Name

Project or Property Location (upper and lower or single tier municipality)

Proponent Name

Proponent Contact Information

Screening Questions

	Yes	No
1. Is there a pre-approved screening checklist, methodology or process in place?	☐	☐

If Yes, please follow the pre-approved screening checklist, methodology or process.

If No, continue to Question 2.

	Yes	No
2. Has an archaeological assessment been prepared for the property (or project area) and been accepted by MTCS?	☐	☐

If Yes, do **not** complete the rest of the checklist. You are expected to follow the recommendations in the archaeological assessment report(s).

The proponent, property owner and/or approval authority will:

- summarize the previous assessment
- add this checklist to the project file, with the appropriate documents that demonstrate an archaeological assessment was undertaken e.g., MTCS letter stating acceptance of archaeological assessment report

The summary and appropriate documentation may be:

- submitted as part of a report requirement e.g., environmental assessment document
- maintained by the property owner, proponent or approval authority

If No, continue to Question 3.

	Yes	No
3. Are there known archaeological sites on or within 300 metres of the property (or the project area)?	☐	☐
4. Is there Aboriginal or local knowledge of archaeological sites on or within 300 metres of the property (or project area)?	☐	☐
5. Is there Aboriginal knowledge or historically documented evidence of past Aboriginal use on or within 300 metres of the property (or project area)?	☐	☐
6. Is there a known burial site or cemetery on the property or adjacent to the property (or project area)?	☐	☐
7. Has the property (or project area) been recognized for its cultural heritage value?	☐	☐

If Yes to any of the above questions (3 to 7), do **not** complete the checklist. Instead, you need to hire a licensed consultant archaeologist to undertake an archaeological assessment of your property or project area.

If No, continue to question 8.

	Yes	No
8. Has the entire property (or project area) been subjected to recent, extensive and intensive disturbance?	☐	☐

If Yes to the preceding question, do **not** complete the checklist. Instead, please keep and maintain a summary of documentation that provides evidence of the recent disturbance.

An archaeological assessment is not required.

If No, continue to question 9.

	Yes	No
9. Are there present or past water sources within 300 metres of the property (or project area)?	☐	☐

If Yes, an archaeological assessment is required.

If No, continue to question 10.

	Yes	No
10. Is there evidence of two or more of the following on the property (or project area)?	☐	☐

- elevated topography
- pockets of well-drained sandy soil
- distinctive land formations
- resource extraction areas
- early historic settlement
- early historic transportation routes

If Yes, an archaeological assessment is required.

If No, there is low potential for archaeological resources at the property (or project area).

The proponent, property owner and/or approval authority will:

- summarize the conclusion
- add this checklist with the appropriate documentation to the project file

The summary and appropriate documentation may be:

- submitted as part of a report requirement e.g., under the *Environmental Assessment Act, Planning Act* processes
- maintained by the property owner, proponent or approval authority

Instructions

Please have the following available, when requesting information related to the screening questions below:

- a clear map showing the location and boundary of the property or project area
    - large scale and small scale showing nearby township names for context purposes
- the municipal addresses of all properties within the project area
- the lot(s), concession(s), and parcel number(s) of all properties within a project area

In this context, the following definitions apply:

- **consultant archaeologist** means, as defined in Ontario regulation as an archaeologist who enters into an agreement with a client to carry out or supervise archaeological fieldwork on behalf of the client, produce reports for or on behalf of the client and provide technical advice to the client. In Ontario, these people also are required to hold a valid professional archaeological licence issued by the Ministry of Tourism, Culture and Sport.
- **proponent** means a person, agency, group or organization that carries out or proposes to carry out an undertaking or is the owner or person having charge, management or control of an undertaking.

1. Is there a pre-approved screening checklist, methodology or process in place?

An existing checklist, methodology or process may be already in place for identifying archaeological potential, including:

- one prepared and adopted by the municipality e.g., archaeological management plan
- an environmental assessment process e.g., screening checklist for municipal bridges
- one that is approved by the Ministry of Tourism, Culture and Sport under the Ontario government's Standards & Guidelines for Conservation of Provincial Heritage Properties [s. B.2.]

2. Has an archaeological assessment been prepared for the property (or project area) and been accepted by MTCS?

Respond 'yes' to this question, if all of the following are true:

- an archaeological assessment report has been prepared and is in compliance with MTCS requirements
    - a letter has been sent by MTCS to the licensed archaeologist confirming that MTCS has added the report to the Ontario Public Register of Archaeological Reports (Register)
- the report states that there are no concerns regarding impacts to archaeological sites

Otherwise, if an assessment has been completed and deemed compliant by the MTCS, and the ministry recommends further archaeological assessment work, this work will need to be completed.

For more information about archaeological assessments, contact:

- approval authority
- proponent
- consultant archaeologist
- Ministry of Tourism, Culture and Sport at archaeology@ontario.ca

3. Are there known archaeological sites on or within 300 metres of the property (or project area)?

MTCS maintains a database of archaeological sites reported to the ministry.

For more information, contact MTCS Archaeological Data Coordinator at archaeology@ontario.ca.

4. Is there Aboriginal or local knowledge of archaeological sites on or within 300 metres of the property?

Check with:

- Aboriginal communities in your area
- local municipal staff

They may have information about archaeological sites that are not included in MTCS' database.

Other sources of local knowledge may include:

- property owner
- local heritage organizations and historical societies
- local museums
- municipal heritage committee
- published local histories

5. Is there Aboriginal knowledge or historically documented evidence of past Aboriginal use on or within 300 metres of the property (or property area)?

Check with:

- Aboriginal communities in your area
- local municipal staff

Other sources of local knowledge may include:

- property owner
- local heritage organizations and historical societies
- local museums
- municipal heritage committee
- published local histories

6. Is there a known burial site or cemetery on the property or adjacent to the property (or project area)?

For more information on known cemeteries and/or burial sites, see:

- Cemeteries Regulation Unit, Ontario Ministry of Consumer Services – for database of registered cemeteries
- Ontario Genealogical Society (OGS) – to locate records of Ontario cemeteries, both currently and no longer in existence; cairns, family plots and burial registers
- Canadian County Atlas Digital Project – to locate early cemeteries

In this context, 'adjacent' means 'contiguous', or as otherwise defined in a municipal official plan.

7. Has the property (or project area) been recognized for its cultural heritage value?

There is a strong chance there may be archaeological resources on your property (or immediate area) if it has been listed, designated or otherwise identified as being of cultural heritage value by:

- your municipality
- Ontario government
- Canadian government

This includes a property that is:

- designated under *Ontario Heritage Act* (the OHA), including:
  - individual designation (Part IV)
  - part of a heritage conservation district (Part V)
  - an archaeological site (Part VI)
- subject to:
  - an agreement, covenant or easement entered into under the OHA (Parts II or IV)
  - a notice of intention to designate (Part IV)
  - a heritage conservation district study area by-law (Part V) of the OHA
- listed on:
  - a municipal register or inventory of heritage properties
  - Ontario government's list of provincial heritage properties
  - Federal government's list of federal heritage buildings
- part of a:
  - National Historic Site
  - UNESCO World Heritage Site
- designated under:
  - *Heritage Railway Station Protection Act*
  - *Heritage Lighthouse Protection Act*
- subject of a municipal, provincial or federal commemorative or interpretive plaque.

To determine if your property or project area is covered by any of the above, see:

- Part A of the MTCS Criteria for Evaluating Potential for Built Heritage and Cultural Heritage Landscapes

Part VI – Archaeological Sites

Includes five sites designated by the Minister under Regulation 875 of the Revised Regulation of Ontario, 1990 (Archaeological Sites) and 3 marine archaeological sites prescribed under Ontario Regulation 11/06.

For more information, check Regulation 875 and Ontario Regulation 11/06.

8. Has the entire property (or project area) been subjected to recent extensive and intensive ground disturbance?

Recent: after-1960

Extensive: over all or most of the area

Intensive: thorough or complete disturbance

Examples of ground disturbance include:

- quarrying
- major landscaping – involving grading below topsoil
- building footprints and associated construction area
    - where the building has deep foundations or a basement
- infrastructure development such as:
    - sewer lines
    - gas lines
    - underground hydro lines
    - roads
    - any associated trenches, ditches, interchanges. **Note**: this applies only to the excavated part of the right-of-way; the remainder of the right-of-way or corridor may not have been impacted.

A ground disturbance does **not** include:

- agricultural cultivation
- gardening
- landscaping

Site visits

You can typically get this information from a site visit. In that case, please document your visit in the process (e.g., report) with:

- photographs
- maps
- detailed descriptions

If a disturbance isn't clear from a site visit or other research, you need to hire a licensed consultant archaeologist to undertake an archaeological assessment.

9. Are there present or past water bodies within 300 metres of the property (or project area)?

Water bodies are associated with past human occupations and use of the land. About 80-90% of archaeological sites are found within 300 metres of water bodies.

Present

- Water bodies:
    - primary - lakes, rivers, streams, creeks
    - secondary - springs, marshes, swamps and intermittent streams and creeks
- accessible or inaccessible shoreline, for example:
    - high bluffs
    - swamps
    - marsh fields by the edge of a lake
    - sandbars stretching into marsh

Water bodies not included:

- man-made water bodies, for example:
  - temporary channels for surface drainage
  - rock chutes and spillways
  - temporarily ponded areas that are normally farmed
  - dugout ponds
- artificial bodies of water intended for storage, treatment or recirculation of:
  - runoff from farm animal yards
  - manure storage facilities
  - sites and outdoor confinement areas

Past

Features indicating past water bodies:

- raised sand or gravel beach ridges – can indicate glacial lake shorelines
- clear dip in the land – can indicate an old river or stream
- shorelines of drained lakes or marshes
- cobble beaches

You can get information about water bodies through:

- a site visit
- aerial photographs
- 1:10,000 scale Ontario Base Maps - or equally detailed and scaled maps.

10. Is there evidence of two or more of the following on the property (or project area)?

- elevated topography
- pockets of well-drained sandy soil
- distinctive land formations
- resource extraction areas
- early historic settlement
- early historic transportation routes

- **Elevated topography**

  Higher ground and elevated positions - surrounded by low or level topography - often indicate past settlement and land use.

  Features such as eskers, drumlins, sizeable knolls, plateaus next to lowlands, or other such features are a strong indication of archaeological potential.

  Find out if your property or project area has elevated topography, through:

  - site inspection
  - aerial photographs
  - topographical maps

- **Pockets of well-drained sandy soil, especially within areas of heavy soil or rocky ground**

  Sandy, well-drained soil - in areas characterized by heavy soil or rocky ground - may indicate archaeological potential

  Find out if your property or project area has sandy soil through:

  - site inspection
  - soil survey reports

- **Distinctive land formations**

  Distinctive land formations include – but are not limited to:

  - waterfalls
  - rock outcrops
  - rock faces
  - caverns
  - mounds, etc.

  They were often important to past inhabitants as special or sacred places. The following sites may be present – or close to – these formations:

  - burials
  - structures
  - offerings
  - rock paintings or carvings

  Find out if your property or project areas has a distinctive land formation through:

  - a site visit
  - aerial photographs
  - 1:10,000 scale Ontario Base Maps - or equally detailed and scaled maps.

- **Resource extraction areas**

  The following resources were collected in these extraction areas:

  - food or medicinal plants e.g., migratory routes, spawning areas, prairie
  - scarce raw materials e.g., quartz, copper, ochre or outcrops of chert
  - resources associated with early historic industry e.g., fur trade, logging, prospecting, mining

  Aboriginal communities may hold traditional knowledge about their past use or resources in the area.

- **Early historic settlement**

  Early Euro-Canadian settlement include – but are not limited to:

  - early military or pioneer settlement e.g., pioneer homesteads, isolated cabins, farmstead complexes
  - early wharf or dock complexes
  - pioneers churches and early cemeteries

  For more information, see below – under the early historic transportation routes.

- **Early historic transportation routes** - such as trails, passes, roads, railways, portage routes, canals.

  For more information, see:

  - historical maps and/or historical atlases
    - for information on early settlement patterns such as trails (including Aboriginal trails), monuments, structures, fences, mills, historic roads, rail corridors, canals, etc.
    - Archives of Ontario holds a large collection of historical maps and historical atlases
    - digital versions of historic atlases are available on the Canadian County Atlas Digital Project
  - commemorative markers or plaques such as local, provincial or federal agencies
  - municipal heritage committee or other local heritage organizations
    - for information on early historic settlements or landscape features (e.g., fences, mill races, etc.)
    - for information on commemorative markers or plaques

From: von Bitter, Robert (MHSTCI)
To: Ian Callum
Subject: RE: Request for Archaeological Information - Town of Shelburne
Date: April 20, 2020 4:36:47 PM
Attachments: image001.png

Ian,

No reported archaeological sites are mapping within 300 m of that location.

Regards,

Rob

Robert von Bitter
Archaeological Data Co-Ordinator
Archaeology Program Unit
Heritage, Tourism and Culture Division
Ministry of Heritage, Sport, Tourism and Culture Industries
401 Bay Street Suite 1700
Toronto, Ontario M7A 0A7
416-314-7161
Robert.vonBitter@ontario.ca

From: Ian Callum <ian.callum@sbaengineering.com>
Sent: April-20-20 4:28 PM
To: von Bitter, Robert (MHSTCI) <Robert.vonBitter@ontario.ca>
Subject: RE: Request for Archaeological Information - Town of Shelburne

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Rob,

I have attached a map showing the Project Boundary and a 300 m buffer. The legal property extends beyond the Project Boundary, including into a neighbouring park, as both are owned by the Town of Shelburne. All project activities would be restricted to within the Project Boundary, so this seemed more appropriate.

Much appreciated,

Ian

From: von Bitter, Robert (MHSTCI) <Robert.vonBitter@ontario.ca>

Sent: April 20, 2020 9:21 AM
To: Ian Callum <ian.callum@sbaengineering.com>
Subject: RE: Request for Archaeological Information - Town of Shelburne

Ian,

Do you have a map of the subject property you could provide?

Thanks,

Rob

Robert von Bitter
Archaeological Data Co-Ordinator
Archaeology Program Unit
Heritage, Tourism and Culture Division
Ministry of Heritage, Sport, Tourism and Culture Industries
401 Bay Street Suite 1700
Toronto, Ontario M7A 0A7
416-314-7161
Robert.vonBitter@ontario.ca

From: Ian Callum <ian.callum@sbaengineering.com>
Sent: April 19, 2020 2:42 PM
To: Archaeology (MHSTCI) <archaeology@ontario.ca>
Subject: Request for Archaeological Information - Town of Shelburne

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good day,

On behalf of the Town of Shelburne, please accept this request for archaeological information in support the Town's Environmental Assessment for Increased Capacity of the Town of Shelburne's Water Pollution Control Plant (WPCP). To complete the "Criteria for Evaluating Archaeological Potential - A Checklist for the Non-Specialist", the Town requires confirmation that there are no archaeological sites on, or within 300 m of the WPCP property, located at 300 Centennial Road, Shelburne Ontario.

If you have any questions, or require additional information in support of this request, don't hesitate to contact me. Kind regards,

Ian Callum
Sr. Environmental Project Manager

S. Burnett & Associates Limited
210 Broadway, Unit 203
Orangeville, ON L9W 5G4

T: 519.941.2949 ext. 240
C: 519.215.6893
W: www.sbaengineering.com

S. BURNETT & ASSOCIATES LIMITED
ENGINEERING & ENVIRONMENTAL

Appendix G

Maintenance, Repair and Safety Issues Identified by WCPC Operator

Issues Identified by OCWA

Category	OCWA Input
General	Round about driveway for truck haulage – Health & safety issue for local pedestrian traffic, time consuming while hauling (see pictures below for possible suggestions)
General	Light fixtures in headworks/garage revamped, lowered for easier light bulb replacement, LED, energy efficiency throughout plant
General	A/C
General	New Lab, sink/potable water plumbing rusted, leaking. Shelves rusted
General	Eye wash stations, in lab, alum area
General	New ceiling (office, hallway, lab)
General	Lunchroom
General	Bathroom, new sink/shower, plumbing old/rusted
General	Incoming potable water line replaced. Pipe has burst and flooded basement and damaged equipment
General	Floor drains: have floors slope towards drains
General	New windows, most broken/taped. Loss of heat in winter
General	Automated doors at garage/filter room
General	Fix culvert that has heaved where the parking lot opens up.
General	Cathode protection for high risk equipment in certain areas
General	Most receptacles around plant not working – please fix
General	Remove obsolete MCC panels in office
General	Remove obsolete/decommissioned equipment, pipe systems
General	Gas Detection monitoring in key areas throughout plant (GV)
General	Fire alarm/ sprinkler system throughout plant
General	Re-brick building (loose/missing bricks throughout) i.e. hypo delivery area
General	Re-pave driveway/parking lot
General	New perimeter fence (preferably wire)
General	FE yard hydrant pipeline replaced. Heavy leakage, compromising ground around aeration
General	Flowmeters above ground and easily accessible (preferably inside building)
General	Reverse button for all pumps
General	Better way to measure alum level (milltronics)
General	Upgrade illegal entry alarm

Issues Identified by OCWA

Category	OCWA Input
Headworks	Replace Bar Screen with either Perforated Plate Screen or Step Screen (Green From Controls, Claro, Veolia, etc.). Current bar screen insufficient, causing issues at aeration, clarifiers, filters, pipes throughout.
Headworks	Wash water system for bar screen rag auger
Headworks	Grit vortex – with no top cover, for easier troubleshooting/maintenance
Headworks	New grit auger required
Headworks	Electric chain hoist for pump removal
Headworks	Flowmeter for incoming raw sewage
Headworks	Fix valve in septage receiving chamber
Headworks	If Storm Ponds are eliminated: Consider adding a joined wet well for dealing with incoming flow during peak hours with redundant pumps.
Aeration	Consider separating each cell/return line for optimizing operations and maintenance (this also means re-piping some of the aeration lines).
Aeration	Ensure enough aeration is given, based on the strength of the incoming sewage increasing due to water saving measures and reduced infiltration (ongoing upgrades).
Aeration	Valve for each RAS outlet
Aeration	Drainage pipes at bottom of each cell (tie into RAS pumps/RAS Wet Well)
Aeration	Main blower with lager operating range (possible turbo or rotary screw) Keep existing blowers as backup blower. Updated fuses on blowers. Fuse blown numerous times
Aeration	Separate each cell for easier maintenance, reduce disruption to process during maintenance
Aeration	Continuously record DO readings/trending and control with SCADA.
Aeration	SA 4 ladder corroded, replace with stainless steel, cathode protection.Railings corroded
Clarifier	Need to be completely rebuilt. Old rusted, constantly breaking, parts obsolete. Ensure cathodic protection is added to help prevent corrosion. Preferably sweeper arm to move above scum trough, not under (current design).
Clarifier	N.C Aluminium roofing such as south clarifier
Clarifier	Flow meter for influent/effluent
Clarifier	Cathode protection
Clarifier	Ability to fully drain clarifiers with slip tube/pump (only ¼ can be drained with current design)
Clarifier	Walkway extended full length, easier maintenance for sweeper arm
Clarifier	LED lights – N.C. light hazard

Issues Identified by OCWA

Category	OCWA Input
Digesters	If new digesters, keep old ones (covered) for contingency
Digesters	Consider installing RDT (Rotating Drum Thickener) to pre-thicken sludge before the digester. This could bring the concentration up to 4 - 8%, and vastly increase the HRT in the digester. This could account for decant required and thus possibly more than double the concentration; therefore it would in effect double the current capacity of the sludge storage. An RDT will reduce sludge haulage and energy cost since it will reduce the volume of sludge needing to held and hauled.
Digesters	Slip tube for decanting, preferably goes most of the way down (like Wasaga Beach), or adjustable decant pump installed (but this requires electricity and adds extra mechanical equipment). Currently large of amounts of decant water ends up at biosolids tank, resulting in tank being fuller quicker unnecessarily
Digesters	Install a modulating air valves on blowers to deal with temperature swings and sludge depth or consider installing a Rotary Screw Blower to optimize performance
Filters	Ensure SCADA is programmed to send final clarifier effluent to filters at a consistent rate, to simulate flowrate moving through facility. This will remove high flows currently being sent to filters and will help reduce backwashes required along with sudden increases in head pressure. The disk filters function better when they receive consistent flow verses on/off flow (under current control setup).
Filters	Modulating backwash pump valves (while backwash pumps are on, valves move slightly resulting in no suction, and backwashes multiple times (60+: normally max 4/day). Filters overflow to Head Works, cloths clogged
Filters	Review filter loading rates and confirm that the effluent coming from the final clarifiers is a reasonable number, since the current effluent limit is 5 mg/L. It is not uncommon to have final clarifiers in the winter deliver 15 to 20+ mg/L of TSS and since the north clarifier is very shallow, it is more susceptible to higher TSS. This might show that filters are undersized or more consideration may need to be given to future clarifier design.
Filters	Consideration should be given to divert flow from filters for Storm Ponds if filters are struggling to meet flow demands or effluent quality. This system could be automated to allow operators to respond quickly to any issues, or have the plant redirect if flows get to high for filters to properly compensate (if Raw Storm Ponds are removed).

Issues Identified by OCWA

Category	OCWA Input
Filters	Extend building (over digesters) to allow room when removing filter disks so maintenance and repairs can be completed in a safe manner (or install platform over filters so disk can be laid down safely for maintenance)
Filters	Access to influent and effluent troughs for maintenance and monitoring TSS. Will allow for quicker detection of filter cloth tears/degradation.
Filters	Railings on grating, H&S hazard
Filters	Turbidimeters for influent /effluent to monitor process and quicker detection of issues
Filters	Filter influent wet well relocated above ground/or barrier around access point. Current location has high potential for infiltration
Sludge Storage	Instead of another sludge storage tank, possibly a dewatering system to landfill final product, as field application is limited
Sludge Storage	If RDT is not installed another bio-solids tank would be required very soon: preferably with a longer slip tube, multiple slip tubes or another way to decant without waiting until it's full.
Sludge Storage	Consider adding an extra Sludge Storage Tank (even with RDT) to ensure there is enough storage to meet the up and coming needs as the town continuous to grow (as raw sewage concentrations continue to increase).
Sludge Storage	Aeration in tank should help to minimize odours, breakdown sludge, allow for more decant and keep it from going septic.
Sludge Storage	Add a valve and 6" camlock to the access hatch on side of tank. Trucks could fill via gravity from here. Also easier to empty tank for cleaning and inspection

Issues Identified by OCWA

Category	OCWA Input
Pond	If ponds are being continued to be used as Raw wastewater lagoons, then some form of treatment should be considered: oFine air in ponds to help break down Raw Sewage. oMixing/aeration capabilities to insure homogenous mixture when returning from lagoons, to prevent solids/BOD overloading when levels get low. oConsider section lagoons for aeration/settling area with overflow area to minimize raw sewage being sent throughout the lagoons.
Pond	inlet and outlet too close to each other, possibility to separate further apart
Pond	Consider maintaining Storm Ponds but turn them into Effluent Ponds. This will give operational flexibility if there are issues with Effluent ammonia or solids, and allow operations time to get process back on track.oCapability to send secondary clarifier effluent for contingency oShould not have odours associated with final effluent oContingently for facility during high flow events oMinimal capital cost required to convert to Effluent Ponds oPossible maintain one pond if town would like to create more park land/setback from lagoon.
Effluent Channel	Possibly upgrade new UV system to self-cleaning. Current system obsolete
Effluent Channel	Weir at exit similar to GV, channel should have a weir like at GV, not swing gate. When water flow stops, water leaks past swing gate, level drops, UV lamps are exposed to human eyes with no protection. Also causes fouling of lamp sleeves and burnout of bulbs due to no cooling water
Office	OCWA Staff Office

S. BURNETT & ASSOCIATES LIMITED
ENGINEERING & ENVIRONMENTAL

Appendix H

Boyne River Adaptive Monitoring and Stewardship Plan

S. BURNETT & ASSOCIATES LIMITED
ENGINEERING & ENVIRONMENTAL

Town of Shelburne

Boyne River Adaptive Monitoring and Stewardship Plan

A People Place, A Change of Pace
SHELBURNE
ONTARIO, CANADA

March 2022

SBA File No.: M16018

REPORT PREPARED BY:

S. BURNETT & ASSOCIATES LIMITED

www.sbaengineering.com |
Tel (519) 941-2949 | Fax (519) 941-2036 | info@sbaengineering.com
210 Broadway, Unit 203 Orangeville, ON L9W 5G4

March 22, 2022

Town of Shelburne
203 Main Street East
Shelburne, ON

Attn: Jim Moss, Director, Development and Operations

Re: Town of Shelburne
Boyne River Draft Stewardship and Adaptive Monitoring Plan
SBA File No: M16018

Dear Jim,

The following Draft Stewardship and Adaptive Monitoring Plan (the "Plan") was prepared by S. Burnett and Associates Limited (SBA) on behalf of the Town of Shelburne. This plan outlines the Town's commitments pertaining to the monitoring of water quality in the Boyne River in association with the Town's increase in capacity of the Water Pollution Control Plant (WPCP) from 3,420 m^3/d to 5,100 m^3/d. The Plan also outlines the Town's broader commitment to the health of the Boyne River by detailing several stewardship projects the Town will implement.

The Plan was developed in close collaboration with the Nottawasaga Conservation Authority (NVCA), who will also be key in its implementation. The Plan is intended to continue to evolve as additional information is gathered through preliminary steps.

Once approved, a separate cost proposal will be prepared that details costs of implementation by SBA and the NVCA. Prior to submitting costs, we will discuss with Town how best to phase certain items over multiple years to align with the Town's budget preferences.

Yours Truly,

Ian Callum, M.Sc., PMP
Senior Environmental Project Manager
S. Burnett & Associates Limited

Table of Contents

1. Introduction 1
2. Adaptive Monitoring Plan 1
2.1 Goals 1
2.2 Monitoring Schedule 1
2.3 Stations 2
2.4 Parameters 4
2.5 Triggers 4
2.6 Data Analysis and Reporting 4
3. Stewardship 5
3.1 Enhanced Riparian Vegetation 5
3.2 Maintaining Existing Riparian Zones 5
3.3 Stormwater Management 5
3.4 3rd Line Pond 6
3.5 Boyne River Improvements 6
3.6 Other Improvement Opportunities 6

Tables

Table 1: Summary of Monitoring Program 4

Figures

Figure 1: Proposed Monitoring Station Locations 3

1. Introduction

The Boyne River, a historically cold-water habitat, begins as a series of tributaries from headwater wetlands northwest of the Town of Shelburne. Many of the stream sections between wetlands have been altered to drain agricultural lands and in doing so has introduced agriculture runoffs to these streams. These tributaries flow eastward through a gently rolling headwater landscape, joining to form the main branch of the Boyne River northeast of Shelburne, Ontario (**Figure 1)**.

Two (2) tributaries to Boyne River, Walter's Creek (also known as the John Theaker Award Drain) and the Besley Drainage Works (Besley Drain), originate just outside the Town boundaries, before passing through the Town and intersecting with the Boyne River. The Town's Water Pollution Control Plant (WPCP) discharges to the Besley Drain at a current capacity of 3,420 m^3/day. The Town is currently evaluating increasing the WPCP capacity to 5,100 m^3/day through a Municipal Class EA (MCEA) process and has completed a Ministry of the Environmental Conservation and Parks approved Assimilative Capacity Study. The Town anticipates completion of the MCEA in 2021, with the upgraded WPCP commencing operations in 2024.

As part of the Town's commitment to the health of the Boyne River, SBA, on behalf of the Town, has developed this Adaptive Monitoring and Stewardship Plan in partnership with the Nottawasaga Conservation Authority (NVCA).

2. Adaptive Monitoring Plan

2.1 Goals

This adaptive monitoring plan was developed to achieve the following goals:

- To better understand the current health of the Boyne River following its confluence with the Besley Drain to establish "baseline conditions";
- To develop monitoring protocols that would identify changes in the water quality of the Boyne River, resulting from the increase in WPCP discharge capacity; and,
- Establish a process for setting water quality "triggers" that, if exceeded, result in consultation between the Town and NVCA to address the issue.

2.2 Monitoring Schedule

To achieve the goals of the Plan, a monitoring program is anticipated to begin in March 2022 and continue to the end of February 2023 to establish a full year of baseline conditions. Further monitoring would then occur for a full year after the WPCP begins operating at its increased capacity and every subsequent five (5) years.

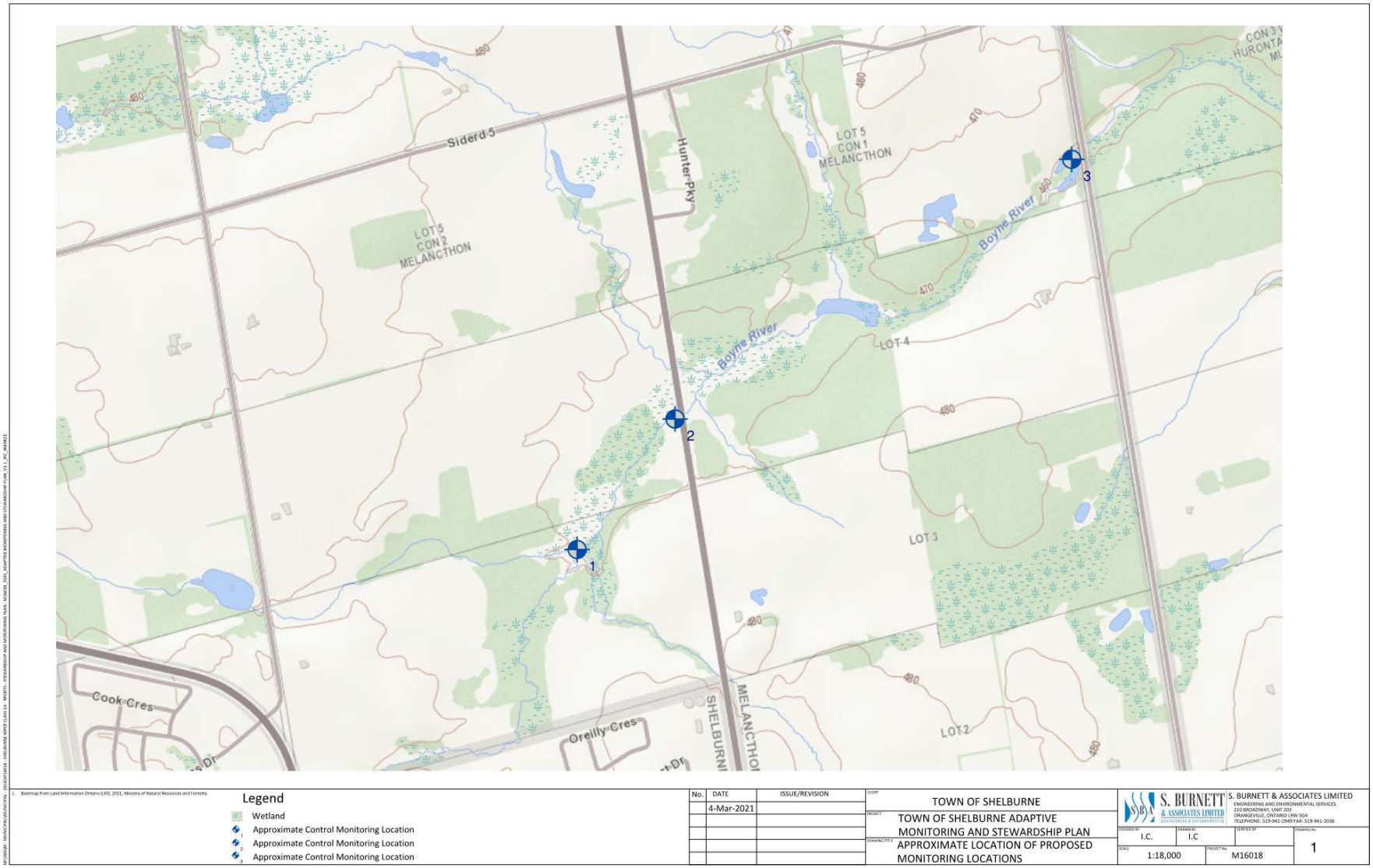
2.3 Stations

To facilitate the monitoring program the following monitoring stations will be established in co-ordination with the NVCA:

- **Control Station:** located upstream of the Besley Drain-Boyne River confluence but downstream of the Boyne River-Walter's Creek confluence;
- **Impact Station:** located at least 100 m downstream of the Besley-Boyne confluence; and,
- **Far-Field:** located at the Boyne River crossing of the Mulmur-Melancthon Townline.

Additionally, amphibian monitoring would occur at the Boyne-Besley Confluence wetland and the CR124 wetland, and at a local control station that will be determined. Additionally, a flow monitor would be installed at CR124, or if not feasible at that location, at Mulmur-Melancthon Township Line. **Figure 1** provides the approximate locations where the monitoring stations will be located.

Figure 1: Proposed Monitoring Station Locations



2.4 Parameters

Table 1 identifies the parameters that will be sampled at each representative location. The sampling will be performed by one (1) representative from the Town and one representative from the NVCA.

Table 1: Summary of Monitoring Program

Parameter(s)	Sampling Method	Sampling Location(s)	Sampling Frequency per Monitoring Period
Flow	Flow Gauge	CR124 or Mulmur-Melancthon Townline	Continuous
Temperature, dissolved oxygen, pH	Data loggers	Control, impact, and far-field stations	Continuous
Phosphorous, nitrate, ammonia, chlorides	Grab samples	Control, impact, and far-field stations	Monthly
Benthic macroinvertebrates	Net	Control, impact, and far-field stations	Once
Fishes	Electrofishing	Control[1], impact, and far-field stations	Once
Amphibian	Frog call survey (3 visits)	Control[1], impact, and far-field stations	Once

[1] Control locations will be determined in consultation with NVCA before the end of 2021.

2.5 Triggers

After evaluating the monitoring data from the baseline year, the Town and NVCA will meet to discuss establishing triggers for each parameter. These triggers would represent thresholds, that if exceeded, would result in the consultation between the Town and NVCA to determine the best means of addressing the issue. Triggers will be established before the upgraded WPCP is online.

2.6 Data Analysis and Reporting

Collected monitoring data will be interpreted by the Town, who will issue report within three (3) months of the last collected data. The report will summarize the monitoring data and flag any exceedance of triggers.

3. Stewardship

The Town is committed to working with the NVCA on a variety of stewardship projects to enhance the health of the Boyne River and to increase its assimilative capacity, thereby reducing the likelihood of exceeding the predetermined triggers. The following sections outline stewardship projects that the Town will endeavor to implement in partnership with the NVCA when feasibly and financially possible.

3.1 Enhanced Riparian Vegetation

Increasing the amount of riparian vegetation along the Boyne River, Besley Drain, and Water's Creek would help maintain the cold-water status of the Boyne Headwaters and reduce impacts from the warmer water discharged from the WPCP. Reduced temperatures will result in less algal growth and a higher dissolved oxygen content.

The NVCA will provide the Town with a prioritized list of areas suitable for planting as well as estimated costs and time required to complete each planting. The Town will then commit to a funding timeline, with plantings occurring in stages over several years. NVCA will be responsible for leading the plantings, including providing necessary equipment and expertise. NVCA will explore the idea of having volunteers participate in the tree plantings, with the Town providing support as appropriate.

3.2 Maintaining Existing Riparian Zones

There is an opportunity to work with existing landowners to ensure that riparian vegetation along Walter's Creek is not removed or mowed. The NVCA and the Town will work together to educate landowners on the importance and benefits of maintaining riparian vegetation.

3.3 Stormwater Management

As part of the Town's anticipated 2022 Stormwater Master Servicing Plan (SWMSP), the Town will identify opportunities for improving the thermal mitigation of stormwater ponds outlets. The plan will also assess opportunities to divert clean groundwater away from the Water Pollution Control Plant (WPCP) and storm drains and have it redirected to streams.

The SWMSP will also look at whether there is an opportunity to divert groundwater from entering the stormwater pond in the Northwest of Shelburne and towards Walter's Creek.

3.4 3rd Line Pond

The 3rd Line Pond creates a stagnant area where water temperatures increase due to solar heat before returning to the Boyne River. The Town will commit to reaching out to the landowner to arrange up to three (3) meetings to discuss possibilities for reducing pond's impact on temperature in the downstream Boyne River. These meetings would also require attendance by NVCA and if additional meetings are required, they would be added to this plan.

3.5 Boyne River Improvements

The Town will arrange a field visit with the NVCA in 2021 to assess opportunities for habitat improvement in the Boyne River, downstream of its confluence with the Besley Drain. One example of habitat improvement would be adding rocks to create riffles, which would increase oxygen content in the river. Further plans will be committed to, as appropriate, following this initial site visit.

3.6 Other Improvement Opportunities

The Town will continue to review opportunities in Natural Environment zones and Open Space Recreational zones, as well as through new developments to improve the aquatic habitat in the Boyne River and its tributaries. As an example, the Town will continue to require new developments adjacent to Walter's Creek and the Besley Drainage Works to provide improvements and enhancements to the watercourses.