



Town of Innisfil

**Lakeshore Water Treatment Plant Expansion
Municipal Class Environmental Assessment
Environmental Study Report
FINAL**



March 2011



Town of Innisfil

**Lakeshore Water Treatment Plant Expansion
Municipal Class Environmental Assessment
Environmental Study Report
FINAL**

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Date:

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2	-	Town of Bradford West Gwillimbury
1	-	Ministry of the Environment

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Executive Summary

A. INTRODUCTION/BACKGROUND

The Town of Innisfil (the Town), through its consultant AECOM, has completed a Municipal Class Environmental Assessment (Class EA) Study¹ for the expansion of the Lakeshore Water Treatment Plant (WTP) in Alcona (see Figure 1).

The Lakeshore WTP was commissioned in 1996 to treat surface water from Lake Simcoe and services part of the Innisfil Lakeshore service area in addition to, by agreement, parts of the Town of Bradford West Gwillimbury (BWG). The purpose of the project is to expand the Lakeshore WTP to provide treated municipal water to accommodate full build out of Innisfil's new 2008 Official Plan (OP) based on Official Plan Amendment (OPA) No. 1, as well as service the approved Big Bay Point Recreational Resort development. The provision of additional water supply capacity will also address future water demands from the recently approved BWG Strategic Employment Lands (BWG OPA No. 15) and Bond Head Secondary Plan (OPA No. 16). The proposed works include expanding (beyond existing rated capacity) the existing Lakeshore WTP from its current capacity of 26 ML/d (26,000 m³/day) to 100 ML/d (gross 106,000 m³/day). The expansion also includes a new Lake Simcoe intake, an expanded-upgraded Low Lift Pumping Station (LLPS) and a new watermain connection between the LLPS and the WTP expansion.

The focus of this Class EA is to identify alternatives that will meet the policies and objectives of both the Towns' Official Plans, continue to provide sufficient, high quality drinking water to meet future demands, build upon the existing facilities at the Lakeshore WTP site and be within control of the Town of Innisfil.

B. STUDY AREA

The primary study area for this Class EA as shown on Figure 1 centres around the Lakeshore WTP and LLPS. It is bounded northerly by Park Road, southerly by Innisfil Beach Road, westerly by 25th Sideroad and easterly by Lake Simcoe. The secondary study area is presented on Figure 2 and includes the larger Innisfil and BWG municipal service areas in addition to all lands within municipal corporate limits.

C. MUNICIPAL CLASS EA PLANNING SCHEDULE

This Class EA was completed under the Municipal Engineers Association (MEA) Municipal Class EA document (October 2000, as amended in 2007). The project described in this report involves the potential siting and construction of a new WTP or expansion to existing WTP facilities, beyond their rated capacity. Therefore, it falls under the Schedule C planning process and as such, Phases 1 to 4 (see Figure 3) of the Class EA planning process apply to this study.

¹ Similar to this Class EA study, the Town also recently completed a wastewater treatment capacity Class EA study that involves the expansion and upgrading of the existing Lakeshore Water Pollution Control Plant in Alcona.



LEGEND:

TOWN OF INNISFIL
LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

FIGURE 1	STUDY AREA
BASE MAPPING PROVIDED BY:	
ADDITIONAL SOURCES: (ONTARIO REGULATION 9704): REGULATION OF DEVELOPMENT, INTERFERENCE WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOLOURS.	
AECOM	
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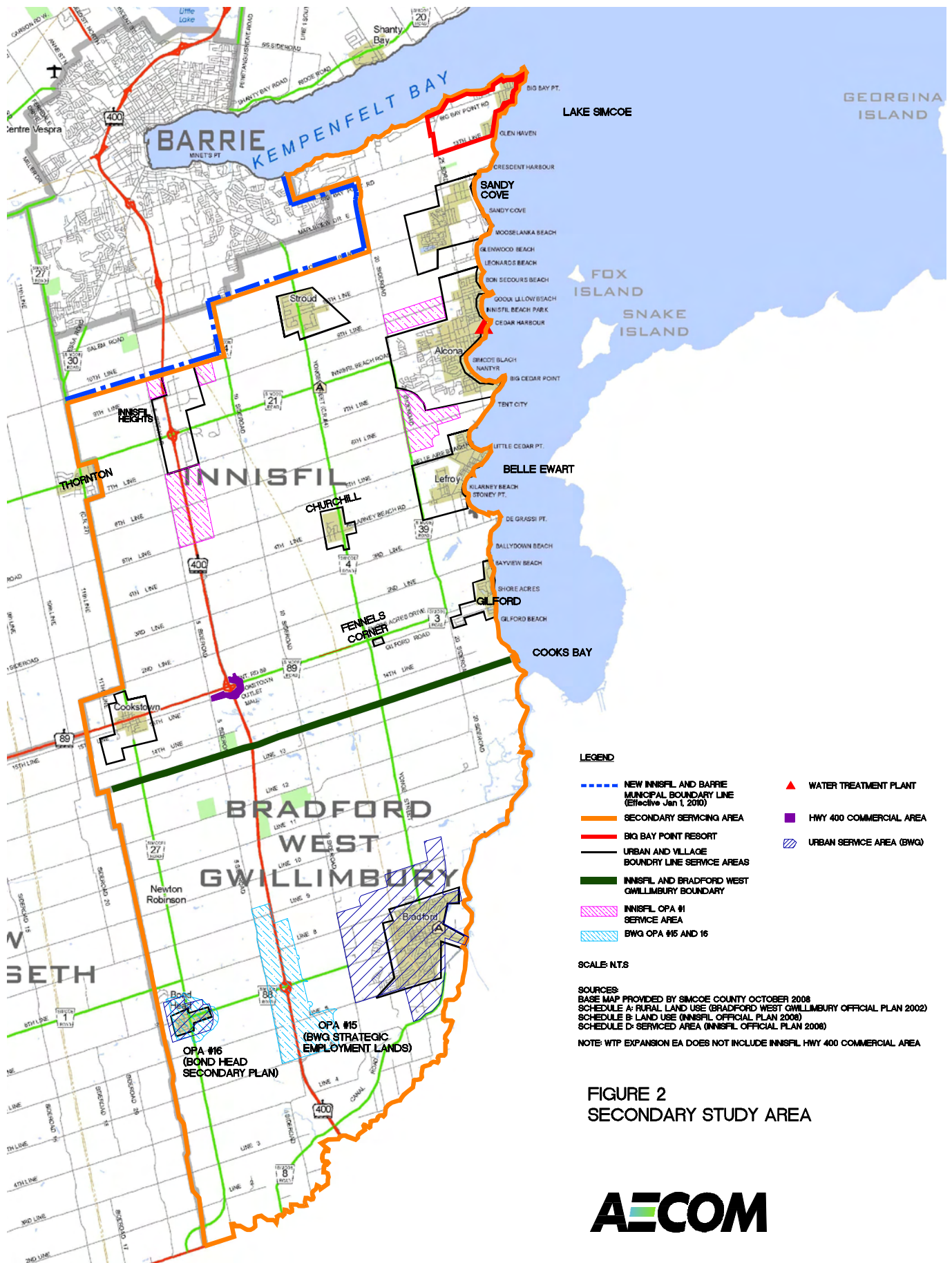


FIGURE 2
SECONDARY STUDY AREA

AECOM

The flowchart illustrates the five phases of the environmental study process, with key milestones and public involvement opportunities. The process begins with the 'Notice of Study Commencement and PIC # 1 (Discretionary Contact Point)' on November 2008, leading to Phase 1: 'Identify & Describe the Problem/Opportunity'. This phase leads to Phase 2: 'Complete Study Area Inventory Identify & Evaluate Alternative Solutions & Establish the Recommended Solution', which includes 'Schedule A, A+, B & C Projects'. Phase 2 is followed by 'Public Information Centre #1 (Mandatory Contact Point)' on November 27, 2008, and 'Public Information Centre #2 (Discretionary Contact Point)' on January 26, 2010. Phase 2 leads to Phase 3: 'Identify & Evaluate Alternative Design Concepts, Environmental Effects & Confirm Preferred Design', which includes 'Schedule B Project' and 'Schedule C Project'. Phase 3 is followed by 'Public Information Centre #3 (Mandatory Contact Point)' on May 18, 2010. Phase 3 leads to Phase 4: 'Prepare Environmental Study Report (ESR) Documenting Phases 1-3', which includes 'Schedule A & A+ Projects'. Phase 4 leads to the 'Environmental Study Report' (ESR) document, which is followed by 'Notice of Study Completion (Mandatory Contact Point)' on January 20, 2011. The ESR document is followed by the 'Opportunity for Part II Order Request (Appeal to MOE)', which is highlighted with a yellow arrow pointing to it, indicating the current stage. Finally, the process leads to Phase 5: 'Complete Drawings & Documents Proceed to Construct, Operate & Monitor Project'.

```
graph TD; A[Notice of Study Commencement and PIC # 1  
(Discretionary Contact Point)  
November 2008] --> B[PHASE 1  
Identify & Describe the Problem/Opportunity]; B -- "Schedule A, A+, B & C Projects" --> C[PHASE 2  
Complete Study Area Inventory  
Identify & Evaluate Alternative Solutions & Establish the Recommended Solution]; D[Public Information Centre #1  
(Mandatory Contact Point)  
November 27, 2008] --> C; E[Public Information Centre #2  
(Discretionary Contact Point)  
January 26, 2010] --> C; C -- "Schedule B Project" --> F[PHASE 3  
Identify & Evaluate Alternative Design Concepts,  
Environmental Effects & Confirm Preferred Design]; C -- "Schedule C Project" --> F; G[Public Information Centre #3  
(Mandatory Contact Point)  
May 18, 2010] --> F; F -- "Schedule A & A+ Projects" --> H[PHASE 4  
Prepare Environmental Study Report (ESR) Documenting  
Phases 1-3]; I[Environmental Study Report] --> J[Notice of Study Completion  
(Mandatory Contact Point)  
January 20, 2011]; J --> K([Opportunity for Part II Order Request  
(Appeal to MOE)]); K --> L[PHASE 5  
Complete Drawings & Documents  
Proceed to Construct, Operate & Monitor Project];
```

D. Problem/Opportunity Statement

The Problem/Opportunity Statement for this Municipal Class EA study is defined as follows:

A review of the following documents:

1. *Town of Innisfil's new Official Plan (2008) including Official Plan Amendment No. 1; and*
2. *Town of BWG's current Official Plan including the recently approved BWG Strategic Employment Lands (BWG Official Plan Amendment No. 15) and Bond Head Secondary Plan (BWG Official Plan Amendment No. 16)*

has confirmed the need to provide additional Municipal treated water to service the approved growth within Innisfil and BWG. Additional water supply capacity and associated infrastructure must be in place in a timely and orderly manner to service proposed development in the aforementioned Official Plan development areas.

In order to address the above, the Town initiated this Class EA planning process in 2008, which identifies and evaluates alternative solutions and design concepts; and accordingly addresses the above problem statement. This Environmental Study Report (ESR) has been prepared to determine how to best site, design, construct and operate the proposed Lakeshore WTP expansion.

E. Alternative Solutions to the Problem

Phase 2 alternative solutions to the problem include:

1. Do Nothing;
2. Reduce Limits of Service Area;
3. Reduce Water Demands;
4. Increase Lakeshore WTP Capacity Rating;
5. Expand the Lakeshore WTP and Storage including New Intake and Low Lift Pumping Station;
6. Construct New Surface WTP including New Intake and LLPS;
7. Develop New Groundwater Sources;
8. Obtain Treated Water from a Neighboring Municipality (i.e. Barrie, New Tecumseth, York Region);
9. Construct Water Reuse Treatment Plant and Recharge Aquifer, Develop Well Supply System; and
10. Implement Grey Water Systems.

F. PREFERRED SOLUTION

Based on an evaluation of the above Phase 2 alternative solutions (section 6), Alternative 5: Expand the Lakeshore WTP and Storage including New Intake and Low Lift Pumping Station, in combination with Alternative 3: Reduce Water Demands, was identified as the preferred solution that best addresses the problem statement.

Rationale for selecting Alternative 5 as the preferred solution includes:

- Completely addresses the problem statement;
- Meets the policies and objectives of the Official Plans of both Innisfil and BWG;
- Is within control of the Town of Innisfil, allowing the Town to maintain control over the cost of water;
- Continues to provide sufficient, high quality drinking water in compliance with all water quality regulations, to meet future demands;
- Will build upon existing facilities at the Lakeshore WTP site, thereby maximizing infrastructure and reducing overall cost of both construction and ongoing operation; and
- Will not require the purchase, development and operation of remote new sites for new facilities (i.e., new WTP at another location).

G. IDENTIFICATION AND EVALUATION OF ALTERNATIVE DESIGN CONCEPTS

Carrying forward with the preferred solution (Alternative 5: WTP Expansion), the following provides a description and evaluation of alternative design concepts (i.e. methods of implementing the preferred solution).

1) Intake Twinning

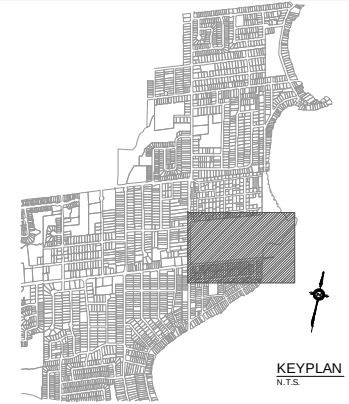
As it is proposed to twin the existing intake within the previously disturbed existing Lake Simcoe intake corridor, alternatives are limited to which side of the existing intake pipe the new pipe is constructed. Since there is limited difference in terms of impacts, the north side was identified as the preferred side based on the location of the preferred LLPS expansion, which is described below.

2) Low Lift Pumping Station Expansion Siting Options (LLPS)

The LLPS expansion includes increasing the pumping capacity to 106 ML/day. The alternative LLPS expansion siting options include:

- **Alternative A:** Expand existing LLPS on north side; and
- **Alternative B:** Expand existing LLPS on south side.

Both of the alternatives have a building footprint of approximately 13.8 metres by 10.6 metres. Figure 4 illustrates the LLPS expansion siting options.



LEGEND:

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LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

FIGURE
4

**ALTERNATIVE LLPS
EXPANSION SITING OPTIONS**

BASE MAPPING PROVIDED BY:

ADDITIONAL SOURCES:
(ONTARIO REGULATION 97/04) REGULATION OF DEVELOPMENT, INTERFERENCE
WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES.

JUNE
2010

AECOM



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Preferred LLPS Siting Option

Based on the evaluation of LLPS alternatives, the preferred LLPS siting option is Alternative A: Expand existing LLPS on the north side. Rationale for selecting Alternative A includes:

- Provides opportunity to improve upon existing LLPS building's architectural design;
- Complies with Innisfil Beach Road Urban Design Guidelines (i.e., does not block view of Lake Simcoe from Innisfil Beach Road); and
- Avoids raw water transmission main pipe crossing.

3) Watermain Connection

In addition to expanding the WTP treatment and LLPS pumping capacities, transmission capacity between the two facilities will also have to be increased. As such, alternative watermain connection routes between the WTP and LLPS were identified as follows:

- **Route 1:** Twin existing watermain between WTP and LLPS (follow existing watermain alignment through Innisfil Beach Park); and
- **Route 2:** New watermain to extend from LLPS and follow Innisfil Beach Road to 25th Sideroad connecting to new WTP expansion.

Figure 5 illustrates the watermain connection alternatives.

Preferred Watermain Connection Route

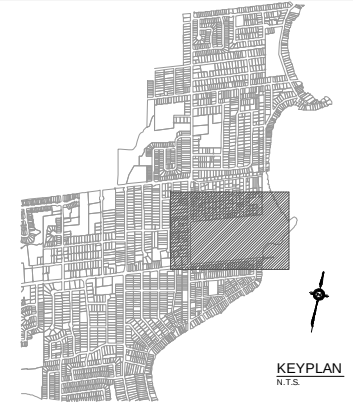
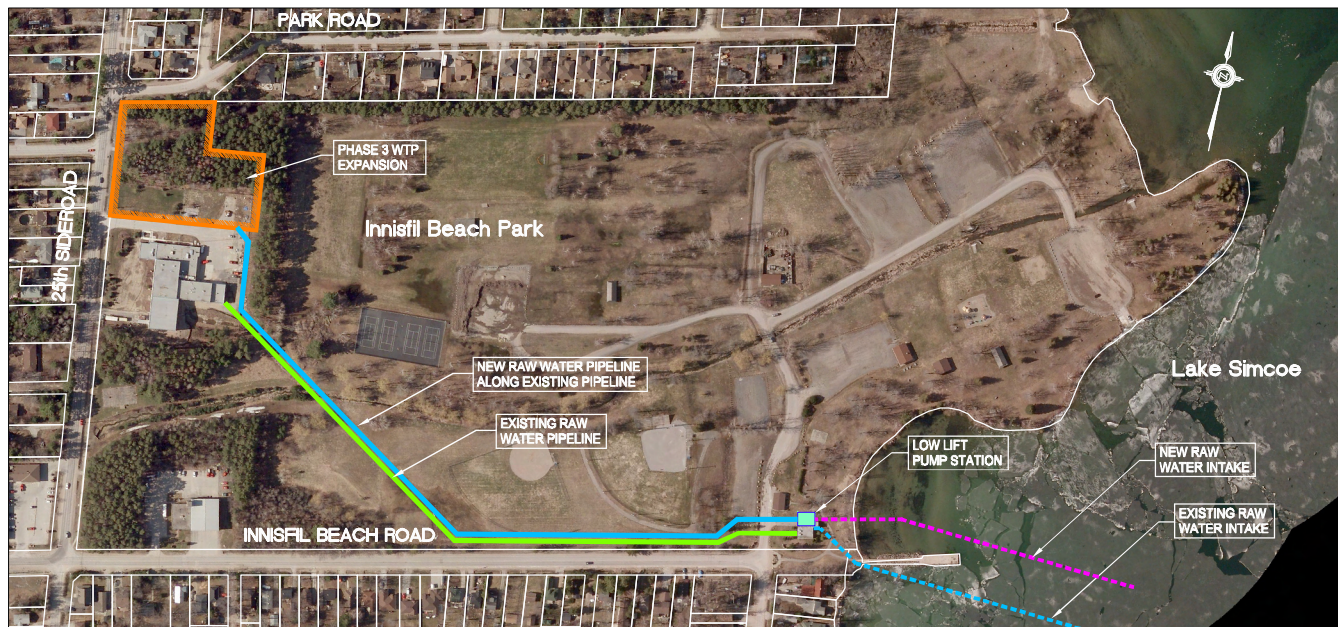
Based on the evaluation of alternative routing options, the preferred watermain connection option is Route 1: Twin existing watermain between WTP and LLPS (follow existing watermain alignment through Innisfil Beach Park). Rationale for selecting Route 1 includes:

- No construction impacts to residences, traveling public and Fire Hall on Innisfil Beach Road;
- Construction can be timed for winter when park usage is lower;
- Low construction cost;
- Avoids having to restore newly reconstructed Innisfil Beach Road; and
- Easy restoration.

4) Water Treatment Plant Expansion Siting Options (WTP)

Alternative WTP expansion siting options are as follows:

- **Alternative 1:** WTP expansion to the north of the existing WTP driveway (outside fenced area); and
- **Alternative 2:** WTP expansion to the east of the existing WTP driveway (outside fenced area).



LEGEND:

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LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT**

**FIGURE
5**

**ALTERNATIVE WATERMAIN
CONNECTION ROUTES**

BASE MAPPING PROVIDED BY:

ADDITIONAL SOURCES:
(ONTARIO REGULATION 97/04) REGULATION OF DEVELOPMENT, INTERFERENCE
WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES.

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2010**

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Primary components for both design concepts include staged treatment blocks and a residuals management facility.

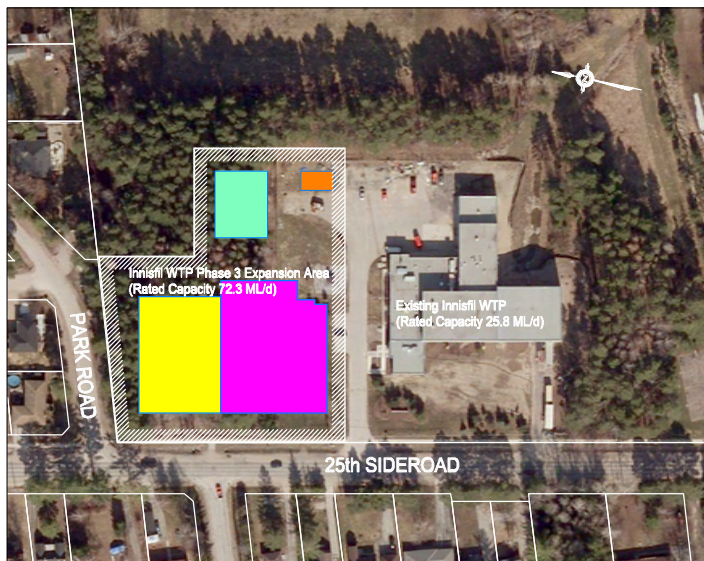
Figure 6 illustrates the WTP expansion alternatives.

Preferred WTP Siting Option

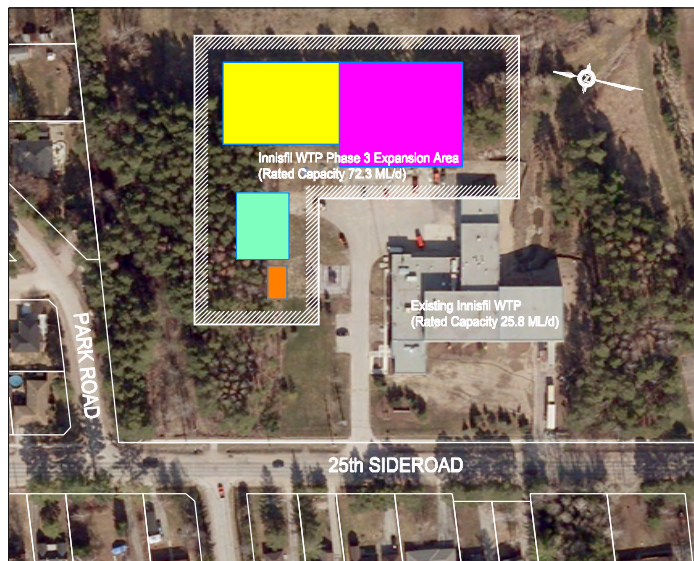
Based on the evaluation of alternatives, Alternative 1: Expansion North of Existing WTP was most preferred.

Rationale for selecting Alternative 1 includes:

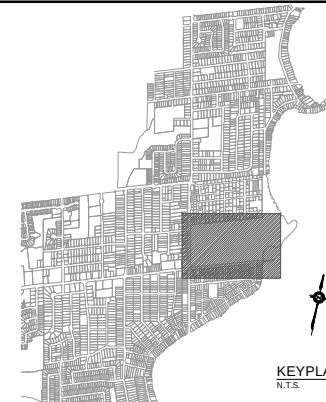
- Avoids expansion into Lake Simcoe Region Conservation Authority (LSRCA) Alcona Creek (also referred to as Watercourse No. 4) regulated floodplain and potential impacts to fish habitat;
- Avoids temporary loss of soccer field and significant disruption to park user groups;
- Avoids significant costs related to mitigating loss of soccer fields and loss of revenue;
- Provides good buffer for residuals management facility;
- Moderate capital costs; and
- Easier to arrange treatment facilities.



ALTERNATIVE 1: WTP expansion to the north of existing WTP driveway (outside fenced area)



ALTERNATIVE 2: WTP expansion to the east of existing WTP driveway (outside fenced area)



LEGEND:

-  New 38 ML/d Expansion (Including chem. feed facilities)
-  Future Additional 38 ML/d Expansion
-  Residual Management Facility
-  Generator

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LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

FIGURE
6

**ALTERNATIVE WATER TREATMENT
PLANT SITING OPTIONS**

BASE MAPPING PROVIDED BY:

ADDITIONAL SOURCES:
(ONTARIO REGULATION 97/04) REGULATION OF DEVELOPMENT, INTERFERENCE
WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES.

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2010

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H. PREFERRED WATER TREATMENT PROCESS

A detailed economic and technical evaluation was completed as part of this project to identify and screen viable water treatment processes for the proposed WTP expansion, and ultimately to select the preferred water treatment process train. This evaluation process considered a number of treatment train processes and is documented in detail, in a Technical Memorandum – Water Treatment Process Alternatives (see Appendix B).

Based on the evaluation, Option 5a – Dissolved Air Flotation (DAF)-Granular Media Filtration – Ultraviolet Advanced Oxidation Process (UV-AOP) has been identified as the preferred treatment process. Figure 7 presents a schematic of the preferred treatment process.

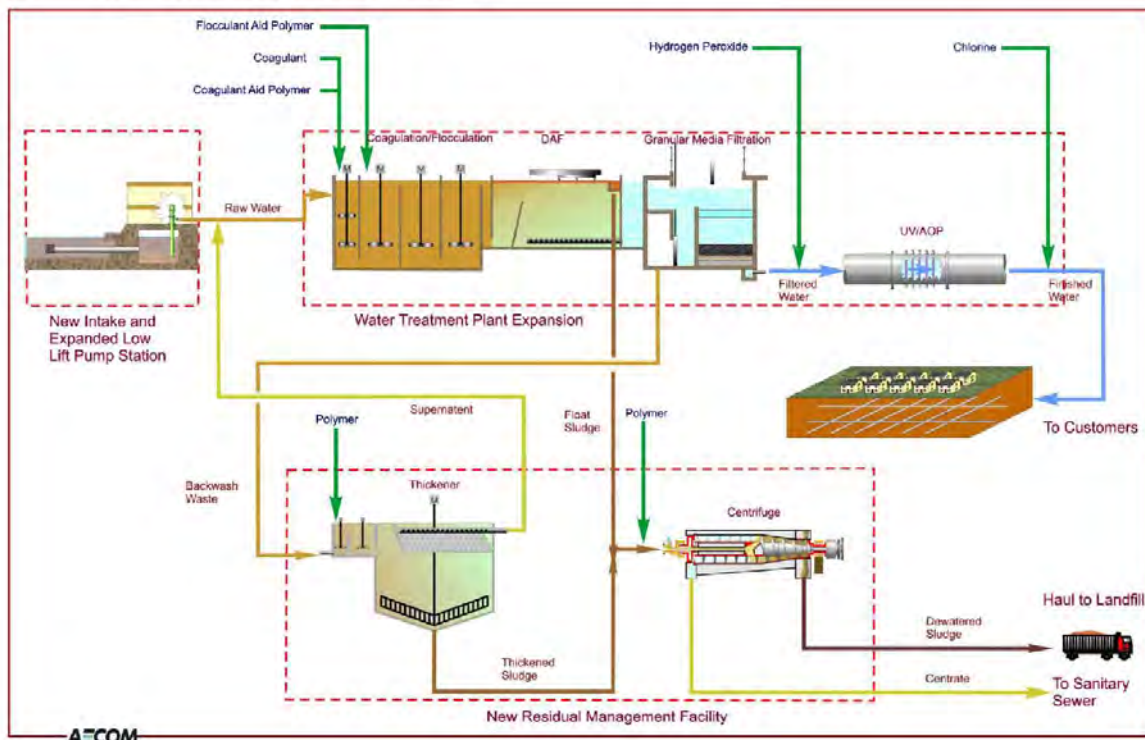
I. WTP RESIDUAL MANAGEMENT

Currently the Lakeshore WTP pumps its process wastewater directly to the sanitary sewer. With the proposed expansion involving such a significant increase in capacity, it is expected that continued reliance on this approach would have significant impacts on the Lakeshore Water Pollution Control Plant (WPCP), as the projected waste volumes from the expanded WTP would represent a significant fraction of the WPCP capacity. Therefore, several residual management solutions were evaluated.

The analysis concluded that the most cost effective option overall was to provide full residuals handling, including sludge thickening and mechanical dewatering on-site. The basis for design was selected to be lamella clarification/thickening, and centrifugation dewatering.

This involves a stand-alone residuals management facility whereby supernatant from the thickening process would be recycled to the head of the WTP. Centrate from the centrifuge (a low overall waste volume) would be sent to the sanitary sewer. Sludge cake produced by the centrifuge would be hauled to landfill.

Figure 7 Preferred Phase 3 Expansion Process Schematic



J. REVIEW AGENCY APPROVALS

During preliminary and detailed design and prior to construction, approvals will be required from several review agencies including the MOE, LSRCA, MNR, and Ministry of Tourism and Culture in addition to various utility companies, as further described below:

- A MOE Drinking Water Works Permit (DWWP) will be required as part of the Municipal Water Licensing Program;
- The need for MOE Permit to Take Water (PTTW) will be confirmed through the completion of the hydrogeological study;
- Dependent on the groundwater discharge type and location, MOE approval under Section 53 of the *Ontario Water Resources Act* may be required;
- Upon completion of detailed design, the Town will be required to obtain amendments to existing C of A (Water);
- Regarding the intake twinning, this project should be able to proceed under a LSRCA Letter of Advice provided that appropriate design considerations are in place. Separate permits will be required under the *Conservation Authorities Act* (O.Reg.179/06) prior to construction within or near any watercourse crossings;
- Under the *Lakes and Rivers Improvement Act* (December 15, 2009), an approval is required for the construction of the intake pipe. An MNR work permit under the *Public Lands Act* will also be required for the intake pipe;
- A permit under the *Navigable Waters Protection Act* will be required as construction will affect the navigation in the area of the intake twinning; and
- A Stage 1 Archaeological Assessment (land and possibly marine) will be completed or other level of investigation, as required to obtain archaeological clearance from the Ministry of Tourism and Culture prior to construction of the proposed works.

K. IMPLEMENTATION SCHEDULE

Due to significant overall expansion in net plant capacity, from 26 ML/d to 100 ML/d, it is recommended that the expansion be undertaken in two discrete phases: Phase 3a – A 37 ML/d expansion, raising net plant capacity from 26 ML/d to 63 ML/d; and Phase 3b – A second 37 ML/d expansion, raising net capacity to the design horizon of 100 ML/d.

Construction of Phase 3a could commence in August 2012.

L. MITIGATION MEASURES

Impacts related to construction of the Innisfil WTP expansion will be limited to the duration and location of construction. The most significant impacts relate to the loss of trees and the relocation of a small watercourse required for the WTP expansion; and loss of fish habitat due to intake twinning. Other potential impacts relate to

dewatering activities – groundwater management, and LLPS expansion which will require the relocation of two commemorative monuments and relocation of the Innisfil Beach Park gatehouse. In addition, the twinning of the raw water intake will temporarily impact marine navigation in the area of construction. By incorporating proper best management practices and construction techniques/controls, these impacts can be minimized. Anticipated and/or potential construction related impacts and their associated mitigative measures are summarized in section 13.

To address some of the above impacts, appropriate compensation measures will be developed in conjunction with the Town, LSRCA, and MNR. Possible areas of focus many include tree planting and/or replacement as part of the Town's current Innisfil Beach Park Master Plan Update and fish habitat enhancements along the Lake Simcoe shoreline and Alcona Creek. Post-construction monitoring will also be required for the intake twinning to ensure restoration has been successfully achieved.

Lastly, archaeological clearance (land and possibly marine) is to be obtained at the preliminary and detailed design stage.

M. COMMUNICATIONS AND CONSULTATION PROGRAM

As part of the Municipal Class EA planning process, several communications and consultation methods were undertaken with stakeholders, including BWG, which was part of the project steering committee, government review agencies, such as LSRCA, surrounding property owners and other interested members of the public to inform them of the nature and scope of the project and to solicit input/comments. These methods included direct mailing of notices, publication of Notices of Study Commencement (and Completion) and Public Information Centres (PICs) in local newspapers. Project information, such as the Notices and PIC display boards were also posted on the Town's website.

Three (3) PICs, which consisted of an informal drop-in centre with displays, were held during the course of the study at the Town of Innisfil Administration Centre.

PIC # 1 was held on November 27, 2008, and presented background information on the study, problem/opportunity statement and an evaluation of alternative water supply solutions, as well as the next steps in the study.

Following PIC # 1, a significant increase in water demand projections was identified due to the approval of Innisfil's OPA No. 1 and Bradford West Gwillimbury OPAs No. 15 and No. 16, which subsequently resulted in new development areas that require servicing. Therefore, PIC # 2 was held on January 26, 2010 to present revised water demand projections and associated WTP capacity requirements including a new Problem/Opportunity Statement and an updated description of the recommended solution.

PIC # 3 was held on May 18, 2010 to present the recommended water supply design concept to the public. Also presented at PIC # 3 were the water treatment process evaluation, identification and evaluation of alternative design concepts for each of the WTP facility expansions, proposed mitigation measures, and next steps.

From comments received to date, many PIC attendees and those who submitted comments expressed support for the project. Two local residents expressed concerns related to the loss of trees from the WTP expansion and

potential loss of access to Innisfil Beach Park from 25th Sideroad. In response to these concerns, the loss of trees will be addressed by tree replacement in conjunction with the current Innisfil Beach Park Master Plan Update and ensuring that access to the park is maintained from 25th Sideroad and Park Road.

In addition, a meeting to explain the project and to address specific issues related to WTP expansion construction and intake twinning was held with LSRCA. Based on discussions it was concluded that the project should be able to proceed under a Letter of Advice from LSRCA provided that appropriate design considerations are in place, including a robust sediment control and management plan for in-lake works and a MNR Work Permit issuance for the new intake pipe.

First Nations consultation included all mandatory and discretionary Class EA contact points with FN bands who may have historic ties to the study area. Further to PIC #3, follow up communications with the First Nations bands were conducted. Correspondence with First Nations can be found in Appendix F.

The Notice of Study Completion was issued on January 20, 2011 with the 30 day public review period of this Class EA Environmental Study Report commencing on January 21, 2011 and finishing on February 19, 2011. In early March 2011, MOE confirmed that no Part II Order requests were received by the Ministry.

N. RECOMMENDATIONS

Based on the above, it is recommended that:

- The Town proceed with the preliminary and detailed design of the preferred design concept;
- The Town proceed with planning and implementation of Water Conservation and Efficiency Strategy in conformance with the Lake Simcoe Protection Plan;
- Through detailed design, proceed to secure remaining approvals including MOE, LSRCA, MNR, Transport Canada and Ministry of Tourism and Culture as described in section 12.6;
- The mitigation measures identified in section 13 of this report should be confirmed and further elaborated upon during preliminary and detailed design, and implemented as part of the construction process; and
- Proceed to revise Innisfil-BWG water supply agreement based on new capacity allocations.

Table of Contents

Statement of Qualifications and Limitations

Distribution List

Executive Summary

page

Part A: Phase 1 of the Class EA Planning Process.....	1
1. Introduction and Study Background.....	1
1.1 Background.....	1
1.2 Study Location and Scope.....	1
1.3 Study Purpose and Objectives	4
1.4 Study Team Organization.....	4
1.5 Municipal Class Environmental Assessment Planning Process.....	5
1.5.1 Overview.....	5
1.5.2 Project Planning Schedule	9
1.5.3 Canadian Environmental Assessment Act Triggers	9
1.5.4 Communications and Consultation Program Overview.....	9
1.6 Public Review of this Report and Next Steps.....	12
1.7 Format of this Report.....	13
2. Existing Lakeshore Water Treatment Plant and Service Area.....	15
2.1 Lakeshore Water Treatment Plant.....	15
2.1.1 Intake	15
2.1.2 Low Lift Pumping Station.....	15
2.1.3 Lakeshore Water Treatment Plant.....	15
2.2 Service Area	15
2.2.1 Town of Innisfil.....	15
2.2.2 Town of Bradford West Gwillimbury	16
2.3 Planning and Servicing Considerations.....	16
2.3.1 Town of Innisfil Growth Management Strategy	16
2.3.2 Town of Innisfil Official Plan	17
2.3.2.1 OPA No. 1	17
2.3.2.2 Big Bay Point.....	17
2.3.3 Town of Bradford West Gwillimbury Official Plan.....	17
2.3.3.1 BWG Strategic Employment Lands (OPA No. 15)	17
2.3.3.2 Bond Head Secondary Plan (OPA No. 16)	17
2.3.4 Simcoe County Official Plan	17
2.3.5 Lake Simcoe Protection Plan	18
2.3.6 Places to Grow Plan – Simcoe Area: A Strategic Vision for Growth.....	18
2.3.7 Provincial Policy Statement.....	18
2.3.8 Greenbelt Plan Area	19
2.4 Water Efficiency.....	19
2.4.1 Water Opportunities and <i>Water Conservation Act</i>	19
2.4.2 Current Town of Innisfil Water Conservation Measures.....	19
2.4.3 Future Innisfil Water Conservation Plan and Efficiency Strategy (WCES).....	20
2.4.4 Bradford West Gwillimbury Water Efficiency Program.....	20
3. Phase 1: Identification and Description of the Problems and Opportunities	22

3.1	Population and Water Demand Projections.....	22
3.2	Problem/Opportunity Statement	24
Part B: Phase 2 of the Class EA Planning Process.....		25
4.	Phase 2: Alternative Solutions to the Problem	25
4.1	Description of Alternative Solutions.....	25
5.	Study Area Features	27
5.1	Study Area Delineation	27
5.2	Existing Land Uses	27
5.3	Future Land Uses	29
5.4	Social/Cultural Environment	29
5.4.1	Innisfil Beach Park.....	29
5.4.2	Archaeological and Cultural Built Heritage Resources.....	29
5.5	Natural Environment.....	29
5.5.1	Methods	32
5.5.1.1	Agency Consultation	32
5.5.1.2	Field Investigations.....	32
5.5.2	Existing Ecological Conditions.....	34
5.5.2.1	Alcona Creek (also referred to as Watercourse No. 4)	34
5.5.2.2	Lake Simcoe Inlet and Intake Corridor	36
5.5.2.3	Unnamed Watercourse	37
5.5.2.4	Terrestrial Conditions	38
6.	Comparative Evaluation of Alternative Solutions.....	40
6.1	Evaluation Methodology	40
6.1.1	Development of Evaluation Framework and Criteria.....	40
6.1.2	Use of Descriptive Information and Qualitative Evaluation	41
6.2	Evaluation of Alternative Solutions	42
6.2.1	Alternative 1: Do Nothing.....	42
6.2.2	Alternative 2: Reduce Limits of Service Area	43
6.2.3	Alternative 3: Reduce Water Demands	44
6.2.4	Alternative 4: Increase Lakeshore WTP Capacity Rating	45
6.2.5	Alternative 5: Expand the Lakeshore WTP and Storage including New Intake and Low Lift Pumping Station.....	46
6.2.6	Alternative 6: Construct New Surface WTP including New Intake and LLPS	47
6.2.7	Alternative 7: Develop New Groundwater Sources	48
6.2.8	Alternative 8: Obtain Treated Water from a Neighbouring Municipality (i.e. Barrie, New Tecumseth, York Region).....	49
6.2.9	Alternative 9: Construct Water Reuse Treatment Plant and Recharge Aquifer, Develop Well Supply System	50
6.2.10	Alternative 10: Implement Grey Water Systems	51
6.3	Evaluation Summary.....	52
6.4	Rationale for Selecting the Preferred Solution	52
Part C: Phase 3 of the Class EA Planning Process.....		55
7.	Water Treatment Process Selection.....	55
7.1	Preferred Water Treatment Process.....	55
7.2	Preferred Residual Management Solution.....	57

8.	Identification of Alternative Design Concepts	61
8.1	Intake	61
8.2	Low Lift Pumping Station Expansion Siting Options	61
8.3	Watermain Connection	61
8.4	Water Treatment Plant Expansion Siting Options	61
9.	Evaluation of Low Lift Pumping Station Expansion Siting Options	66
9.1	Evaluation of LLPS Expansion Siting Options.....	66
9.2	Preferred Low Lift Pumping Station Expansion Siting Option	67
10.	Evaluation of Watermain Connection Options.....	69
10.1	Evaluation of Watermain Connection Options.....	69
10.2	Preferred Watermain Connection Option	70
11.	Evaluation of Water Treatment Plant Expansion Siting Options	73
11.1	Evaluation of WTP Expansion Siting Options	73
11.2	Preferred Water Treatment Plant Siting Option.....	74
12.	Implementation	77
12.1	Overview of the Preferred Design Concept	77
12.1.1	Intake	77
12.1.1.1	Intake Dive.....	79
12.1.2	Low Lift Pumping Station.....	80
12.1.3	Watermain Connection	80
12.1.4	Phase 3 Water Treatment Plant Expansion	80
12.1.5	Stormwater Management	87
12.2	Emergency Overflow and Discharge of Residuals	88
12.3	Implementation Schedule	88
12.4	WTP Capacity Staging.....	90
12.5	Construction Costs and Funding	91
12.5.1	Construction Costs	91
12.5.2	Project Funding.....	92
12.6	Review Agency Approvals.....	93
12.6.1	Ministry of the Environment	93
12.6.1.1	Drinking Water Works Permit and Permit to Take Water	93
12.6.1.2	Certificate of Approval	93
12.6.2	Lake Simcoe Region Conservation Authority	93
12.6.3	Ministry of Natural Resources	93
12.6.4	Transport Canada.....	94
12.6.5	Ministry of Tourism and Culture.....	94
13.	Mitigation Measures and Commitments	95
13.1	Construction Related Impacts	95
13.2	Enhancements.....	97
13.3	Mitigation – Post Construction/Monitoring Requirements	98
14.	Communications and Consultation Program.....	99
14.1	Public Consultation	99
14.1.1	Public Notification	99
14.1.2	Public Information Centre #1 – November 27, 2008	99
14.1.3	Public Information Centre #2 – January 26, 2010	100

14.1.4	Public Information Centre #3 – May 18, 2010	100
14.1.5	Comments Received and Responses	101
14.2	Review Agency and First Nations Consultation	102
14.2.1	Agency and First Nations Notification.....	102
14.2.2	Review Agency Consultation	102
14.2.2.1	Ministry of the Environment.....	102
14.2.2.2	Lake Simcoe Region Conservation Authority.....	102
14.2.2.3	Ministry of Transportation	103
14.2.2.4	Ministry of Tourism and Culture	103
14.2.3	First Nations Consultation	103
14.2.3.1	First Nations Responses to Notice of Study Completion	104
15.	Conclusions and Recommendations	105
15.1	Conclusions	105
15.2	Recommendations.....	105

List of Figures

Figure 1-1	Study Area.....	2
Figure 1-2	Secondary Study Area	3
Figure 1-3	Overview of the Municipal Class Environmental Assessment Planning Process.....	7
Figure 1-4	Communications and Consultation Plan	11
Figure 5-1	Existing Land Use Features	28
Figure 5-2	Significant Natural Heritage Features – Innisfil Beach Park	30
Figure 5-3	Significant Natural Heritage Features-Town of Innisfil and Bradford West Gwillimbury.....	31
Figure 8-1	Alternative LLPS Expansion Siting Options	63
Figure 8-2	Alternative Watermain Connection Routes	64
Figure 8-3	Alternative Water Treatment Plant Siting Options	65
Figure 12-1	Preferred Water Treatment Plant Design Concept	78
Figure 12-2	Water Treatment Plant Process	84
Figure 12-3	Estimated Project Schedule	89
Figure 12-4	Projected Demand Served by the Lakeshore WTP	90

List of Tables

Table 3-1	Population Projections and Associated Water Demand	22
Table 4-1	Alternative Solutions	25
Table 5-1	Fish Species in Alcona Creek (also referred to as Watercourse No. 4)	35
Table 6-1	Evaluation Framework Components	40
Table 6-2	Evaluation Criteria.....	40
Table 6-3	Evaluation of Alternative Solutions.....	53
Table 7-1	Ratings of Each Alternative in the Benefits Decision Model	58
Table 7-2	Opinions of Probable Cost for Each Treatment Alternative	59
Table 7-3	Calculated Benefit to Cost Ratios for Each Treatment Alternative	60
Table 7-4	Probable Life Cycle Costs of Residuals Handling Options	60
Table 9-1	Evaluation of Alternative Low Lift Pumping Station Siting Options.....	68
Table 10-1	Evaluation of Alternative Watermain Connection Options	72

Table 11-1	Evaluation of Alternative Water Treatment Plant Expansion Siting Options.....	76
Table 12-1	Design Criteria for the Low Lift Pumps.....	80
Table 12-2	Summary of Design Criteria of Water Treatment Plant Phase 3 Expansion	82
Table 12-3	Estimate of Probable Capital Costs	92
Table 13-1	Potential Construction and Long Term Operations Related Impacts and Associated Mitigation Measures.....	95

Appendices

Appendix A	Municipal Class Environmental Assessment Planning Process
Appendix B	Water Treatment Process Alternatives Technical Memorandum
Appendix C	Ecological Investigations
Appendix D	Public Consultation
Appendix E	Review Agency Consultation
Appendix F	First Nations Consultation

List of Acronyms

AOP	Advanced Oxidation Process
BAC	Biologically Activated Carbon
BWG	Bradford West Gwillimbury
CEAA	<i>Canadian Environmental Assessment Act</i>
Class EA	Municipal Class Environmental Assessment
C of A	Certificate of Approval
cm	centimetre
DAF	Dissolved Air Flotation
DAF/F	In Filter Dissolved Air Flotation
dbh	diameter at breast height
DFO	Department of Fisheries and Oceans
DWWP	Drinking Water Works Permit
EA	Environmental Assessment
EAA	<i>Environmental Assessment Act</i>
ELC	Ecological Land Classification
EPA	Environmental Protection Agency
ESR	Environmental Study Report
GAC	Granular Activated Carbon
GMF	Granular Media Filtration
GMS	Growth Management Strategy
Ha	Hectare
HADD	Harmful Alteration, Disruption or Destruction
km	Kilometres
L/c/d	Litres per capita per day
L/sec	Litres per second
LLPS	Low Lift Pumping Station
LPMF	Low Pressure Membrane Filtration
LSRCA	Lake Simcoe Region Conservation Authority
LSPP	Lake Simcoe Protection Plan
m³/day	metres cubed per day
MCC	Motor Control Centre
MEA	Ontario Municipal Engineers Association
ML/D	Mega Litres per Day



MNR	Ontario Ministry of Natural Resources
MMAH	Ministry of Municipal Affairs and Housing
m	metre
mm	millimetre
MOE	Ontario Ministry of the Environment
MTO	Ministry of Transportation
NOC	Notice of Completion
OMB	Ontario Municipal Board
OPA	Official Plan Amendment
OP	Official Plan
PAC	Powdered Activated Carbon
PIC	Public Information Centre
PPS	Provincial Policy Statement
ppu	Persons per unit
PS	Pumping Station
PTTW	Permit to Take Water
RMF	Residuals Management Facility
TDH	Total Dynamic Head
Town	Town of Innisfil
TS	Tensile Strength
UV	Ultraviolet
UV-AOP	Ultraviolet Advanced Oxidation Process
VFD	Variable Speed Drive
WCES	Water Conservation and Efficiency Strategy
WTP	Water Treatment Plant
WPCP	Water Pollution Control Plant



Part A: Phase 1 of the Class EA Planning Process

1. Introduction and Study Background

1.1 Background

The Town of Innisfil (the Town), through its consultant AECOM, has completed a Municipal Class Environmental Assessment (Class EA) study² for the expansion of the Lakeshore Water Treatment Plant (WTP) in Alcona (see Figure 1-1). The Lakeshore WTP was commissioned in 1996 to treat surface water from Lake Simcoe and services the Innisfil lakeshore service area in addition to, by agreement, parts of the Town of Bradford West Gwillimbury (BWG). The purpose of the project is to expand the Lakeshore WTP to provide treated municipal water to accommodate full build out of Innisfil's new 2008 Official Plan (OP) based on Official Plan Amendment (OPA) #1, as well as service the approved Big Bay Point Recreational Resort development. The provision of additional water supply capacity will also address future water demands from the recently approved BWG Strategic Employment Lands (BWG OPA No. 15) and Bond Head Secondary Plan (OPA 16). The proposed works include expanding (beyond existing rated capacity) the existing Lakeshore WTP as well as a new Lake Simcoe intake and an expanded-upgraded Low Lift Pumping Station (LLPS). The project also involves construction of a new interconnecting watermain between the LLPS and WTP.

1.2 Study Location and Scope

The primary study area for this Class EA centres around the Lakeshore WTP and LLPS and is bounded northerly by Park Road, southerly by Innisfil Beach Road, westerly by 25th Sideroad and easterly by Lake Simcoe including Innisfil Beach Park in Alcona. Figure 1-1 illustrates the primary study area which centres around the Innisfil WTP. The secondary study area includes the larger Innisfil and BWG Lakeshore WTP service areas in addition to all lands within municipal corporate limits. Figure 1-2 presents the secondary study area including current and approved servicing areas.

The focus of this Class EA was to identify alternatives that can meet the policies and objectives of both of the Town's Official Plans, continue to provide sufficient, high quality drinking water to meet future demands, build upon the existing facilities at the Lakeshore WTP site and be within control of the Town of Innisfil.

The need and justification for this EA was assessed at a project specific level of detail. The project scope for this Schedule C (see section 1.5.2) Class EA was to determine the best way to provide additional treated water to service the approved growth in the Towns of Innisfil and Bradford West Gwillimbury.

² Similar to this Class EA study the Town has also recently completed a wastewater treatment capacity increase Class EA study that involves the expansion and upgrading of the existing Lakeshore Water Pollution Control Plant (WPCP) in Alcona.



LEGEND:

TOWN OF INNISFIL
LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

FIGURE 1-1	STUDY AREA
---------------	------------

BASE MAPPING PROVIDED BY:	JUN 2011
ADDITIONAL SOURCES: (ONTARIO REGULATION 9704) REGULATION OF DEVELOPMENT, INTERFERENCE WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES.	
40m 0 80m 	106449

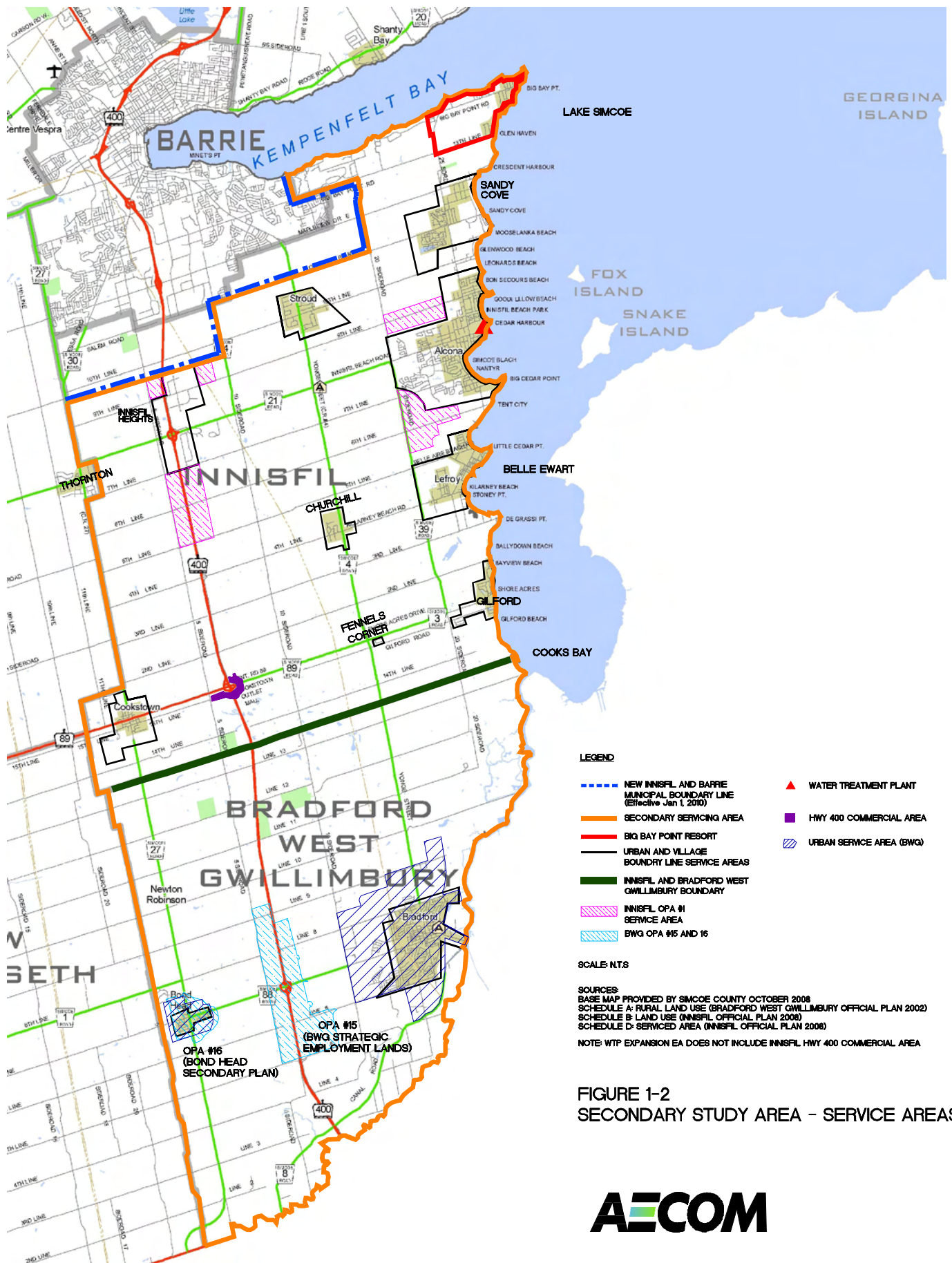


FIGURE 1-2
SECONDARY STUDY AREA - SERVICE AREAS

AECOM

1.3 Study Purpose and Objectives

The purpose of this Municipal Class EA study is to provide a comprehensive and environmentally sound planning process which is open to public participation and to select the preferred water supply solution and associated design concept(s). Study objectives include:

- Protection of the environment, as defined in the *Environmental Assessment Act (EAA)*, through the wise management of resources;
- Extensive consultation with all affected and interested parties, including participation of a broad range of stakeholders to allow for the sharing of ideas, education, testing of creative solutions and developing alternatives;
- Facilitating dialogue between those with different or contrasting interests;
- Documentation of the study process in compliance with all phases of the Municipal Class EA planning process; and
- Mitigation and monitoring to ensure minimal disruption during construction to residents, businesses and the natural environment.

By completing the Class EA planning process, the preferred Lakeshore Water Treatment Plant Expansion design concept should be endorsed by the majority of residents, the general public and acceptable to stakeholders and review agencies.

1.4 Study Team Organization

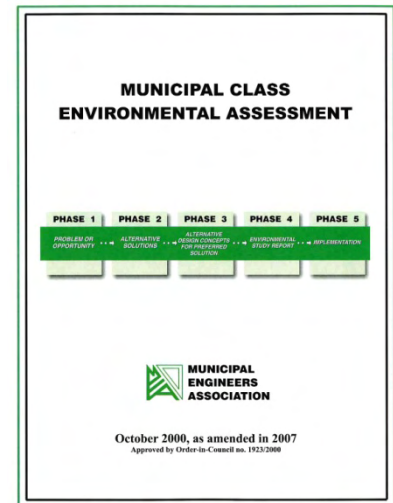
This EA study was undertaken for the Town by AECOM. The project team was comprised of the following individuals:

Town of Innisfil	
Jim Zimmerman	Director of Infrastructure and Town Engineer
Grant W. Shellswell	Manager of Engineering
Don Bauerlein	Water Treatment Plant Operations
Ainley Group	
Joe Mullan	Project Manager
Town of Bradford West Gwillimbury	
Debbie Korolnek	Director of Engineering Services
Vince Musacchio	Manager of Capital Projects
AECOM	
Simon Breese	Project Director
Craig Hebert	Project Manager
Joe Gemin	Project Engineer
Ray Yu	Project Engineer
Karl Grueneis	Class EA Lead
Jessica Romano	EA Planner
Jill deMan	Ecological Investigations Lead

1.5 Municipal Class Environmental Assessment Planning Process

1.5.1 Overview

All municipalities in Ontario, including the Town of Innisfil, are subject to the provisions of the *EAA* and its requirements to prepare an Environmental Assessment for applicable public works projects. The Ontario Municipal Engineers Association (MEA) "Municipal Class Environmental Assessment" document (October 2000, as amended in 2007) provides municipalities with a five-phase planning procedure approved under the *EAA* to plan and undertake all municipal water, sewage, stormwater management, and transportation projects that occur frequently, are usually limited in scale, and have a predictable range of environmental impacts and applicable mitigation measures.



5 Phases

In Ontario, water projects are subject to the Municipal Class EA process and must follow a series of mandatory steps outlined in the Municipal Class EA document. The Class EA consists of five phases, which include:

Phase 1 – Problem or Opportunity: Identify the problem or opportunity, need and justification;

Phase 2 – Alternative Solutions: Identify alternative solutions to the problem by taking into consideration the existing environment, and establish the preferred solution taking into account public and agency review and input;

Phase 3 – Alternative Design Concepts for Preferred Solution: Examine alternative methods of implementing the preferred solution, based upon the existing environment, public and agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects;

Phase 4 – Environmental Study Report (ESR): Document, in an ESR a summary of the rationale, planning, design and consultation process of the project as established through the above phases and make such documentation available for scrutiny by review agencies and the public; and

Phase 5 – Implementation: Complete contract drawings and documents, and proceed to construction and operation; monitor construction for adherence to environmental provisions and commitments. Where special conditions dictate, also monitor the operation of the complete facilities.

The Class EA process ensures that all projects are carried out with effectiveness, efficiently and fairness. This process serves as a mechanism for understanding economic, social and environmental concerns while implementing improvements to municipal infrastructure.

Mandatory Principles

The process followed not only adheres to the guidelines outlined by the Class EA document, but reflects the five mandatory principles of Class EA planning under the *EA Act*:

1. *Consultation with affected parties early on, such that the planning process is a co-operative venture;*
2. *Consideration of a reasonable range of alternatives;*
3. *Identification and consideration of the impacts of each alternative on all aspects of the environment;*
4. *Systematic evaluation of alternatives in terms of their advantages and disadvantages to determine the net environmental effects; and*
5. *Provision of clear and complete documentation of the planning process, to allow “traceability” of decision-making with respect to the project.*

Following these five principles ensures that the EA process is devoted to the prevention of problems and damage through thorough planning and decision-making, recognizing that research and evaluation of possible impacts have been taken into account prior to the implementation of the project.

Figure 1-3 illustrates the process followed in the planning and design of projects covered by a Municipal Class EA, including the Lakeshore Water Treatment Plant Expansion Municipal Class EA study.

The flowchart illustrates the five phases of the Environmental Assessment process for the Lakeshore Water Treatment Plant Municipal Class Environmental Assessment. The process begins with a 'Notice of Study Commencement and PIC # 1 (Discretionary Contact Point)' on November 2008, leading to Phase 1: 'Identify & Describe the Problem/Opportunity'. Phase 1 leads to Phase 2: 'Complete Study Area Inventory Identify & Evaluate Alternative Solutions & Establish the Recommended Solution', which is associated with 'Schedule A, A+, B & C Projects'. Phase 2 includes two 'Public Information Centres': PIC #1 (Mandatory Contact Point) on November 27, 2008, and PIC #2 (Discretionary Contact Point) on January 26, 2010. Phase 2 leads to Phase 3: 'Identify & Evaluate Alternative Design Concepts, Environmental Effects & Confirm Preferred Design', which is associated with 'Schedule B Project' and 'Schedule C Project'. Phase 3 leads to Phase 4: 'Prepare Environmental Study Report (ESR) Documenting Phases 1-3'. Phase 4 leads to a box representing the 'Environmental Study Report' (ESR) document, which is associated with 'Schedule A & A+ Projects'. The ESR document is associated with 'Public Information Centre #3 (Mandatory Contact Point)' on May 18, 2010. The ESR document leads to an 'Opportunity for Part II Order Request (Appeal to MOE)', which is associated with 'Notice of Study Completion (Mandatory Contact Point)' on January 20, 2011. The 'Opportunity for Part II Order Request' leads to Phase 5: 'Complete Drawings & Documents Proceed to Construct, Operate & Monitor Project'. A yellow arrow labeled 'We are Here' points to the 'Opportunity for Part II Order Request' box.

```
graph TD; A[Notice of Study Commencement and PIC # 1  
(Discretionary Contact Point)  
November 2008] --> B[PHASE 1  
Identify & Describe the Problem/Opportunity]; B -- "Schedule A, A+, B & C Projects" --> C[PHASE 2  
Complete Study Area Inventory  
Identify & Evaluate Alternative Solutions & Establish the Recommended Solution]; D[Public Information Centre #1  
(Mandatory Contact Point)  
November 27, 2008] --> C; E[Public Information Centre #2  
(Discretionary Contact Point)  
January 26, 2010] --> C; C -- "Schedule B Project" --> F[PHASE 3  
Identify & Evaluate Alternative Design Concepts,  
Environmental Effects & Confirm Preferred Design]; C -- "Schedule C Project" --> F; G[Public Information Centre #3  
(Mandatory Contact Point)  
May 18, 2010] --> F; F --> H[PHASE 4  
Prepare Environmental Study Report (ESR) Documenting  
Phases 1-3]; H --> I[Environmental Study Report  
ACCOM  
Lakeshore Water Treatment Plant Municipal Class  
Environmental Assessment  
Environmental Study Report]; J[Public Information Centre #3  
(Mandatory Contact Point)  
May 18, 2010] --> I; I --> K([Opportunity for Part II  
Order Request  
(Appeal to MOE)]); L[Notice of Study Completion  
(Mandatory Contact Point)  
January 20, 2011] --> K; K --> M[PHASE 5  
Complete Drawings & Documents  
Proceed to Construct, Operate & Monitor Project]; N[We are Here] --> K; A -- "Schedule A & A+ Projects" --> M;
```

Project Classes

The Class EA defines four types of projects and the processes required for each (referred to as Schedule A, A+, B, or C). The selection of the appropriate schedule is dependent on the anticipated level of environmental impact, and for some projects, the anticipated construction costs.

Projects are categorized according to their environmental significance and their effects on the surrounding environment. Planning methodologies are described within the Class EA and are different according to Class type, such as the following:

Schedule A: Projects are limited in scale, have minimal adverse environmental effects and include a number of municipal maintenance and operational activities. These projects are pre-approved and may proceed to implementation without following the full Class EA planning process. Schedule A projects generally include normal or emergency operational and maintenance activities where environmental effects of these activities are usually minimal. Examples of Schedule A projects include repairs and renovations to treatment and pumping plant equipment, water storage facilities, distribution mains and appurtenances. As such, these projects are pre-approved and subsequently do not require any further planning and public consultation.

Schedule A+: The purpose of Schedule A+ is to ensure some type of public notification for certain projects that are pre-approved under the Class EA. It is appropriate to inform the public of municipal infrastructure project(s) being constructed or implemented in their area; however, there would be no ability for the public to request a Part II Order. If the public has any comments, they should be directed to municipal staff and/or municipal Council where they would be more appropriately addressed. Examples of Schedule A+ projects include expanding, or upgrading a water treatment plant up to existing rated capacity where no land acquisition is required.

Schedule B: These projects have the potential for some adverse environmental effects. The proponent is required to undertake a screening process, involving mandatory contact with directly affected public and with relevant review agencies to ensure that they are aware of the project and that their concerns are addressed. If there are no outstanding concerns, then the proponent may proceed to implementation. Examples of Schedule B projects include the replacement of a water intake pipe for a surface water source or increase pumping station (PS) capacity by adding or replacing equipment and appurtenances where new equipment is located in a new building or structure. As a result, the proponent is required to proceed through a screening process (Phases 1 and 2) including consultation with those who may be affected.

At the end of Phase 2, a Project File documenting the planning process followed through Phases 1 and 2 shall be finalized and made available for public and agency review. However if the screening process raises a concern which cannot be resolved, a Part II Order³ may be requested and considered by the Minister of the Environment. Alternatively, the proponent may elect voluntarily to plan the project as a Schedule C undertaking.

Schedule C: Such projects have the potential for significant adverse environmental effects and must proceed under the full planning and documentation (Phases 1 to 4) procedures specified in the Class EA document. Schedule C projects require that an Environmental Study Report (ESR) be prepared and filed for review by the public and review agencies. If concerns are raised that cannot be resolved then a Part II Order may be requested. Examples of Schedule C projects include constructing a new water treatment plant or expand an existing water treatment plant beyond its current rated capacity.

Appendix A further expands on the steps required to complete the Municipal Class EA planning process.

1.5.2 Project Planning Schedule

This Class EA was completed under the October 2000, as amended in 2007 MEA Municipal Class EA document. This project falls under the Schedule C planning schedule as it involves the potential siting and construction of a new WTP or expansion to an existing WTP facility, beyond its rated capacity.

1.5.3 Canadian Environmental Assessment Act Triggers

An environmental assessment under the *Canadian Environmental Assessment Act (CEAA)* may be required before a federal authority takes action, for example, by providing funding, land or issuing an approval. Related to this project, possible *CEAA* triggers include approvals under the *Navigable Waters Protection Act* and the possibility to Department of Fisheries and Oceans (DFO) authorization related to the potential for “harmful alteration, disruption or destruction (HADD) of fish habitat” associated with the twinning of the raw water intake. Through this Municipal Class EA planning process, no *CEAA* triggers were identified, however, a permit from Transport Canada is required under the *Navigable Waters Protection Act* for the twinning of the raw water intake. The potential for a HADD and DFO *CEAA* trigger will be confirmed at detailed design when engineering details and construction methods are confirmed.

1.5.4 Communications and Consultation Program Overview

As part of the Municipal Class EA Schedule C planning process, several steps have been undertaken to inform government agencies, affected landowners, the local community and the general public of the project and to solicit comments.

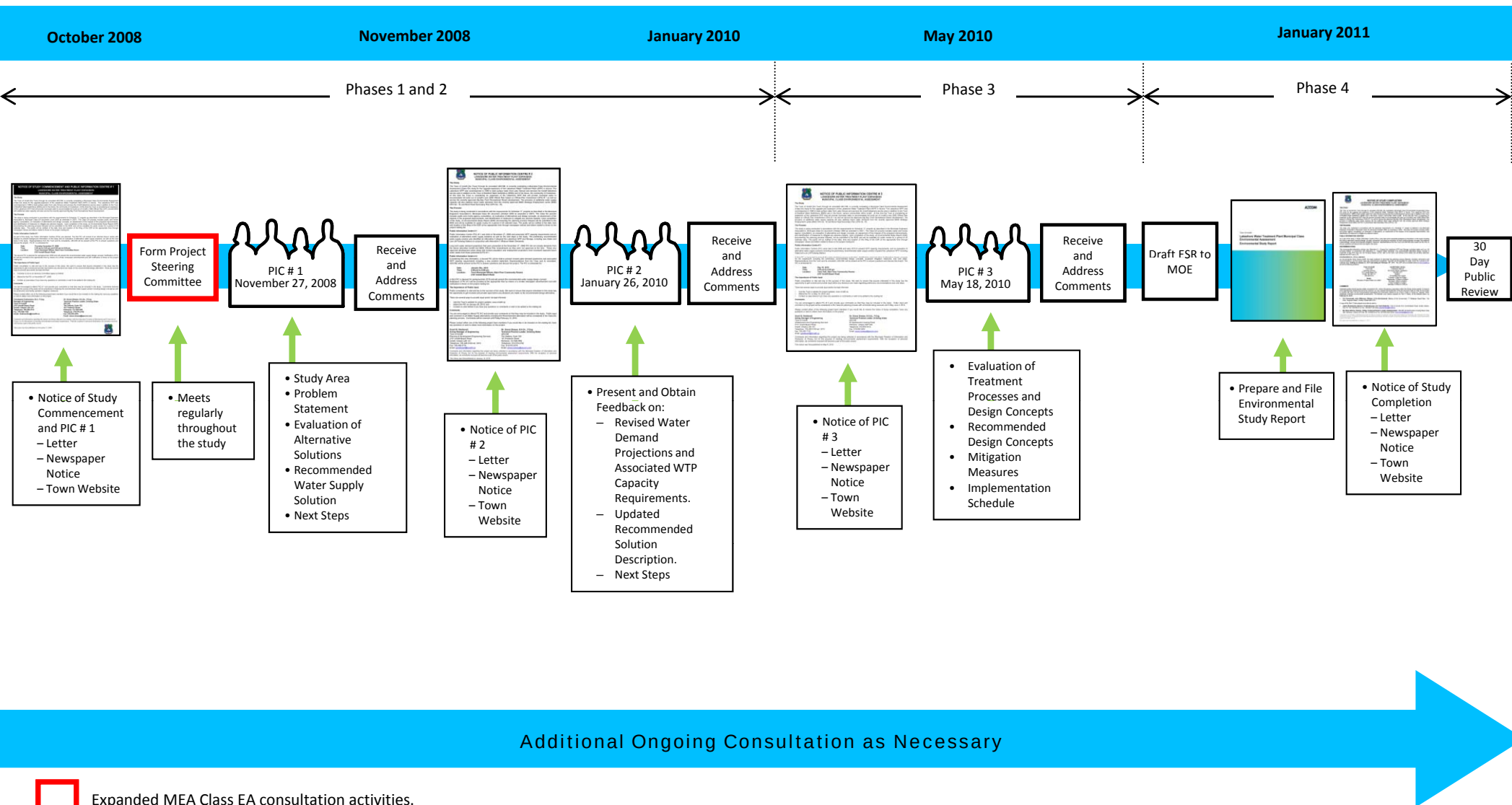
The MEA Municipal Class EA document outlines specific mandatory public and agency consultation contact points and methods. In order to properly communicate the project and to solicit feedback throughout the planning process, the following activities were undertaken:

³Part II Order refers to a request to the Minister of the Environment for a project to comply with Part II (addresses Individual Environmental Assessments) of the Environmental Assessment Act. The need for an Individual EA is based on the conclusion that based on predicted project impacts the MEA Class EA planning process is not sufficient and a more comprehensive EA planning process is required. The requirement to prepare an Individual EA involves the preparation of Terms of Reference and EA document that are submitted to the Ministry of the Environment (MOE), other government agencies and the public for review.

- Posting project milestones on the Town's project website (www.innisfil.ca), including Notices of Study Commencement, Public Information Centres and Completion, and materials presented at Public Information Centres;
- Publication of newspaper notices for all project milestones;
- Direct mailing of notices to stakeholders, affected land owners and review agencies regarding project milestones;
- Holding three Public Information Centres (PICs) to engage and obtain input from the public, review agencies and stakeholders; and
- The Notice of Study Completion was published in the Innisfil Examiner and Bradford Times. The notice was also mailed to adjacent property owners as well as agencies for notification of the 30 day public review period which started on January 21, 2011 and ended on February 19, 2011.

The above communications and consultation program outputs are further described in section 14. Figure 1-4 illustrates the planning and consultation process followed for this project.

Figure 1-4 Communications and Consultation Plan



1.6 Public Review of this Report and Next Steps

The documentation for this Schedule C project consists of an ESR, which is presented as this document. Placement of the ESR for public review completes the planning and preliminary design stages of the project.

This ESR was available for public review and comment for a period of 30 calendar days starting on **January 21, 2011** and ending on **February 19, 2010**. A public notice (Notice of Completion) was published to announce commencement of the review period. To facilitate public review of this document, copies were available at the following locations during regular business hours:

**Town of Innisfil
Town Hall**
Customer Service
2101 Innisfil Beach Road
Innisfil, ON
Telephone: (705) 436-3740

Hours:
Monday-Friday – 8:30am to 4:30pm

**Innisfil Public Library
Cookstown Branch**
20 Church Street
Cookstown, ON
Telephone: (705) 458-1273

Hours:
Sunday/Monday – Closed
Tuesday – 1:00pm to 8:00pm
Wednesday – 10:00am to 8:00pm
Thursday – 1:00pm to 8:00pm
Friday – 10:00am to 5:00pm
Saturday – 10:00am to 3:00 pm

A copy of this document was also available online at www.innisfil.ca.

If, after reviewing this report, you have questions or concerns, please follow the procedure below:

1. Contact Mr. James Zimmerman at the address below to discuss your questions or concerns:

Mr. James Zimmerman
Director of Infrastructure and Town Engineer
Town of Innisfil
2101 Innisfil Beach Road
Innisfil, ON L9S 1A1
Phone: 705-436-3710
Fax: 705-436-7120
E-mail: jzimmerman@innisfil.ca

2. Arrange a meeting with the above if you have significant concerns that may require more detailed explanations;
3. If you have major concerns, the Town will attempt to negotiate a resolution of the issue(s). A mutually acceptable time period for this negotiation will be set. If the issue remains unresolved, you may request the Minister of the Environment, by order, to require the Town to comply with Part II of the *EAA* before proceeding with the project. This is called a Part II Order request. The Minister may make one of the following decisions:
 - Deny the request with or without conditions;
 - Refer the matter to mediation; or
 - Require the Town comply with Part II of the *EAA* by undertaking one of the following:

- Set out directions with respect to preparing the Terms of Reference and an Individual EA for the undertaking; or
- Declare that the Town (proponent) has satisfied the requirements for the preparation of a Terms of Reference, however, the proponent must still prepare an Individual EA.

Requests must be submitted in writing to the Minister of the Environment at the following address within the 30-day review period:

Minister's Office
Minister of the Environment
77 Wellesley Street West, 11th Floor, Ferguson Block,
Toronto, Ontario M7A 2T5

A copy of the request must also be forwarded to the attention of Mr. James Zimmerman at the Town of Innisfil at the address provided above.

If no Part II Order requests are received, the Town may proceed with detailed design and construction of the recommended works as presented in this report.

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

1.7 Format of this Report

This report was prepared to meet the requirements of the Ontario MEA Municipal Class EA planning process. The report combines all phases of the planning process under one cover and incorporates steps considered essential for compliance with the requirements of the *EAA* in the following sections:

- **Section 1** provides background information about the initiation of this study, outlines the format of this report, and describes the study purpose and team organization. This section also provides an overview of the Municipal Class EA planning process, including the project planning schedule followed, public review procedures and next steps;
- **Section 2** provides an overview of the Lakeshore WTP including servicing and planning considerations;
- **Section 3** includes population projections and associated water demands for Innisfil and BWG and identifies and describes the problems/opportunities addressed by this Class EA study;
- **Section 4** presents and describes the alternative solutions that were considered;
- **Section 5** describes the study area and its features, including existing and future land uses, the social/cultural environment, including archaeological and cultural-built heritage and natural environmental features;

- **Section 6** describes the evaluation criteria and methodology used in the evaluation of alternative solutions. This section also summarizes the comparative evaluation of alternative solutions and presents the rationale for selecting the preferred solution;
- **Section 7** outlines the water treatment process selection;
- **Section 8** identifies the alternative design concepts based on siting options for the water treatment plant, low lift pumping station and watermain connection routes;
- **Section 9** summarizes the evaluation of low lift pumping station siting options and identifies the preferred pumping station siting option including rationale;
- **Section 10** summarizes the evaluation of the watermain connection routes and identifies the preferred route including rationale;
- **Section 11** summarizes the evaluation of the water treatment plant expansion siting options and identifies the preferred expansion siting option including rationale;
- **Section 12** describes the implementation of the water treatment plant expansion including an overview of the preferred design, construction costs and funding, intake diving inspection, review agency approvals and implementation schedule;
- **Section 13** describes the mitigative measures recommended to ensure that any disturbances are managed by the best available methods. Also included are commitments that will be honoured during detail design;
- **Section 14** summarizes the communications and consultation program including public, agency and First Nations consultation activities undertaken as part of this Municipal Class EA; and
- **Section 15** provides the final study conclusions and recommendations for the Lakeshore Water Treatment Plant Expansion Municipal Class EA study.

2. Existing Lakeshore Water Treatment Plant and Service Area

2.1 Lakeshore Water Treatment Plant

2.1.1 Intake

The existing intake consists of a 900 mm diameter concrete pipe (buried under approximately 1.0 metre cover), extending from the shoreline and terminating at the inlet structure that rises above the lakebed. The pipe is not aligned perpendicular to the shoreline, and the inlet is located approximately 300 metres from shore in water depth of 11.5 metres. The intake inlet is located 1.7 metres above the lake bed.

As per the 2007 surface water vulnerability report⁴, three intake protection zones have been delineated in order to address potential risks to the drinking water supply and develop a source protection plan.

2.1.2 Low Lift Pumping Station

The existing Low Lift Pumping Station (LLPS), located to the north of Innisfil Beach Road and inside the main entrance to Innisfil Beach Park, was designed to provide raw water pumping capacity for the Phase 2 WTP expansion. The LLPS primarily comprises of raw water channels (inlet well and screen wells), static coarse and fine screens, pump well, and four low lift pumps with their motor control centre (MCC). Three vertical turbine pumps with VFDs installed as part of the Phase 2 Expansion can provide a firm capacity of 328 L/s at 30.5 m TDH. One pump installed at Phase 1 will supply additional raw water at a rate up to 110 L/s. There is a powered activated carbon (PAC) storage and dosing facility attached at northeast corner of the LLPS building. However, this facility has no longer been used since the Phase 2 WTP Expansion.

2.1.3 Lakeshore Water Treatment Plant

As stated previously, the Lakeshore WTP was originally commissioned in 1996 and was recently upgraded to have a maximum capacity of 28,000 m³/day. The WTP is based on a packaged upflow clarification process with granular media filtration and has consistently produced water that meets or exceeds provincial standards. Other components include the low lift pumping station and Lake Simcoe intake. Appendix B includes the Water Treatment Process Alternatives Technical Memorandum that provides an overview of the WTP process train and a brief review of the existing plant operations, covering the basic design of the existing plant. Also included is an overview of historical raw and treated water quality and a brief discussion on plant performance.

2.2 Service Area

2.2.1 Town of Innisfil

Through the Town of Innisfil's water distribution system the Lakeshore WTP serves the Alcona settlement area in addition to BWG (discussed in the next section).

Future service areas (referred to as Urban and Village Service Areas) to be served by the WTP in the future include all areas identified as Settlement areas within the Town's Official Plan which include, but are not limited to:

⁴ *Surface Water Vulnerability Analysis for Lake Simcoe Region Conservation Authority (LSRCA), Town of Innisfil-Alcona Water Treatment Plant Draft Report. W.F. Baird & Associates Coastal Engineers Ltd. December 7, 2007.*

- Big Bay Point development area;
- Innisfil Heights Employment Lands;
- Cookstown;
- Lefroy;
- Gilford; and
- Sandy Cove.

Areas that are currently serviced or planned to be serviced by municipal water are shown on Figure 1-2 in section 1.2. In 2010, the Town of Innisfil initiated a master plan process to determine how to best service its development areas.

2.2.2 Town of Bradford West Gwillimbury

Municipal water supply for BWG urban service areas have been developed based on local groundwater supplies (7 municipal wells). In 2006 the Town of Innisfil and BWG entered into an agreement that allows BWG to purchase a specified amount of municipal water from Innisfil in order to service approved growth. Based on the current agreement, Innisfil will provide BWG with up to 13,000 m³ maximum day demand. In 2009, approximately 45 percent of BWG's water supply came from Innisfil.

Treated water from the Lakeshore WTP is supplied to BWG through the Innisfil/Bradford Water Transmission Main between the Alcona Reservoir, located in Innisfil to the John Fennel Reservoir located in BWG. This dedicated transmission main runs south along the 20th Sideroad from Innisfil Beach Road to Highway 89, westerly along Highway 89 to County Road 4 (Yonge Street/former Hwy 11), southerly along County Road 4 crossing into BWG to Line 12, then westerly along BWG Line 12 to the John Fennel Reservoir on Sideroad 10. Innisfil's Third Line Booster Pumping Station at Line 3 and 20th Sideroad provides the necessary pressure increase to deliver water to the John Fennel Reservoir, and flows are monitored and metered at the municipal boundary. Water is re-chlorinated at the John Fennel Reservoir and distributed through the BWG water distribution system. This water transmission system should be evaluated based on ultimate flows to BWG.

2.3 Planning and Servicing Considerations

The following sub-sections discuss the planning and servicing considerations that were taken into account to ensure that this project helps accommodate the anticipated growth within the Town of Innisfil, while also protecting the natural environment and public health.

2.3.1 Town of Innisfil Growth Management Strategy

In 2006 Innisfil completed a Growth Management Strategy (GMS) to determine the population and employment growth that could be anticipated in the Town by 2025 and the land area necessary to accommodate that growth. The GMS provided input to Innisfil's current Official Plan including OPA No. 1 described below.

2.3.2 Town of Innisfil Official Plan

2.3.2.1 OPA No. 1

The Town of Innisfil completed its Official Plan review process in mid 2006 and adopted its new Official Plan on July 26, 2006. Subsequently, based on comments from the County of Simcoe and the Province, a modified version of the new Official Plan was prepared and was adopted by Council in September of 2008. It was subsequently approved by the County of Simcoe on November 25, 2008.

On April 15, 2009 Innisfil Council approved Official Plan Amendment (OPA No. 1) to expand the existing settlement area boundaries of the Innisfil Heights Economic District and the Alcona Urban Settlement Area in the new Official Plan to accommodate growing population and employment. OPA No. 1 also includes policies with respect to infilling of population and employment within the existing settlement areas which was approved by Simcoe County on October 14, 2009. The latest version of the plan has not been approved by the Ministry of Municipal Affairs and Housing (MMAH).

2.3.2.2 Big Bay Point

The Big Bay Point Resort Secondary Plan planning area comprises approximately 239 hectares (590 acres) and is located in the north-eastern part of the Town of Innisfil on Big Bay Point, between Kempenfelt Bay and open waters of Lake Simcoe. The design of the Big Bay Point Resort features a compact, pedestrian-scaled resort development containing a mixture of Open Space and recreational uses intermingled with Resort Residential, Resort Commercial, cultural and Civic Uses, and is focused on an enlarged marina with a maximum of approximately 1,000 boat slips and an 18-hole championship Golf Course. The Big Bay Point development will receive full municipal servicing from the Innisfil Alcona water and wastewater systems.

2.3.3 Town of Bradford West Gwillimbury Official Plan

2.3.3.1 BWG Strategic Employment Lands (OPA No. 15)

The Town of BWG Official Plan Amendment (OPA No. 15) was adopted by BWG council in November of 2006, which establishes an employment lands corridor along Highway 400. The OPA was revised in April 2009 and after an Ontario Municipal Board (OMB) hearing was approved in August and December of 2009.

2.3.3.2 Bond Head Secondary Plan (OPA No. 16)

The Town of BWG Official Plan Amendment (OPA No. 16) was adopted by BWG council in March 2007, designating additional residential development in the hamlet of Bond Head. The OPA was revised in April 2009 and after an OMB hearing and was approved in August of 2009.

2.3.4 Simcoe County Official Plan

The Simcoe County Official Plan (consolidated in August 2007) sets out a broad County policy framework regarding development and land use and incorporates the basic planning policies of the Provincial Policy Statement which the County administers on behalf of the Province of Ontario.

The plan applies to sixteen towns (e.g. Towns of Innisfil and BWG) and townships, or local municipalities, which constitute the County of Simcoe. The plan is a broad policy document which is implemented through local municipal official plans, zoning bylaws and subdivision approvals.

2.3.5 Lake Simcoe Protection Plan

In June 2009 the province released the Lake Simcoe Protection Plan (LSPP). The plan provides a roadmap to help restore and protect the health of Lake Simcoe by promoting immediate action to address threats to the ecosystem, such as excessive phosphorous in the lake, and targeting new and emerging causes of stress to Lake Simcoe such as invasive species and climate change. The plan is supported by a regulation that builds on and supports Ontario's framework for sustainable growth in communities in the Lake Simcoe watershed. Implementation of the preferred undertaking (e.g. new WTP or WTP expansion) must comply with the plan's policies and regulations which are being developed. As per LSPP policy 5.3-SA municipalities including Innisfil, that are part of the Lake Simcoe watershed must prepare and begin implementation of a water conservation and efficiency plan by June 2014.

2.3.6 Places to Grow Plan – Simcoe Area: A Strategic Vision for Growth

In June 2009 the province released a discussion paper entitled *Simcoe Area: A Strategic Vision for Growth* which lays out a strategy and directions to plan for more prosperous and sustainable growth in the Simcoe area. The strategy is based on provincial principles and policies, including the Growth Plan for the Greater Golden Horseshoe, 2006 and the Lake Simcoe Protection Plan.

The growth plan provides population and employment allocations for Simcoe County and its lower-tier municipalities and identifies strategic employment areas along the Highway 400 corridor in Innisfil and BWG.

2.3.7 Provincial Policy Statement

The Provincial Policy Statement (Ministry of Municipal Affairs and Housing, March 2005) requires that municipalities promote "efficient development and land use patterns which sustain the financial well being of the Province and municipalities over the long term and promote cost effective development standards to minimize land consumption and servicing costs"⁵. In order that these objectives may reasonably be achieved, the Provincial Policy Statement (PPS) encourages municipalities to focus growth into defined 'settlement' areas where a full level of water and sewer services are or can reasonably be made available. The PPS also directs that the long-term ecological functions and biodiversity of natural heritage systems should be maintained, restored or where possible improved.

The Provincial Policy Statement promotes the expansion of any service in a coordinated, efficient and cost effective manner to accommodate projected needs and requires that planning for infrastructure and public services facilities "be integrated with the planning for growth so that these are available to meet current and projected needs". Section 1.1.2 of the PPS states: "Sufficient land shall be made available through intensification and redevelopment and, if necessary, designated growth areas, to accommodate an appropriate range and mix of employment opportunities, housing and other land use to meet projected needs for a time horizon of up to 20 years."

⁵ The Provincial Policy Statement is issued under the authority of Section 3 of the Planning Act. It provides direction on matters of provincial interest related to land use planning and development, and promotes the provincial "policy-led" planning system (Source: Ministry of Municipal Affairs and Housing).

2.3.8 Greenbelt Plan Area

The study area is located outside of the Greenbelt Planning Area; therefore, policies contained in the Greenbelt Plan (Ministry of Municipal Affairs and Housing, 2005) do not apply to this study.

2.4 Water Efficiency

2.4.1 Water Opportunities and *Water Conservation Act*

Bill 72 (*The Water Opportunities and Water Conservation Act, 2010*)⁶ received Royal Assent on November 29, 2010. The act establishes a framework to drive innovation, create economic opportunities, sustain water infrastructure and conserve Ontario's water. One of the legislation's key thrusts is to conserve and sustain water resources for present and future generations. Through regulation, municipalities would prepare a municipal water sustainability plan which would include an asset management plan, a financial plan, a water conservation plan, strategies for maintaining and improving the municipal water service, a risk assessment and other prescribed information.

The water conservation plan must also include a summary of annual water use for each of the public agency's operations, as well as documentation of progress and achievements relating to targets established by the public agency in the plan. Regarding current and future water supply Municipal Class EA planning studies, in anticipation of this legislation MOE has been encouraging that water conservation programs and targets should be integrated into the EA problem definition and alternatives evaluation process and ultimate project design⁷.

2.4.2 Current Town of Innisfil Water Conservation Measures

At this time the current water conservation measures being implemented include the following:

- All water customers are metered;
- Awareness of water conservation programs through public consultation and regular advertisement;
- Encourage the use of high efficiency fixtures in existing and future developments (Since the majority of development within the community is pre 1996 many of the Ontario Building Code changes around water conservation initiatives have been adopted within Innisfil.;
- Encourage landscape water efficiency, restrict lawn watering through by-laws, as required;
- Identify and repair leaks in the water distribution system;
- Continue to monitor water usage trends to establish the effectiveness of the awareness program and implement water restrictions at such times as deemed necessary and may be area specific; and
- Continuation with such security measures as the installation of hydrant security locks and ensuring the installation of backflow prevention devices on all water supply lines in accordance with approved budgets.

⁶ Bill 72, *An Act to enact the Water Opportunities Act, 2010 and to amend other Acts in respect of water conservation and other matters.*

⁷ As the EA planning process for the 2010 Innisfil WTP Expansion Municipal Class EA (including ESR documentation) was essentially complete at the time of Bill 72 and the Town has not yet developed a formal water conservation plan, the role of water conservation in the development of Innisfil WTP water demand projections was limited to the assignment of realistic per capita consumption rates that reflect water conservation efforts. Section 2.4.3 describes Innisfil's commitment to develop a water conservation plan.

2.4.3 Future Innisfil Water Conservation Plan and Efficiency Strategy (WCES)

Recognizing the value and need for water conservation, through this Municipal Class EA planning process, the Town of Innisfil has made a commitment to develop its own Water Conservation Plan (Council Report DSR-090-10) that will provide a cost effective and achievable strategy to provide municipal water to its customers. Considering that a significant amount of the total water supply demands will be based on new development, water conservation measures mandated in current and future Ontario Building Codes represent relatively easy to implement opportunities to achieve and track water conservation targets. Other methods for achieving water conservation include focusing on financial incentives for existing users, implementing specific measures for non-essential water use during high demand measures and lastly allowing for voluntary and educational programs.

Similar to York Region's Water Efficiency Master Plan⁸ and other water conservation plans, key components of Innisfil's program could include:

- Residential Indoor;
- Residential Outdoor;
- Multi-Family HighRise Indoor;
- Industrial/Commercial/Institutional;
- Distribution Leakage Reduction;
- Public Education; and
- Youth Education.

As per section 2.3.5, of the Lake Simcoe Protection Plan, the Town of Innisfil must have its WCES in place for implementation by June 2014.

2.4.4 Bradford West Gwillimbury Water Efficiency Program

Bradford West Gwillimbury's water efficiency program at this time includes:

- All water customers are metered;
- Lawn watering restrictions (Lawn Water Regulation By-Law # 2001-021);
- Encourage the use of high efficiency fixtures;
- Indoor water saving tips (e.g., replace older toilets, install water efficient showerhead, limit shower time);
- Outdoor water saving tips (e.g., water early in the morning, use a sprinkler that shoots low to the ground, use a barrel to collect rainwater to use for watering);
- Home Leak detection tips; and

⁸ Region of York, Water Efficiency Master Plan Update, Resource Management Strategies Inc., April 2007.

- Identify and repair leaks in the water distribution system.

Much of this information is available on the Town's website and the Town's offices.

For this Class EA, BWG water demands reflect commitments already made for approved development as well as water conservation-demand reduction expectations all of which have been incorporated into the per capita day demand projections, as presented in section 3.0.

3. Phase 1: Identification and Description of the Problems and Opportunities

3.1 Population and Water Demand Projections

The following Table 3-1 presents population projections and associated water demands for Innisfil and BWG. For Innisfil, the population projections and associated demands reflect areas that are currently serviced or planned to be serviced by municipal water.

Table 3-1 Population Projections and Associated Water Demand

Town	Servicing Area	Population		Employment Lands (ha)	Unit Demand		Water Demand (m ³ /day)
		2007 Existing Population	2026 Projected Population		l/c/day 275	m ³ /ha 20	
Innisfil	Shoreline North (Sandy Cove & Leonard's Beach Shoreline)	5,055	11,654		275		3,205
	Alcona	12,998	24,523		275		6,744
	Shoreline South (Big Cedar Point & DeGrassi Point Shorelines)	1,226	1,240		275		341
	Lefroy (Lefroy & Belle Ewart)	3,237	8,681		275		2,387
	Gilford	1,554	1,886		275		519
	Cookstown	1,481	2,444		275		672
	Big Bay Point	2,853	10,203		275		2,806
	Stroud	2,535	2,824		275		777
	Churchill	702	862		275		237
	Fennels Corners	222	222		275		61
	Others (BBP Resort Landing Watering, etc.)						45
	Sandy Cove - Potential Expansion to Sandy Cove Retirement Area [As per OMB Decision – Case No. PL080118 (767 Units @ 2ppu)]		1,534		275		422
	Innisfil Heights “Existing Designated Area” - Employment Lands (320 Ha) – Equivalent Pop No.	1,000	7,700	320		20	6,400
	Alcona North & South (OPA # 1) - Potential Residential Area		10,000		275		2,750
	Alcona North & South (OPA # 1) - Employment Lands (117.64 Ha) – Equivalent Pop No.		500	117.64		20	2,353
	Innisfil Heights Expansion (OPA # 1) - Expanded Economic District (250 Ha) – Equivalent Pop No.		5,400	250		20	5,000
	Innisfil Heights Expansion (OPA # 1) - Future Expanded Economic District (250 Ha) – Equivalent Pop No.		6,600	250		20	5,000
	Total of Innisfil Equivalent Population and Average Daily Water Demand	32,863	96,273	937.64			39,719

Additional Net Capacity for Innisfil (Peaking Factor 1.7) (Max Day Demand)	67,522
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	Supply to BWG by Agreement Served from Innisfil	Estimated Population	Water Demand (m³/day) to BWG
Bradford West Gwillimbury	BWG Stage 1 (completed with Phase II WTP Expansion)	10,166	3,944
	BWG Stage 2 (to be completed with Phase III WTP Expansion)	35,918	13,936
	Total of Probable BWG Population Served by Innisfil Supply and Average Daily Water Demand	46,084	17,880
Net Capacity for BWG (Peaking Factor=1.8) (Max Day Demand)			32,184

Total Water Demand for Phase III Expansion EA (m³/d)	99,706
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Ultimate Net Capacity m³/day	Existing WTP		Ultimate Expansion		
	Net Capacity m³/day	Allowance of Waste in Plant Use	Increasing Net Capacity m³/day	Allowance of Waste in Plant Use	Ultimate Raw Water Demand (m³/day)
99,706	25,797	10%	73,909 Innisfil-48,824 BWG-25,085	5%	105,981



Includes Intake Expansion

Note: Since being presented at Public Information Centres 1 to 3, the above projections and demands have been refined based on further review and comments from MOE. This included using a per capita consumption rate of 275 litres/capita/day which reflects the impact of water conservation and efficiency measures on water demands.

3.2 Problem/Opportunity Statement

Considering the above, the problem and opportunity statement for this Municipal Class EA study is defined as follows.

A review of the following documents:

- *Town of Innisfil's (Innisfil) new (2008) Official Plan including Official Plan Amendment No. 1: and*
- *Town of BWG current Official Plan including the recently approved BWG Strategic Employment Lands (BWG Official Plan Amendment No. 15) and Bond Head Secondary Plan (BWG Official Plan Amendment No. 16)*

has confirmed the need to provide additional Municipal treated water to service the approved growth within Innisfil and BWG. Additional water supply capacity and associated infrastructure must be in place in a timely and orderly fashion to service proposed development in the aforementioned Official Plan development areas.

In order to address the above, the Town initiated this Class EA planning process in 2008 which identifies and evaluates alternative solutions and design concepts and accordingly addresses the above problem statement. This ESR has been prepared to determine how to best site, design, construct and operate the proposed Lakeshore WTP expansion.

Part B: Phase 2 of the Class EA Planning Process

4. Phase 2: Alternative Solutions to the Problem

4.1 Description of Alternative Solutions

The Class EA process recognizes that there are many ways of solving a particular problem and requires various alternative solutions to be considered. Alternative solutions for consideration in this Municipal Class EA study are described below in Table 4-1.

Table 4-1 Alternative Solutions

Planning Alternative Solutions	Description
Alternative 1: Do Nothing	- No improvements or changes would be undertaken to address future water treatment plant capacity requirements. - Maintain status quo. - The “Do Nothing” alternative represents what would likely occur if none of the alternative solutions were implemented.
Alternative 2: Reduce Limits of Service Area	- Reduce water service area to limit the scope of capital works required in the next planning stage. - Would provide some capacity to extend water servicing to selected areas and accommodate some growth.
Alternative 3: Reduce Water Demands	- Continue use of existing system. - Implement water conservation measures such as encouraging the use of high efficiency fixtures in existing and new developments, leak detection undertaking rehabilitation activities, encouraging landscape water efficiency and restricting lawn watering by-laws. - Develop Water Conservation and Efficiency Strategy to reduce water demands and guide implementation.
Alternative 4: Increase Lakeshore WTP Capacity Rating	- Optimize Lakeshore WTP processes and increase its capacity rating, by operating filters at higher filtration rates. - Process and pumping equipment may need to be modified or replaced and treated water storage has to be expanded.
Alternative 5: Expand the Lakeshore WTP and Storage including New Intake and Low Lift Pumping Station	- Expand existing WTP at existing site using adjacent Town owned lands. - Includes expansion of treated water clear well and high lift pumping station, raw water intake and low lift pumping station, and remote reservoirs.
Alternative 6: Construct New Surface WTP including New Intake and LLPS	- Construct a new WTP along the Lake Simcoe shoreline. - Complete WTP site selection exercise. - Maintain current WTP facility. - Construct and operate associated water distribution system.
Alternative 7: Develop New Groundwater Sources	- Identify well field(s), drill new well(s) and provide adequate treatment. - Construct new watermain and connect to existing system (may require booster station). - Construct and operate associated water distribution system.
Alternative 8: Obtain Treated Water from a Neighbouring Municipality (i.e. Barrie, New Tecumseth, York Region)	Obtain treated water by constructing water transmission main to connect adjacent municipality (e.g. Barrie, New Tecumseth, York

Planning Alternative Solutions	Description
	Region). - Construct associated booster pumping stations and reservoirs along water transmission main route. - May also require financial contributions for upgrades/expansion of neighbouring WTP and transmission system. - Requires negotiation/agreements. 3 options: - City of Barrie – supply from new Big Bay Point Water Treatment Plant; - Town of New Tecumseth System – Purchase water from Collingwood (raw water from Georgian Bay treated by Collingwood and conveyed through an existing pipeline to Alliston); and - York Region – Extend York system northerly from Newmarket (York purchases water from Peel Region – may require upgrades to Peel transmission system and Lakeview WTP).
Alternative 9: Construct Water Reuse Treatment Plant and Recharge Aquifer, Develop Well Supply System	- Construct a wastewater reclamation plant near existing Lakeshore Water Pollution Control Plant (WPCP). - Conduct groundwater aquifer study. - Drill reclaimed water injection wells and construct pumping stations. - Develop water supply wells. - A new centralized well supply system to treat groundwater (from reclaimed water) then connecting to the existing distribution system.
Alternative 10: Implement Grey Water Systems	- Implement grey water (i.e. laundry/bathing water) policy and systems for non-potable uses (i.e. toilets, irrigation). - Grey water collection systems would be constructed to each dwelling. - Grey water treatment and distribution system would be constructed on the basis of community.

5. Study Area Features

The following section describes the project study area, including its location, existing and future land uses, socio-economic environment and natural environmental and archaeological/cultural-built heritage features.

5.1 Study Area Delineation

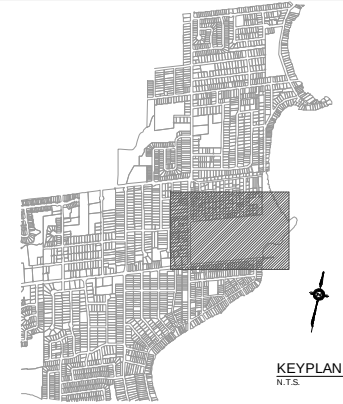
As presented in section 1.2, the primary study area centres around the Lakeshore WTP and LLPS. In addition, based on the nature of alternative solutions (described in section 4), a larger secondary study area was identified that included all lands within the Town's and BWG's municipal corporate limits.

5.2 Existing Land Uses

Existing land uses surrounding the Lakeshore WTP include:

- To the north: Innisfil Beach Park forest including trail (25th Sideroad and Park Road access point) and water feature that discharges to the Park Road ditch system;
- To the east: Innisfil Beach Park including Lake Simcoe;
- To the west: single family residential; and
- To the south: Innisfil Beach Park forest and basketball court.

Existing land uses are illustrated on Figure 5-1.



LEGEND:

- PERMANENT WATERCOURSE
- INTERMITTENT WATERCOURSE

**TOWN OF INNISFIL
LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT**

FIGURE 5-1	EXISTING LAND USES
---------------	---------------------------

BASE MAPPING PROVIDED BY:

ADDITIONAL SOURCES:
(ONTARIO REGULATION 97/04) REGULATION OF DEVELOPMENT, INTERFERENCE
WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES.

JUNE
2010

AECOM



50m 0 150m

106449

5.3 Future Land Uses

There are no known proposed development proposals surrounding the WTP. The Town is currently completing a park master plan for Innisfil Beach Park that will recognize how the WTP is integrated with the park.

5.4 Social/Cultural Environment

5.4.1 Innisfil Beach Park

Innisfil Beach Park is actively used in the summer and winter and includes over 1,000 metres of shoreline, wooded areas and volleyball courts, baseball diamonds, toboggan hill, soccer pitches, and a boat launch. Special annual events and activities include Summer Fest and access to ice fishing. The park also includes part of the Simcoe City Trails system, which includes a 2 km loop called the Innisfil Beach Park Loop.

Surrounding the Lakeshore WTP is a Scot's Pine Forest that provides a visual buffer from adjacent residences to the north, and users of the park. The main access to the park is off of Innisfil Beach Road.

5.4.2 Archaeological and Cultural Built Heritage Resources

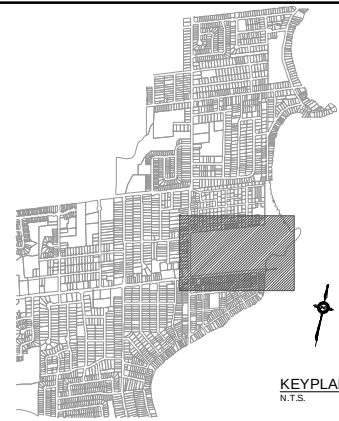
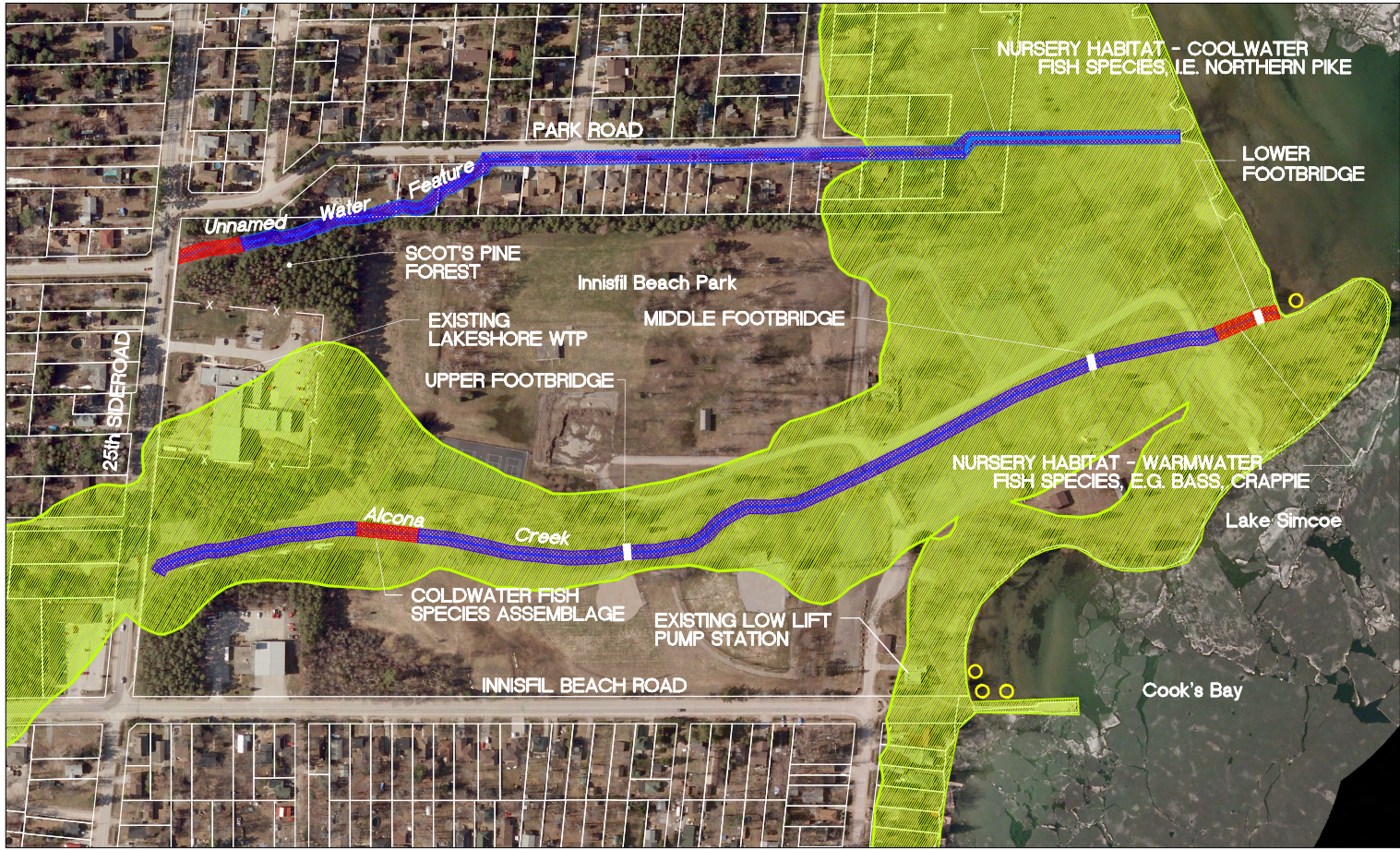
Given its proximity to Lake Simcoe and watercourses there is a strong potential for the discovery of archaeological resources. While there are no buildings designated under the *Ontario Heritage Act* in close proximity to the WTP and park, Innisfil Beach Park does include two commemorative markers/plaques (Innisfil Centennial and Innisfil Township Park) that are located near the LLPS and park entrance.

5.5 Natural Environment

Natural environmental features include trees/vegetation/wooded areas that are located in the park and surround the WTP. Other significant features are the Lake Simcoe shoreline, Alcona Creek (also referred to as Watercourse No. 4) and an unnamed tributary of Lake Simcoe, all of which are regulated by the Lake Simcoe Region Conservation Authority (LSRCA) under Ontario Regulation 179/06 (Regulation Made under the *Conservation Authorities Act* – Development Interference with Wetlands and Alteration to Watercourse and Shoreline Regulation). Figure 5-2 illustrates significant heritage features surrounding the WTP and LLPS. Based on alternative design concepts (Phase 3 of the Class EA process) these features will be investigated in more detail and assessed.

On a broader scale, Figure 5-3 shows the location of significant natural heritage features within the Town and BWG.

DWG NAME: L:\ET\work\106000\106449 - Innisfil WTP EA (Kitchener)\020-CAD\Figure 5-2(Natural Features).dwg Jan 06/11 2:04pm bolan]



- LEGEND:**
- REGULATED AREA
L.S.R.C.A., ONTARIO REGULATION 97/04
 - PERMANENT WATERCOURSE
 - INTERMITTENT WATERCOURSE
 - GENERAL FISH HABITAT ASSESSMENT
 - DETAILED FISH HABITAT AND FISH COMMUNITY ASSESSMENT
 - SEINE NETTING

TOWN OF INNISFIL
LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

FIGURE 5-2
**SIGNIFICANT NATURAL HERITAGE FEATURES
INNISFIL BEACH ROAD**

BASE MAPPING PROVIDED BY:
ADDITIONAL SOURCES:
(ONTARIO REGULATION 97/04) REGULATION OF DEVELOPMENT, INTERFERENCE WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES.

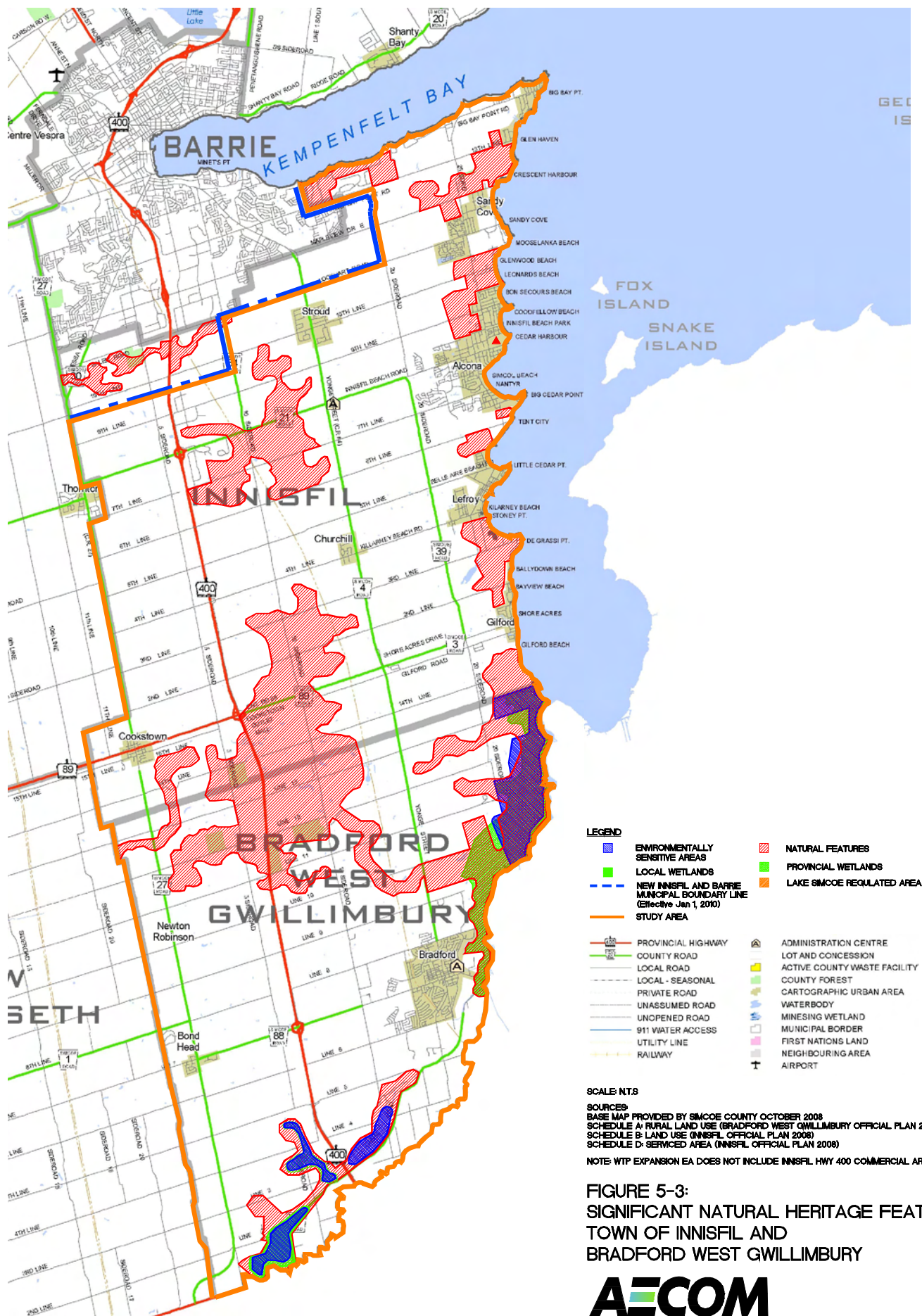
JUN 2010

AECOM



40m 0 80m

106449



**FIGURE 5-3:
SIGNIFICANT NATURAL HERITAGE FEATURES
TOWN OF INNISFIL AND
BRADFORD WEST GWILLIMBURY**

AECOM

5.5.1 Methods

5.5.1.1 Agency Consultation

The study area is located in the jurisdiction of the Lake Simcoe Conservation Authority (LSRCA) and the Ministry of Natural Resources (MNR) – Midhurst District. As such, these agencies were contacted by the project team in order to request background information, which they provided in the form of fish community data and fish habitat information.

The project team held a meeting with LSRCA staff on May 25, 2010 to review the alternative designs, relay the results of the Public Information meeting and discuss the preferred alternative. LSRCA staff were requested to provide input on fish habitat study requirements to support regulatory approvals for any project works affecting fish habitat. LSRCA has a Level III agreement with Fisheries and Ocean Canada (DFO) and as such, will identify and review fisheries issues including HADD determination. DFO should only be directly involved if a harmful alteration, disruption or destruction (HADD) of fish habitat cannot be fully mitigated. AECOM circulated minutes of the meeting to LSRCA staff. These minutes are provided in Appendix E. LSRCA indicated that a fisheries inventory is required in Alcona Creek (also referred to as Watercourse No. 4) and Lake Simcoe to provide adequate information on which to make a determination of potential risks to fish habitat arising from the project works. Specifically, LSRCA indicated a SCUBA dive survey of Lake Simcoe is necessary to obtain first hand information on fish habitat conditions and substrate conditions along potential intake pipe alignments.

Secondary Source Review

Pertinent information on fish habitat and fish community composition was obtained through review of secondary source material from the following sources:

- Ministry of Natural Resources (Midhurst District);
- Lake Simcoe Region Conservation Authority (LSRCA);
- Orthophotography.

Secondary information has been incorporated into the Existing Ecological Conditions (section 5.5.2) of this report.

5.5.1.2 Field Investigations

Alcona Creek (also referred to as Watercourse No. 4)

AECOM ecologists conducted fish habitat and fish community assessments in Alcona Creek (also referred to as Watercourse No. 4) on May 20, 2010. General fish habitat conditions were documented along the entire watercourse and in the outlet channel originating at the WTP and draining into the creek approximately 50 metres distance. Detailed fish habitat conditions and fish community composition were assessed in two 40 metre length reaches. These detailed assessments were conducted at the lower end of the creek where it flows into Lake Simcoe and the upper portion of the creek where it receives discharge from the WTP. Aquatic habitat features were documented in order to identify factors that may influence fish community composition and fish habitat sensitivity. These features included:

- In-stream cover;
- Bank stability;
- Substrate composition;
- Stream morphology;
- Barriers to fish movement;
- Canopy cover;
- Aquatic vegetation; and,
- Riparian vegetation.

Documentation of these features was necessary as it aids in identifying critical habitat within the watercourse such as spawning, nursery, feeding and migratory habitat. The identification of critical habitat is also necessary in determining the projects risk to fish and fish habitat. Representative fish habitat conditions in Alcona Creek (also referred to as Watercourse No. 4) were documented photographically (see Appendix C).

Characterization of fish community composition in Alcona Creek (also referred to as Watercourse No. 4) was completed using a Smith-Root LR24 backpack electrofishing unit. Fish were live released to the stream following species identification.

Lake Simcoe Inlet and Intake Corridor

A fish habitat assessment of the Lake Simcoe inlet in the vicinity of the LLPS was conducted by AECOM in conjunction with Watech Services Ltd's. (Watech) SCUBA dive intake corridor survey of the lake bottom on June 1 and 2, 2010. The intake corridor habitat assessment was carried out along two potential water intake lines: the north line (north of the current intake line), and the south line (south of the current intake line). Watech used a surface supplied diver and video documenting the bottom of the bay spanning 10 m on each side of the proposed lines while an AECOM ecologist simultaneously watched the video on the boat and recorded fish habitat features such as logs, rocks and aquatic vegetation.

A nearshore fish community assessment was conducted at Innisfil Beach on May 20, 2010 using a 7.5 m length seine net. Three areas were seined at the beach and on the north side of the pedestrian causeway and community composition was noted. Seine netting was not performed on the south side of the pedestrian causeway due to the presence of boulders which prevented proper use of the seine net. Fish were live released to Lake Simcoe following species identification. Representative substrate conditions in the nearshore area of the north and south pipe alignments on either side of the wharf were documented photographically (see Appendix C).

Unnamed watercourse

A small unnamed watercourse flows through a wooded area in the northwest corner of the study area and then exits the study area and flows through a roadside ditch along Park Road before re-entering Innisfil Beach Park near Lake

Simcoe. AECOM ecologists conducted visual surveys of the watercourse on May 20 and June 16, 2010 to determine whether there is potential for the watercourse to provide fish habitat and to determine whether it contains ecologically sensitive features. Electrofishing was conducted on June 16, 2010 adjacent to the WTP. Photographs of the unnamed watercourse are shown in Appendix C.

Terrestrial Conditions

Investigations comprised of a late fall and spring season floral species inventory, vegetation community delineation as per MNR's Ecological Land Classification (ELC) guidelines (Lee et al, 1998) and wetland delineation as per MNR's Ontario Wetland Evaluation System (3rd edition). Assessments were completed along Alcona Creek (also referred to as Watercourse No. 4), the unnamed watercourse and the wooded Scot's Pine community. Various planted trees located around the Water Treatment Plant and Innisfil Park were also noted.

5.5.2 Existing Ecological Conditions

5.5.2.1 Alcona Creek (also referred to as Watercourse No. 4)

Upstream of the study area Alcona Creek (also referred to as Watercourse No. 4) is a buried stream and flows through underground pipes in an urban area. It emerges into an open channel at the west side of the study area, at 25th Sideroad, approximately 100 m south of the WTP. From there it flows through Innisfil Beach Park and into Lake Simcoe. Between 25th Sideroad and the middle footbridge Alcona Creek (also referred to as Watercourse No. 4) is narrow and is flanked by dense emergent vegetation which provides shade. Downstream of the middle footbridge the creek is closer to Lake Simcoe and is much wider and deeper with dense submergent aquatic vegetation and no riparian shading. For the purposes of this report, and due to the marked difference in stream dimensions and habitat features, these reaches will be referred to as the upper and lower portions of Alcona Creek (also referred to as Watercourse No. 4) respectively.

The upper section of Alcona Creek (also referred to as Watercourse No. 4), between 25th Sideroad and the middle footbridge, is approximately 0.5 m to 1.0 m wide and 5 cm to 30 cm deep (bankfull dimensions are approximately 7.0 m wide and 1.5 m deep). The creek is a natural channel with gently meandering stream morphology consisting of runs, riffles and pools. Substrates are sand and gravel below 25th Sideroad and then transition to silt and muck adjacent to the baseball diamonds. Instream cover is provided by emergent vegetation, such as cattails, growing on either side of the stream. Woody debris was infrequently noted. Watercress (*Nasturtium officinale*) was noted in numerous locations. Watercress almost always grows in the presence of groundwater. Sand substrates and Watercress in Alcona Creek (also referred to as Watercourse No. 4) suggest there is some groundwater discharge to the creek which could moderate water temperatures through the summer months. Riparian vegetation consisted of grasses and herbaceous species typical of wet meadow communities such as Goldenrod, Joe-pye Weed, Horsetail, Tall Buttercup, Forget-me-not, Grape, as well as shrubs such as Ninebark, Highbush Cranberry, Blackberry, and Tartarian Honeysuckle. Mature Weeping Willow trees line the side of the watercourse and provide shading. Algae was noted in the watercourse throughout the upper reach suggesting nutrient enrichment.

Riparian shrubs such as Willows (*Salix sp.*) and Dogwoods (*Cornus sp.*) and trees such as Scots Pine (*Pinus x*) provided 50-80% shading of the creek but were only allowed to grow up to the top of bank, an average distance of 2m. Grass in Innisfil Beach Park is mowed to the edge of the bank which reduces the effectiveness of the riparian vegetation to act as a natural buffer because the buffer is too narrow. In other areas, such as adjacent to the baseball diamonds there are no riparian shrubs and shading is reduced to 10%. Cyprinids (minnows) were observed throughout the upper reach of Alcona Creek (also referred to as Watercourse No. 4) but tended to be much more abundant closer to Lake Simcoe and less frequent near 25th Sideroad. No permanent barriers to fish movement were noted in the upper section of Alcona Creek (also referred to as Watercourse No. 4), although a seasonal low-flow barrier (a riffle with no surface flow) was noted adjacent to the baseball diamonds.

The lower section of Alcona Creek (also referred to as Watercourse No. 4), between the middle footbridge and Lake Simcoe, is approximately 4.5 m to 6.0 m wide and 0.5 m deep (bankfull dimensions are approximately 6.5 m to 8.0 m wide and 1.0 m deep). The creek appears to have been straightened and stream morphology consists only of flats suggesting a backwater effect from Lake Simcoe. Substrates are comprised of silt, silty sand and muck. In-stream cover is provided mainly by submergent vegetation, such as Milfoil (*Myriophyllum sp.*) and Pondweeds (*Potamogeton sp.*), growing abundantly in the creek but also infrequently by floating aquatic vegetation such as Lilies (*Nuphar sp.*) and woody debris. Algae was noted throughout the lower reach suggesting nutrient enrichment. Riparian vegetation was largely absent with the exception of scattered shrubs below the middle footbridge and recently planted whips of Willow and Dogwood closer to Lake Simcoe. Unmowed grass buffers ranging from 5 m to 15 m have been retained adjacent to the creek. Cyprinids (minnows) were very abundant throughout the lower reach of Alcona Creek (also referred to as Watercourse No. 4) suggesting high biomass and productive habitat in terms of the forage fish base provided to piscivorous (fish-eating) predatory fish such as Largemouth Bass (*Micropterus salmoides*) and Yellow Perch (*Perca flavescens*). No permanent or seasonal barriers to fish movement were observed in the lower section of Alcona Creek (also referred to as Watercourse No. 4).

Fish community sampling (backpack electrofishing) was carried out at two stations, one each in the upper and lower reaches of Alcona Creek (also referred to as Watercourse No. 4). Results of the electrofishing survey are shown in Table 5-1 below.

Table 5-1 Fish Species in Alcona Creek (also referred to as Watercourse No. 4)

Common Name	Scientific Name	Upper Alcona Creek (also referred to as Watercourse No. 4)	Lower Alcona Creek (also referred to as Watercourse No. 4)
Largemouth Bass	<i>Micropterus salmoides</i>		X
Yellow Perch	<i>Perca flavescens</i>		X
Black Crappie	<i>Pomoxis nigromaculatus</i>		X
Rock Bass	<i>Ambloplites rupestris</i>		X
Common White Sucker	<i>Catostomus commersonii</i>		X
Brown Bullhead	<i>Ameiurus nebulosus</i>		X

Common Name	Scientific Name	Upper Alcona Creek (also referred to as Watercourse No. 4)	Lower Alcona Creek (also referred to as Watercourse No. 4)
Emerald Shiner	<i>Notropis atherinoides</i>		X
Mimic Shiner	<i>Notropis volucellus</i>		X
Spottail Shiner	<i>Notropis hudsonius</i>		X
Iowa Darter	<i>Etheostoma exile</i>		X
Brook Stickleback	<i>Culaea inconstans</i>	X	X
Fathead Minnow	<i>Pimephales promelas</i>	X	
Creek Chub	<i>Semotilus atromaculatus</i>	X	
Northern Redbelly Dace	<i>Phoxinus eos</i>	X	
Mottled Sculpin	<i>Cottus bairdii</i>	X	
Blacknose Dace	<i>Rhinichthys</i>	X	

Fish community composition is very different between the upper and lower sections of Alcona Creek (also referred to as Watercourse No. 4) and this is attributable to differences in stream morphology (narrow channel with runs/riffles/pools versus a wide backwater channel near the lake), and in-stream habitat characteristics. The upper section of the creek provides habitat for coolwater baitfish species whereas the lower section of the creek provides habitat for warmwater baitfish and sport fish species. The lower section of the creek provides suitable nursery habitat for a variety of warmwater sportfish species such as Largemouth Bass, Yellow Perch and Black Crappie.

5.5.2.2 Lake Simcoe Inlet and Intake Corridor

AECOM retained Watech Services Ltd. to conduct a SCUBA dive survey of the lake bottom to help characterize fish habitat along the two proposed intake lines: North line, and South line both of which follow the existing intake corridor. The survey was documented on a video recording.

The proposed North line intake pipe was surveyed June 1 and 2, 2010. The survey along the 300 m line into shore spanned 20 m in width (10 m on each side of proposed intake line location); therefore it is assumed that there is sufficient data recorded should there be any inconsistencies in the survey line.

Review of the live underwater video feed was conducted by AECOM staff on board the dive boat. In general the conditions were uniform throughout the 300 m survey. The substrate of the lake consisted of a soft silty, sand bottom, with patches of zebra mussels and algae scattered throughout. There were larger patches of aquatic vegetation (filamentous and algae) at the 170 m, and 130 m marks from shore, however there was no evidence of fish presence or spawning activities. Several logs approximately 2-3 m in length were noted in the survey area, but no evidence of fish presence or spawning activities were noted. Fish were observed at the 250 m mark and again at the 70 m mark; a review of the video recordings will confirm these sightings. There were no areas of significance noted on the video as it pertains to fish habitat.

The South line survey was conducted on June 2, 2010. Again, there was difficulty in setting up the line however through the Watech Services Ltd. dive investigations the current intake was located and then the survey line was

plotted 30 m south. The survey spanned 20 m in width (10 m on each side of the proposed intake line location). GPS co-ordinates of the survey line were recorded by Watech Services Ltd.

The live underwater video feed was reviewed by AECOM staff on board the dive boat. In general the conditions were uniform throughout the 300 m survey. The substrate of the lake consisted of a soft silty, sand bottom, with patches of zebra mussels and algae scattered throughout. There were larger patches of aquatic vegetation (filamentous and algae) at the 130 m mark from shore, however there was no evidence of fish presence or spawning activities. A few logs approximately 1-3 m in length were noted in the survey area, but no evidence of fish presence or spawning activities were noted. Boulders were noted at the 150 m mark and covered approximately 10% of the ground. The scattered boulders continued into the shoreline; however no evidence of fish presence or spawning activities were observed around the rocks. There were no areas of significance noted on the video as it pertains to fish habitat. LSRCA has indicated that Lake Simcoe provides habitat for warm water sport fish such as Smallmouth Bass and that there are no known Lake Trout spawning shoals.

AECOM ecologists conducted seine netting at Innisfil Beach and in Lake Simcoe at the mouth of Alcona Creek (also referred to as Watercourse No. 4) on May 20, 2010. Three fish species were captured at Innisfil Beach: Spottail Shiner, Mimic Shiner and Iowa Darter. Two fish species were captured at the mouth of Alcona Creek (also referred to as Watercourse No. 4): Emerald Shiner and Mimic Shiner.

5.5.2.3 *Unnamed Watercourse*

This small intermittent watercourse is located in the forested area north of the WTP. Upstream of the study area the watercourse is conveyed through underground pipes in an urban area. It emerges into an open channel at 25th Sideroad and flows through a small wooded area before diverging away from the study area into an urban neighbourhood.

At the time of the May 20, 2010 survey adjacent to the WTP the watercourse exhibited poor channel definition and consisted of isolated shallow pools approximately 5 cm or less in depth. Slightly more flow was observed on June 16, 2010 in response to precipitation, and water depth ranged from 5 cm to 10 cm. Substrates consisted of sand and gravel in isolated areas and dark muck in others. Riparian vegetation included grasses and forbs such as Joe-pye Weed and Goldenrods along with shrubs and trees such as Dogwoods, American Elm and Black Ash. A groundwater seep was noted adjacent to the watercourse. Although this watercourse is known to provide direct fish habitat closer to Lake Simcoe it is unlikely that it supports direct fish habitat within the study area due to insufficient flow, except at times of peak flow when hydraulic connectivity is present in the ditch along Park Road. For the majority of the year this watercourse likely provides indirect support to fish habitat further downstream by attenuating storm flows received from the urban catchment area upstream of the study area, by contributing flow and nutrients downstream and by acting as a groundwater discharge/recharge area.

Upon exiting Innisfil Beach Park, the watercourse is conveyed through a roadside ditch along the length of Park Road (for approximately 500 m) but re-enters Innisfil Beach Park near Lake Simcoe. Portions of the ditch were dry during both the May 20 and June 16 field surveys and were observed to have grass growing across the bottom of the ditch, suggesting that standing water is not sustained for long periods of time. At the bottom of Park Road the

channel enters a small wooded backwater area (5-10 metres wide and 40 cm deep) and cattail-lined channel (2-3 metres wide 40 cm deep) before entering Lake Simcoe. Dense submergent aquatic vegetation comprised of Canada Waterweed and Sago Pondweed was observed. Other plant species included Water Plantain, Marsh Marigold, Arrowhead, Narrow-leaved Cattail, and Reed Canary Grass along the margins, as well as Horsetails, Spotted Jewelweed, Bittersweet Nightshade and Goldenrods along the banks. Dense shade was provided by mature Black Willow trees. This area may potentially support permanent flow year-round as evidenced by an abundance of submergent aquatic vegetation and green frogs. According to LSRCA, this portion of the unnamed tributary provides nursery habitat for Northern Pike, a coolwater fish species.

5.5.2.4 Terrestrial Conditions

The terrestrial features within the study area consist of a wooded Scot's Pine community and riparian vegetation along Alcona Creek (also referred to Watercourse No. 4) and the unnamed watercourse. Vegetation community assemblages consist of a combination of meadow marsh, meadow, deciduous swamp and coniferous forest. Communities with a 50% or greater coverage of wetland floral species occur within and along the watercourses. These small wetland communities are not part of a greater wetland complex nor have they been formally evaluated by MNR. Considering their small size and relatively common vegetation assemblages, it is unlikely that the wetland features would be considered provincially significant. However, these do provide ecological benefit to the watercourses within the study area and should be protected as such.

Scot's Pine Community

There is a Scot's pine (*Pinus sylvestris*) community which surrounds the current Innisfil WTP. Through investigations and background review, it has been determined that this community was historically planted as a restoration project to increase tree cover within the area. All Scot's Pine trees were of similar age where diameter at breast height (dbh) ranged between 30 to 40 centimetres. Trees were not found planted in rows or evenly spaced, which would be typical of a plantation and were in fact planted and spaced in such a way to allow for a more natural appearance and growth of an understory as well as an herbaceous layer. There is a relatively low count of invasive species and a high number of ground cover species located within the woodlot, especially poison ivy (*Rhus radicans* sp) and lily of the valley (*Convallaria majalus*) in some areas. Ground cover species observed included, jack-in-the-pulpit (*Arisaema triphyllum*), baneberry (*Actaea rubra*), wild-lily-of-the-valley (*Maianthemum canadense*), helleborine (*Epipactus helleborine*) and pyrola (*Pyrola* sp). Considering that this community was planted, it would be designated as a Mineral Cultural Woodland Ecosite (CUW1) as per MNR's Ecological Land Classification system. A portion of the unnamed watercourse flows through this community as well.

Alcona Creek (also referred to as Watercourse No. 4) and Unnamed Watercourse

Vegetation communities along the watercourses were assessed from the water treatment plant to the outlet at Lake Simcoe. The following communities were observed:

CUM 1-1: Dry-Moist Old Field Meadow Type – This community occurred along the upper banks of the creek as well along the outflow channel from the Water Treatment Plant. Species consist of Canada goldenrod (*Solidago*

canadensis), aster (*Aster sp*), tall buttercup (*Ranunculus acris*) smooth brome (*Bromus inermis*) colt's foot (*Tussilago farfara*) and white avens (*Geum canadense*)

MAM 2-10: Forb Mineral Meadow Marsh Type – This community occurred along the banks of the creek and the unnamed watercourse. A result from ground maintenance along both watercourses, this community is restricted to a narrow band of approximately 1 to 2 metres from the water's edge. Plant species consist of a variety of shrub and herb species with regular planted trees. Planted trees include black willow (*Salix nigra*). These trees are fairly mature and were planted at least 40 years ago. Shrubs include grey dogwood (*Cornus racemosa*), red-osier dogwood (*Cornus stolonifera*), ninebark (*Physocarpus opulifoliosus*), alternate-leaved dogwood (*Cornus alternifolia*), Tartarian honeysuckle (*Lonicera tatarica*) and red raspberry (*Rubus idaeus*). Herbs include forget me not, bedstraw (*Galium triflorum*), and jewelweed (*Impatiens capensis*).

MAS 2-1: Cattail Mineral Shallow – cattails (*Typha angustifolia*) occur within the watercourses with some jewelweed (*Impatiens capensis*) and water plantain (*Alisma plantago-aquatica*).

Appendix C presents a list of floral species observed during investigations.

Environmental Approval Requirements

Environmental approval requirements are associated primarily with the construction of a new water intake pipe to Lake Simcoe, trenchless crossings of Alcona Creek (also referred to as Watercourse No. 4), modifications to the Unnamed Watercourse, and vegetation clearing. The following acts and regulations may potentially apply and will be confirmed at detailed design:

- *Fisheries Act*;
- *Canadian Environmental Assessment Act*;
- *Conservation Authorities Act* – Ontario Regulation 179/06 (Development, Interference with Wetlands and Alteration to Watercourse and Shoreline Regulation);
- *Navigable Waters Protection Act*;
- *Public Lands Act*;
- *Lakes and Rivers Improvement Act*; and,
- *Migratory Birds Convention Act*.

6. Comparative Evaluation of Alternative Solutions

6.1 Evaluation Methodology

6.1.1 Development of Evaluation Framework and Criteria

An evaluation framework was developed and is presented in Table 6-1, including technical considerations and environmental components that address the broad definition of the environment as described in the *Environmental Assessment Act*⁹ and those based on comments received from relevant agencies.

Table 6-1 Evaluation Framework Components

Component	Description
Natural Environment	Component that evaluates the potential effects on the natural and physical aspects of the environment (e.g., air, land, water and biota) including natural heritage/ environmentally sensitive areas.
Social/Cultural Environment	Component that evaluates the potential effects on residents, neighbourhoods, businesses, community character, social cohesion and potential effects on historical/archaeological and built heritage resources.
Economic/Financial	Component that evaluates the proposed financial costs to construct and operate the recommended improvements.
Legal/Jurisdictional	Components that considers potential land requirements and compliance with planning policies.
Technical	Component that evaluates the technical suitability and other engineering aspects of the water system.

Based on the above components, evaluation criteria were developed and used to evaluate alternative solutions. Evaluation criteria are described in Table 6-2.

Table 6-2 Evaluation Criteria

Component	Evaluation Criteria
Natural Environment	Potential impacts to natural environment including siting and routing considerations.
Social/Cultural	- Does the alternative conform with county and municipal development objectives? - Short/medium term construction related impacts (e.g. noise, vibration, dust) including traffic, access and potential impacts from operations. - Potential siting/routing considerations including impacts to existing and future land uses and cultural/heritage resources (e.g. archaeological). - Likelihood of social acceptance.
Economic/Financial	- Relative capital costs. - Relative incremental operations & maintenance costs.
Legal/Jurisdictional	- Land requirements. - Degree of jurisdictional control over alternative.
Technical	Ease of implementation and constructability of alternative.

⁹ The Environmental Assessment Act (Section 1.(c)(i) to (vi) defines the "environment" as "air, land, water, plant and animal life including human life; the social and cultural conditions that influence the life of humans or a community; any building, structure, machine or other device or thing made by humans; any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting in directly or indirectly from the human activities, or; any part or combination of the foregoing and the interrelationships between any two or more of them, in or of Ontario." This definition of the environment is used and is reflected in the environmental components used in the Phase 2 evaluation.

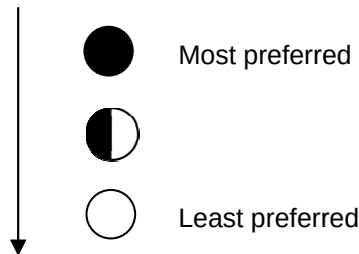
Component	Evaluation Criteria
	- Allowance for future treatment and servicing needs: - Expandability; - Change in regulatory treatment requirements; and - Servicing feasibility. - Degree to which alternative maximizes use of existing infrastructure. - Complexity of regulatory approvals.

6.1.2 Use of Descriptive Information and Qualitative Evaluation

A detailed assessment of each alternative was completed based on the previously described evaluation components. The evaluation used for this study was not based on a numerical ranking system. To ensure statistical validity, such an approach would have to strictly adhere to statistical methods that are often difficult to apply in a multi-faceted project such as a Municipal Class EA. Instead, a descriptive or qualitative evaluation was used to consider the suitability and feasibility of alternative solutions and design concepts. In this respect, trade-offs considering the advantages or disadvantages of each alternative to address the problem and opportunity statement with the least environmental effects and the most technical benefits will result in a higher priority and forms the rationale for the identification of the preferred solution.

Trade-offs involve forfeiting an advantage or accepting a disadvantage to address a higher priority consideration. For information purposes only, the alternatives have been ranked in order of preference (based on advantages/disadvantages) under the discussion with respect to each aspect of the environment.

As shown on the following evaluation summary tables, the following rating symbols were used:



6.2 Evaluation of Alternative Solutions

The following describes the evaluation process that was applied to the alternative solutions. Details of this evaluation are presented in the following sections for each of the alternative solutions. A comparative evaluation in a matrix format was also prepared and used to present the evaluation of the alternatives and shown in Table 6-3 (at the end of this section).

6.2.1 Alternative 1: Do Nothing

No improvements or changes would be undertaken to address future water treatment plant capacity requirements.

Natural Environment

This alternative would have no negative effects on the natural environment.

Social/Cultural

This alternative does not conform to county and municipal development objectives with respect to servicing future growth based on approved official plans. Also, for this alternative there would be no construction related impacts or impacts to existing and future land uses and cultural/heritage resources, however, the likelihood of social acceptability was determined to be low.

Economic/Financial

No relative capital costs or incremental operations and maintenance costs would be incurred with this alternative.

Legal/Jurisdictional

There would be no requirement for additional land and the Town of Innisfil has jurisdictional control over this alternative.

Technical

This alternative would not address future treatment and servicing needs and provides no opportunity to maximize use of existing infrastructure.

Summary

Despite not having significant effects on the above evaluation components, this alternative does not address the problem/opportunity statement. Therefore, this alternative was not carried forward for further consideration

6.2.2 Alternative 2: Reduce Limits of Service Area

This alternative would reduce the limits of service area by revising municipal planning documents and provide some capacity to extend water servicing to selected areas and accommodate some growth.

Natural Environment

This alternative would have minor impacts on the natural environment related to servicing.

Social/Cultural

Depending on the new service area(s), short term construction impacts may be encountered, but, there would be a low impact to existing and future land uses and cultural/heritage resources associated with this alternative related to less areas requiring construction. However, this alternative would not conform to county and municipal development objectives (i.e. cannot service future growth based on approved official plans). There is also the likelihood of low social acceptability.

Economic/Financial

There would be a minor increase in operations and maintenance costs and a low relative capital cost related to servicing revised development areas.

Legal/Jurisdictional

The Town of Innisfil has jurisdictional control over this alternative and there would be no need to acquire land.

Technical

This alternative would be easy to implement, however, it does not address future treatment and servicing needs. However, there is a high degree to which this alternative maximizes the use of existing infrastructure.

Summary

This alternative would have low impacts on the natural and social/cultural environments with a minor increase in operations and maintenance costs. Technically, this alternative would be easy to implement, however, it does not address future treatment and servicing needs. Therefore, this alternative was not carried forward for further consideration.

6.2.3 Alternative 3: Reduce Water Demands

This alternative would continue using the existing system however future water demands may be offset by implementing water conservation measures.

Natural Environment

By reducing water demands and consumption this alternative would have no negative impact on the natural environment (i.e. requires no significant construction) and conversely would have a positive impact on the natural environment in that less water would be taken from Lake Simcoe and less wastewater would have to be treated.

Social/Cultural

This alternative does not conform to county and municipal development objectives as the amount of water saved through consumption is inefficient to meet long term demands based on approved growth. While there would be no construction related impacts or impacts to cultural/heritage resources this alternative would require a high level of participation from the public to make it effective and socially acceptable.

Economic/Financial

There are relatively low capital costs associated with this alternative and operation or maintenance costs would also be reduced based on the requirement to treat less water.

Legal/Jurisdictional

The Town of Innisfil has jurisdictional control over this alternative and there would be no requirement for land.

Technical

This alternative would be easy to implement, however, it does not address future treatment and servicing needs. Still, there is a high degree to which this alternative maximizes the use of existing infrastructure.

Summary

This alternative requires a high level of participation from the public and by the public reducing water demands and consumption there will be no effects on the natural environment. Technically this alternative on its own does not address future treatment and servicing needs. However, when implemented in conjunction with the preferred alternative it will contribute to satisfying the problem and opportunity statement and as such will be carried forward for further consideration.

6.2.4 Alternative 4: Increase Lakeshore WTP Capacity Rating

Alternative 4 optimizes the Lakeshore WTP processes and increases its capacity rating, by operating filters at higher filtration rates.

Natural Environment

This alternative would have no impact to the natural environment in that all improvements and procedures would take place in existing WTP buildings.

Social/Cultural

This alternative does not conform to county and municipal development objects in that it is unable to meet long term demands based on approved growth. This alternative would have no construction related impacts or impacts to cultural/heritage resources and the likelihood of social acceptability of this alternative is high.

Economic/Financial

Low capital, operations and maintenance costs would be associated with this alternative.

Legal/Jurisdictional

This alternative is located within control of the Town of Innisfil also has no land requirements as all works would take place on the existing WTP property.

Technical

This alternative would maximize the use of the existing WTP however, it would be difficult to implement based on the WTP's current design and unable to meet the future long term treatment and servicing needs of Innisfil and BWG.

Summary

Despite having no impact to the natural environment, technically this alternative would be difficult to implement and does not address the problem and opportunity statement. Therefore, this alternative was not carried forward for further consideration.

6.2.5 Alternative 5: Expand the Lakeshore WTP and Storage including New Intake and Low Lift Pumping Station

This alternative would expand the existing WTP beyond its current rated capacity and includes expansion of treated water clear well and high lift pumping station, raw water intake and low lift pumping station, and remote reservoirs.

Natural Environment

Depending on the WTP expansion area and the siting of WTP components this alternative may have moderate impacts to trees/vegetation (i.e. removal) and water resources (e.g. potential for sedimentation erosion, loss or disruption to fish habitat, alteration of localized groundwater recharge/discharge areas).

Social/Cultural

This alternative conforms to the county and municipal development objectives in that long term water supply demands based on approved growth would be met. This alternative may result in moderate construction impacts and moderate impacts to existing land uses such as Innisfil Beach Park (e.g. encroachment into park, construction of new LLPS/raw water connection pipe between LLPS and WTP in addition to intake twinning). The likelihood of social acceptability is moderate due to the potential impacts to the park dependant on the WTP expansion area and WTP component siting.

Economic/Financial

There is relatively high capital costs associated with this alternative. The additional water distribution and pumping costs associated with the new intake and LLPS would be moderate and the WTP operations costs would be relatively low.

Legal/Jurisdictional

This alternative is within the control of the Town of Innisfil. The land requirements for the LLPS would be low. As the land required for WTP expansion is owned by the Town, the land requirements would be considered moderate.

Technical

This alternative fully addresses future treatment and servicing needs and maximizes the use of existing infrastructure (i.e. Lakeshore WTP). However it is expected that there would be some construction difficulties related to maintaining WTP operations during construction, dependent on the WTP expansion area and WTP component siting.

Summary

This alternative has moderate impacts to the natural and social/cultural environments, as well as relatively high capital costs. However, technically this alternative fully addresses future treatment and servicing needs and maximizes the use of the existing Lakeshore WTP. This alternative in conjunction with Alternative 3 satisfies the problem and opportunity statement entirely and was carried forward for further consideration.

6.2.6 Alternative 6: Construct New Surface WTP including New Intake and LLPS

This alternative would entail the construction of a new WTP and associated intake along the Lake Simcoe shoreline while maintaining the current WTP facility.

Natural Environment

Dependent on the siting of the new WTP this alternative would have significant impacts to trees/vegetation and water resources in that a new WTP and Lake Simcoe intake would be constructed at a new location.

Social/Cultural

This alternative conforms to the county and municipal development objectives as long term water supply demands would be easily met. However, there would be high construction related impacts with the greatest impact along the shoreline of Lake Simcoe (dependant on WTP and intake facility siting).

Economic/Financial

There would be relatively high capital and WTP operational costs (i.e. now operating two separate WTP's) but lower water transmission costs associated with this alternative as the WTP could be potentially sited where future demand exists.

Legal/Jurisdictional

This alternative would be located within the control of the Town of Innisfil. However, due to the siting of a new WTP significant land requirements are associated with this alternative.

Technical

Construction will be moderately difficult. This alternative addresses future treatment and servicing needs and provides the greatest potential for expandability. However, this alternative has a high complexity of obtaining regulatory approvals (i.e. new Lake Simcoe intake).

Summary

This alternative would have significant impacts to the natural environment and high construction related impacts especially along the shoreline of Lake Simcoe in addition to high capital costs. While this alternative, in conjunction with Alternative 3, addresses future treatment and servicing needs there would be moderately difficult construction issues and a high complexity associated with obtaining regulatory approvals.

Therefore, this alternative was not carried forward for further consideration.

6.2.7 Alternative 7: Develop New Groundwater Sources

Alternative 7 requires the identification and evaluation of well fields and the establishment of municipal wells with treatment. This alternative would also involve construction of a new watermain that would connect to the existing system (may require booster station).

Natural Environment

This alternative would have significant impacts to trees/vegetation and water resources depending on the siting and routing of the new well facilities and watermains.

Social/Cultural

This alternative conforms to the county and municipal development objectives in that dependent on the number of well facilities that are established it is possible to meet long term water supply demands. However, there are significant impacts based on the magnitude of construction activities (dependant of well facility siting and watermain routing). Furthermore, there will be moderate impacts to existing and future land uses and cultural/heritage resources based on the location and magnitude of construction activities. For this alternative social acceptance is considered to be moderate.

Economic/Financial

The capital costs for this alternative are considered to be moderate to high while operations and maintenance costs would be moderate.

Legal/Jurisdictional

This alternative would be located within the control of the Town of Innisfil, however land is required for new municipal well facilities including associated well field protection areas.

Technical

Construction and implementation of this alternative will be moderately difficult as the location of municipal well fields and associated well head protection areas would be far from areas of demand. Future treatment and servicing needs will not be supported due to the aquifer's inability to support future demands (i.e. if there is insufficient groundwater availability). Lastly, while the approvals process is well established and considered to be moderate in complexity, dependent on the location and number of municipal wells, regulatory environment approvals could become complex.

Summary

This alternative would have significant impacts to the natural and social/cultural environments. Technically, the aquifer will likely be unable to support future demands. Therefore, this alternative was not carried forward for further consideration.

6.2.8 Alternative 8: Obtain Treated Water from a Neighbouring Municipality (i.e. Barrie, New Tecumseth, York Region)

This alternative involves obtaining treated water by constructing a water transmission main that will connect to an adjacent municipality's (e.g. Barrie, New Tecumseth, York Region) water supply system. Also, associated booster pumping stations and reservoirs will need to be constructed along the water transmission main route.

Natural Environment

This alternative would have moderate impacts to trees/vegetation and water resources (i.e. pipe water crossings) depending on the siting and routing of the new transmission watermains and booster pumping stations and reservoirs.

Social/Cultural

This alternative would have moderate construction impacts and moderate impacts to existing and future land uses and cultural/heritage resources depending on the routing of the new transmission watermains and siting of the booster pumping stations and reservoirs. It would also have low social acceptability as the Town would be dependent on another municipality for its water supply.

Economic/Financial

Both capital costs and operations/maintenance costs will be high for this alternative.

Legal/Jurisdictional

Minor land requirements are required for the booster pumping stations and reservoirs. A significant disadvantage with this alternative is that it is outside of the Town of Innisfil's control (e.g. no control over rate setting, dependent on negotiations and agreements).

Technical

This alternative would be relatively difficult to construct and implement as two separate systems would be connected and operated. It is also unable to meet the projected demands without significant WTP facility expansions located outside of Innisfil. Also this alternative has a high complexity of obtaining regulatory approvals (i.e. potential watershed transfer).

Summary

This alternative will have moderate impacts on natural and social/cultural environments. Jurisdictionally, this alternative is outside the Town of Innisfil's control and is difficult to construct and operate. This alternative will be unable to meet the projected demands, therefore, it was not carried forward for further consideration.

6.2.9 Alternative 9: Construct Water Reuse Treatment Plant and Recharge Aquifer, Develop Well Supply System

This alternative involves the construction of a wastewater reclamation plant near the existing Lakeshore WPCP and developing new water supply wells that are based on reclaimed water injection wells (aquifer recharge). Overall this entails a new centralized well supply system to treat groundwater (from reclaimed water) which would then connect to the existing distribution system.

Natural Environment

Dependant on the siting of the water reuse treatment plant, this alternative has the highest impact to trees/vegetation and water resources (e.g., groundwater taking).

Social/Cultural

Implementation of this alternative potentially has the highest impact based on significant magnitude of construction. It also has low social acceptability.

Economic/Financial

While this alternative does reduce operations and maintenance costs at the existing WTP, both the capital costs and operations/maintenance costs for the overall system are very high in regards to this alternative.

Legal/Jurisdictional

This alternative is within the control of the Town of Innisfil, however, it requires the greatest amount of land (e.g. aquifer recharge area, treatment plant) of all the alternatives evaluated.

Technical

This alternative has high construction impacts, is difficult to implement and will be unable to meet the projected demands. Also this alternative has very complex regulatory approvals requirements.

Summary

This alternative has significant impacts on the natural and social/cultural environments and requires the greatest land requirements for the siting of the new wastewater reclamation plant. Technically, this alternative is very difficult to construct and operate and does not meet the projected demands. Therefore, this alternative was not carried forward for further consideration.

6.2.10 Alternative 10: Implement Grey Water Systems

This alternative will involve the implementation of grey water (e.g., laundry/bathing water) policy and system for non-potable uses (e.g., toilets, irrigation). Grey water collection systems would be constructed for each dwelling based on a communal treatment and distribution system.

Natural Environment

This alternative would have minor impacts to trees/vegetation and water resources depending on the siting of the grey water collection treatment and distribution system.

Social/Cultural

In terms of construction there are high impacts associated with this alternative related to the modification to each dwelling to accommodate the grey water collection system. This alternative also has moderate impacts to existing and future land uses and cultural/heritage resources and low social acceptance.

Economic/Financial

This alternative has the highest capital and operations/maintenance costs.

Legal/Jurisdictional

This alternative is within the control of the Town of Innisfil, and has moderate land requirements.

Technical

This alternative is the most difficult to construct and operate and will be unable to meet the projected demands. This alternative also has very complex regulatory approvals requirements.

Summary

Dependant on the siting and routing of the grey water collection system, this alternative has moderate impacts to the natural environment. High impacts are associated with the modifications that will be required to each dwelling to install the collection system. Technically, this alternative has the greatest construction and implementation difficulties, and does not meet the projected demands.

Therefore, this alternative was not carried forward for further consideration.

6.3 Evaluation Summary

Based on the preceding natural environmental, social/cultural and technical evaluations, the best possible solution with the least adverse effects, was identified as the expansion of the Lakeshore WTP. As summarized in Table 6-3 below, Alternative 5 (Expand the Lakeshore WTP and Storage, including new Intake and Low Lift Pumping Station) in conjunction with Alternative 3 (Reduce Water Demands) is the preferred solution.

6.4 Rationale for Selecting the Preferred Solution

The evaluation process including the various discipline's experience, knowledge and input on the alternative solutions concluded that the recommended solution to solve the current Lakeshore WTP expansion involves expanding the existing WTP beyond its rated capacity (i.e. Alternative 5) and reducing water demands (Alternative 3). Alternative 3 is further described in section 2.4.

Rationale for the preferred solution (Alternative 5) includes:

- Completely addresses the problem statement;
- Meets the policies and objectives of the Official Plans of both Innisfil and BWG;
- Is within control of the Town of Innisfil, allowing the Town to maintain control over the cost of water;
- Continues to provide sufficient, high quality drinking water in compliance with all water quality regulations, to meet future demands;
- Will build upon existing facilities at the Lakeshore WTP site, thereby maximizing infrastructure and reducing overall cost of both construction and ongoing operation; and
- Will not require the purchase, development and operation of remote new sites for new facilities (i.e., new WTP at another location).

Table 6-3 Evaluation of Alternative Solution

Alternative Solutions	Evaluation Criteria													
	Natural Environment	Social/Cultural				Economic/Financial		Legal/Jurisdictional		Technical				Evaluation Summary
	Potential Impacts to the natural environment including siting and routing considerations	Does the alternative conform with county and municipal development objectives?	Short/medium term construction related impacts (e.g. noise, vibration, dust) including traffic, access and potential impacts from operations	Potential siting/routing considerations including impacts to existing and future land uses and cultural / heritage resources (i.e., archaeological)	Likelihood of Social Acceptability	Relative Capital Costs	Relative Incremental Operations & Maintenance Costs	Land Requirements	Degree of Jurisdictional Control over Alternative	Ease of Implementation and Constructability of Alternative	Allowance for future treatment and servicing needs - Expandability - Change in regulatory treatment requirements - Servicing feasibility	Degree to which alternative maximizes use of existing infrastructure	Complexity of Regulatory Approvals	Most preferred ● ◐ ○ Least preferred
Alternative 1: Do Nothing	None	No	None	None	Low	None	None	None	Within control of Town of Innisfil	Not Applicable	Does not address future treatment and servicing needs	None	None required	○
Alternative 2: Reduce Limits of Service Area	Minor impact	No	Varies depending on new service area	Low impact	Low	Low	Minor increase	None	Within control of Town of Innisfil	Easy to implement	Does not address future treatment and servicing needs	High	Low	○
Alternative 3: Reduce Water Demands *Preferred Solution in conjunction with Alternative 5*	None	No	None	None	High, however, high level of participation required	Low	Not Identified	None	Within control of Town of Innisfil	Easy to implement	Does not address future treatment and servicing needs	High	Low	●
Alternative 4: Increase Lakeshore WTP Capacity Rating	None	No	None	Not Applicable	High	Low	Low	Already implemented	Within control of Town of Innisfil	Difficult to implement	Unable to meet projected demands	High	Low	○
Alternative 5: Expand the Lakeshore WTP and Storage including New Intake and Low Lift Pumping Station (LLPS) *Preferred Solution*	Moderate impacts to trees/vegetation and water resources (dependant on WTP expansion area and WTP component siting)	Yes	Moderate impact (dependant on WTP expansion area and WTP component siting)	Moderate impact on Innisfil Beach Park (dependant on WTP expansion area and WTP component siting)	Moderate	High	Moderate additional water distribution and pumping cost Low additional WTP operation cost	Low land requirements for LLPS Moderate land requirements (WTP site and expansion area owned by Town)	Within control of Town of Innisfil	Moderate construction difficulty	Addresses future treatment and servicing needs	High	Moderate	●



Alternative Solutions	Evaluation Criteria													
	Natural Environment	Social/Cultural				Economic/Financial		Legal/Jurisdictional		Technical				Evaluation Summary
	Potential Impacts to the natural environment including siting and routing considerations	Does the alternative conform with county and municipal development objectives?	Short/medium term construction related impacts (e.g. noise, vibration, dust) including traffic, access and potential impacts from operations	Potential siting/routing considerations including impacts to existing and future land uses and cultural / heritage resources (i.e., archaeological)	Likelihood of Social Acceptability	Relative Capital Costs	Relative Incremental Operations & Maintenance Costs	Land Requirements	Degree of Jurisdictional Control over Alternative	Ease of Implementation and Constructability of Alternative	Allowance for future treatment and servicing needs - Expandability - Change in regulatory treatment requirements - Servicing feasibility	Degree to which alternative maximizes use of existing infrastructure	Complexity of Regulatory Approvals	Most preferred ● ◐ ○ Least preferred
Alternative 6: Construct new Surface WTP including New Intake and LLPS	Significant impacts to trees/vegetation and water resources (dependant on siting)	Yes	High impact (dependant on siting)	Greatest impact on lake shoreline (dependant on WTP and intake facility siting)	Low	High	High WTP operation cost Lower water transmission cost	Significant land requirements (new site required)	Within control of Town of Innisfil	Moderate construction difficulty	Addresses future treatment and servicing needs Provides greatest potential for expandability	Low	High	◐
Alternative 7: Develop New Groundwater Sources	Significant impact to trees/vegetation and water resources (dependant on siting)	Yes	Significant impact based on magnitude of construction activities (dependant on siting)	Moderate impact based on magnitude of construction activities (dependant on siting)	Moderate	Moderate to high	Moderate	Moderate	Within control of Town of Innisfil	Moderate construction difficulty and implementation	Aquifer unable to support new demands	Low	Moderate	○
Alternative 8: Obtain Treated Water from an Adjacent Municipality (i.e. Barrie, New Tecumseth, York Region)	Moderate impact to trees/vegetation and water resources (dependant on siting)	Yes	Moderate impact based on route of transmission mains (dependant on siting)	Moderate impact based on route of transmission mains (dependant on siting)	Low	High	High	Minor land required for boost pumping station and reservoir	Outside of Town of Innisfil control	High construction difficulty and implementation	Unable to meet projected demands	Low	High	○
Alternative 9: Construct Water Reuse Treatment Plant and Recharge Aquifer, Develop Well Supply	Highest impact to trees/vegetation and water resources (dependant on siting)	Yes	Highest impact due to most extensive construction activities (dependant on siting)	Highest impact due to largest magnitude of construction (dependant on siting)	Low	Very High	Very High	Greatest land requirement	Within control of Town of Innisfil	High construction difficulty and implementation	Unable to meet projected demands	Moderate	Very High	○
Alternative 10: Implement Grey Water Systems	Moderate impact to trees/vegetation and water resources (dependant on siting)	Yes	High impact due to modification to each dwelling (dependant on siting)	Moderate impact based on magnitude of construction activities (dependant on siting)	Low	Highest	Highest	Moderate	Within control of Town of Innisfil	Greatest construction difficulty and implementation	Unable to meet projected demands	Low	Very High	○

Part C: Phase 3 of the Class EA Planning Process

7. Water Treatment Process Selection

7.1 Preferred Water Treatment Process

A detailed economic and technical evaluation was completed as part of this work to identify and screen viable water treatment processes for the proposed plant expansion, and ultimately to select the preferred process train. This evaluation process was documented in detail in a Technical Memorandum – Water Treatment Process Alternatives. For the sake of brevity, and since the evaluation was conducted at a level of detail beyond the specific purpose of this report, this section of the report will limit itself to presenting the salient findings of that memorandum, and documenting the selection of the preferred water treatment train. The Technical Memorandum has however been included in full as Appendix B for the interested reader.

In order to formulate a list of viable process trains for the plant expansion, historical raw water was considered, as well as both present and anticipated future drinking water quality objectives to identify individual unit processes viable for the project. Integrated process trains were then compiled using these short-listed water treatment processes, resulting in the following 15 trains:

- Option 1 – Mimic the Treatment Process at the existing plant, using packaged plants for clarification and filtration, and GAC contactors for Taste & Odour Control;
- Option 2 – Mimic the Treatment Process at the existing plant, except that new basins would be constructed in concrete to maximize possible construction savings due to common wall construction, and reduced plant footprint;
- Option 3a – Direct Granular Media Filtration, followed by Ultraviolet (UV) Disinfection / Advanced Oxidation Process (UV-AOP);
- Option 3b - Direct Granular Media Filtration, followed by GAC filtration;
- Option 4a – In-Filter Dissolved Air Flotation (DAF/F), followed by UV-AOP ;
- Option 4b – DAF/F, followed by GAC filtration;
- Option 5a – Separate DAF and Granular Media Filtration, followed by UV-AOP;
- Option 5b – Separate DAF and Granular Media Filtration, followed by GAC contactors;
- Option 6 – DAF, followed by Ozonation and Biologically Active Carbon (BAC);
- Option 7a – Coagulation and Low Pressure Membrane Filtration (LPMF), followed by UV-AOP;
- Option 7b – Coagulation and LPMF, followed by GAC filtration;
- Option 7c – Coagulation and powdered activated carbon (PAC), with LPMF, followed by UV-AOP;

- Option 8a – Coagulation and DAF, with LPMF, followed by UV-AOP;
- Option 8b – Coagulation and DAF, with LPMF, followed by GAC filtration; and
- Option 8c – PAC and Coagulation, with DAF, followed by LPMF.

Since the selection of the preferred approach to treatment needs to strike a balance between cost and non-cost factors, the following methodology was used for the evaluation and selection of the preferred treatment process:

- A decision model was constructed including consideration of all factors not directly related to cost which would impact the selection of the process. Each of these factors was expressed in a positive manner, such that when each option was rated against this model, if an option rates well against that factor, it effectively measures a relative benefit offered by that option compared to others. In other words, decision modeling was used to rate the “Benefits” offered by each option. Criterium Decision Plus decision modeling software was used for decision modeling;
- In parallel, conceptual level capital and O&M costs were generated for each option, which were in turn used to develop Life Cycle Costs for each option;
- Thirdly, the Benefits Score generated by the decision model will be divided by the Life Cycle Costs, to produce a “Benefit-to-Cost Ratio”. The option which scored the highest benefit-to-cost ratio was selected as the preliminary preferred option;
- Lastly, sensitivity analyses were performed on both the decision model, and the cost estimates, to check that the results wouldn’t change if small changes in scoring or costs are made. This effectively verified that decisions made using this process were robust and defensible.

The following tables document the findings of this decision making process:

- Table 7-1 presents the benefit analysis of 15 alternatives (end of section);
- Table 7-2 summarizes the analysis of probable costs for 15 alternatives (end of section);
- Table 7-3 presents the “Benefit-to-Cost Ratio” for 15 alternatives (end of section).

In summary, Option 5a – DAF-Granular Media Filtration – UV-AOP has been identified as the preferred treatment process. The analysis showed that Option 4a also scored only slightly less than Option 5a, partly because they are effectively the same process, except that Option 4a comprises the DAF process being physically constructed in the same tankage as the granular media filters. There are advantages and disadvantages to this stacked approach, however at this level of detail, and for planning purposes, it is considered best to identify Option 5a as the preferred approach to ensure that ample land is secured for the expansion. Further and more detailed evaluation of separate DAF-filtration and In-Filter DAF/F is recommended for preliminary design to definitively select the preferred alternative for construction.

7.2 Preferred Residual Management Solution

The original design of the Lakeshore WTP included facilities for providing some crude on-site treatment of wastes from the plant. Specifically, equalization basins were provided to capture backwash wastes from the clarification/filtration processes, and to provide some settling of these wastes. The intent was that sludge produced by this settling would be pumped to the municipal wastewater treatment plant (WWTP), while clarified supernatant would be decanted from this tank and discharged to the creek adjacent to the Historically however, this treatment has not been practiced, and all of the process wastes from the plant have been discharged to the sewer and ultimately to the WWTP with no treatment.

With the proposed expansion involving such a significant increase in capacity, it is expected that continued reliance on this approach would have significant impacts on the Lakeshore Water Pollution Control Plant (WPCP), as the projected waste volumes from the expanded WTP would represent a significant fraction of the WPCP capacity. Therefore, residual management solutions were evaluated as part of this. Four alternative residuals management alternatives were developed:

- Option 1 – Continue to discharge all wastewater to WPCP;
- Option 2 – Construct crude thickening basins to treat all process wastewater, and then discharge thickened sludge to WWTP, and send supernatant back to the Lake;
- Option 3 – Utilize Lamella thickening process to handle all process wastewater, discharge thickened sludge to WWTP, and recycle supernatant to the head of WTP; and
- Option 4 – Use centrifuges to dewater the thickened sludge from Lamella thickening process, discharge centrate to WPCP, and recycle supernatant from thickeners to the head of the WTP.

A cost-benefit analysis has been completed to investigate the above alternative solutions, again documented in more detail in the Technical Memorandum – Water Treatment Process Alternatives, included as Appendix B. Table 7-4 summarizes the probable life cycle costs for the four options (end of section). The key conclusions are presented below:

- Since discharges of waste to the sanitary sewer will impact directly on capital costs for the wastewater treatment plant expansion and O&M costs of the water treatment plant, it was quickly determined that continued discharge of all wastes to the sanitary sewer was not a cost effective approach.
- The analysis concluded preliminarily that the most cost effective option overall was to provide full residuals handling, including sludge thickening and mechanical dewatering on-site. The basis for design was selected to be lamella clarification/thickening, and centrifugation dewatering.
- Supernatant from the thickening process would be recycled to the head of water treatment plant. Centrate from the centrifuge (a low overall waste volume) would be sent to the sanitary sewer. Sludge cake produced by the centrifuge would be hauled to the landfill.

Table 7-1 Ratings of Each Alternative in the Benefits Decision Model

Criterion	Overall Weighting	Option 1 Use Existing Process - Packaged Plants	Option 2 Use Existing Process Concrete Tankage	Option 3a DF with UV/AOP	Option 3b DF with GAC	Option 4a DAF/F with UV/AOP	Option 4b DAF/F with GAC	Option 5a DAF-Filtration with UV/AOP	Option 5b DAF-Filtration with GAC	Option 6 DAF-Ozone-BAC	Option 7a LPMF – UV/AOP	Option 7b LPMF - GAC	Option 7c PAC-LPMF	Option 8a DAF-LPMF – UV/AOP	Option 8b DAF-LPMF - GAC	Option 8c PAC-DAF-LPMF
Robustness of Process	50%	70%	70%	60%	50%	80%	75%	85%	80%	85%	95%	85%	80%	100%	95%	95%
Minimizes Waste Volume	10%	40%	40%	50%	40%	70%	60%	100%	70%	90%	65%	55%	50%	80%	80%	50%
Ability to Address Endocrine Disruptors	2.5%	40%	50%	40%	50%	40%	50%	40%	50%	80%	40%	50%	40%	50%	50%	20%
Ability to Address More Stringent Disinfection Goals	5%	20%	20%	80%	40%	80%	40%	80%	40%	50%	100%	90%	100%	100%	100%	90%
Ability to Deal with Future Algae Blooms	2.5%	20%	20%	10%	10%	90%	90%	100%	100%	100%	60%	60%	60%	100%	100%	60%
Operational Complexity	15%	80%	80%	60%	50%	80%	70%	80%	70%	60%	80%	70%	70%	70%	50%	60%
Compatibility with Existing Process	5%	100%	100%	30%	50%	40%	40%	60%	70%	50%	30%	30%	30%	30%	30%	30%
Flexibility for Future Expansion	10%	0%	20%	70%	50%	100%	70%	80%	60%	10%	90%	70%	80%	60%	90%	100%
Net Score		59%	61%	58%	48%	78%	69%	83%	73%	71%	84%	74%	73%	85%	82%	80%

Table 7-2 Opinions of Probable Cost for Each Treatment Alternative

Option	Opinion of Probable Capital Cost Million 2010\$	Opinion of Probable Annual O&M Cost Million 2010\$	20-Year Life Cycle Cost (4% Discount Rate) Million 2010\$
Option 1 – Maintain Existing Process Selection – Packaged Plants	72.7	1.9	98.6
Option 2 – Maintain Existing Process Selection – Concrete Construction	70.2	1.9	96.1
Option 3a – Direct Granular Media Filtration, followed by UV/AOP	70.9	2.0	97.7
Option 3b – Direct Granular Media Filtration, followed by GAC	70.6	1.9	96.7
Option 4a – In-Filter DAF/F, followed by UV-AOP	66.8	1.8	91.4
Option 4b – In-filter DAF/F, followed by GAC	66.5	1.8	90.8
Option 5a – Separate DAF and Granular Media Filtration, followed by UV-AOP	70.1	1.8	94.8
Option 5b – Separate DAF and Granular Media Filtration, followed by GAC	69.9	1.8	94.2
Option 6 – DAF-Ozone-Biologically Active Carbon	72.7	1.8	97.1
Option 7a – Coagulation and Membrane Filtration, followed by UV-AOP	77.6	2.0	105.2
Option 7b – Coagulation and Membrane Filtration, followed by GAC	77.4	2.0	104.7
Option 7c – Coagulation and PAC, with Membrane Filtration, followed by UV-AOP	73.9	2.2	103.7
Option 8a – Coagulation and DAF, with Membrane Filtration, followed by UV-AOP	80.0	2.2	109.9
Option 8b – Coagulation and DAF, with Membrane Filtration, followed by GAC	80.0	2.2	109.2
Option 8c – PAC, Coagulation and DAF, with Membrane Filtration	80.0	2.3	111.3

Table 7-3 Calculated Benefit to Cost Ratios for Each Treatment Alternative

Option	Benefit-to-Cost Ratio
Option 1 – Maintain Existing Process Selection – Packaged Plants	0.59
Option 2 - Maintain Existing Process Selection – Concrete Construction	0.63
Option 3a – Direct Granular Media Filtration, followed by UV/AOP	0.59
Option 3b - Direct Granular Media Filtration, followed by GAC	0.49
Option 4a – In-Filter DAF/F, followed by UV-AOP	0.86
Option 4b – In-filter DAF/F, followed by GAC	0.75
Option 5a – Separate DAF and Granular Media Filtration, followed by UV-AOP	0.88
Option 5b – Separate DAF and Granular Media Filtration, followed by GAC	0.77
Option 6 – DAF-Ozone-Biologically Active Carbon	0.73
Option 7a – Coagulation and Membrane Filtration, followed by UV-AOP	0.80
Option 7b – Coagulation and Membrane Filtration, followed by GAC	0.71
Option 7c – Coagulation and PAC, with Membrane Filtration, followed by UV-AOP	0.70
Option 8a - Coagulation and DAF, with Membrane Filtration, followed by UV-AOP	0.77
Option 8b - Coagulation and DAF, with Membrane Filtration, followed by GAC	0.75
Option 8c - PAC, Coagulation and DAF , with Membrane Filtration	0.71

Table 7-4 Probable Life Cycle Costs of Residuals Handling Options

Residuals Handling Scenario	20-Year Life Cycle Cost @ 4% Discount Rate Million 2010\$
Option 1: Discharge all wastes to WWTP	49.18
Option 2: Crude Thickening Only	26.41
Option 3: Lamella Thickening Only	21.82
Option 4: Lamella thickening plus centrifugation	17.66

8. Identification of Alternative Design Concepts

Carrying forward with the preferred solution (Alternatives 5: WTP Expansion), the following provides a description of alternative design concepts (i.e., methods of implementing the preferred solution).

8.1 Intake

As it is proposed to twin the existing intake within the previously disturbed existing intake corridor alternatives for the new intake pipe are limited to either the north or south side of the existing intake pipe. As there is limited difference in terms of impacts, the north side was identified as preferred based on the location of the preferred LLPS expansion (discussed below).

8.2 Low Lift Pumping Station Expansion Siting Options

The LLPS expansion includes increasing the capacity to 106 ML/day. The alternative LLPS expansion siting options include:

- **Alternative A:** North of the existing LLPS; and
- **Alternative B:** South of the existing LLPS.

Both of the alternatives have a building footprint of approximately 13.8 metres by 10.6 metres.

Figure 8-1 illustrates the LLPS expansion siting options.

8.3 Watermain Connection

In addition to expanding the WTP treatment and LLPS pumping capacities, transmission capacity between the two facilities will also have to be increased. As such, alternative watermain connection routes between the WTP and LLPS were identified as follows:

- **Route 1:** Twin existing watermain between WTP and LLPS (follow existing watermain alignment through Innisfil Beach Park); and
- **Route 2:** New watermain to follow Innisfil Beach Road to 25th Sideroad and connect to new WTP expansion.

Figure 8-2 illustrates the alternative watermain connection options.

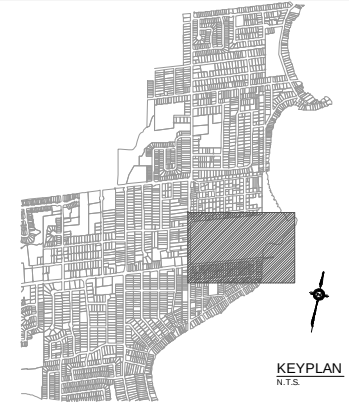
8.4 Water Treatment Plant Expansion Siting Options

Alternative WTP expansion siting options were developed as follows:

- **Alternative 1:** WTP expansion to the north of the existing WTP driveway (outside fenced area); and
- **Alternative 2:** WTP expansion to the east of the existing WTP driveway (outside fenced area).

Primary components for both design concepts include staged treatment blocks and a residuals management facility. Figure 8-3 illustrates Alternatives 1 and 2. Expansion to the south was ruled out due to the proximity of Alcona Creek (also referred to as Watercourse No. 4) while a westerly expansion was not possible due to insufficient space

between the existing WTP and 25th Sideroad. It is important to note that building locations are shown as conceptual and may be revised based on further engineering and design (e.g., stacking or space optimization).



LEGEND:

TOWN OF INNISFIL
LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

FIGURE
8-1

**ALTERNATIVE LLPS
EXPANSION SITING OPTIONS**

BASE MAPPING PROVIDED BY:

ADDITIONAL SOURCES:
(ONTARIO REGULATION 97/04) REGULATION OF DEVELOPMENT, INTERFERENCE
WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES.

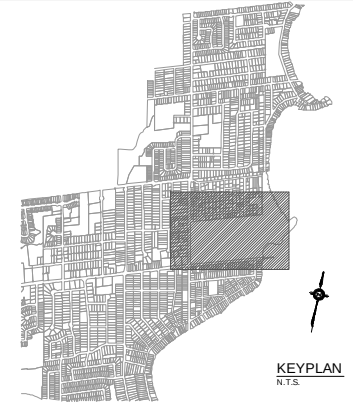
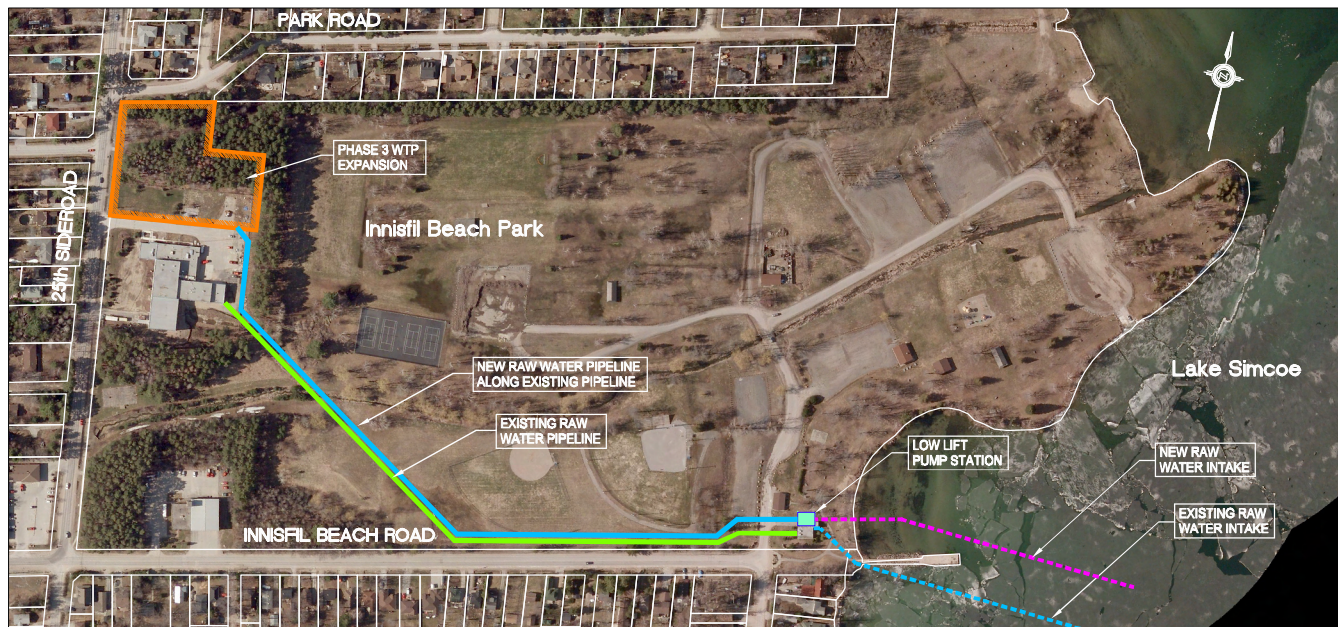
JUNE
2010

AECOM



10m 0 20m

106449



LEGEND:

**TOWN OF INNISFIL
LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT**

FIGURE
8-2

**ALTERNATIVE WATERMAIN
CONNECTION ROUTES**

BASE MAPPING PROVIDED BY:

ADDITIONAL SOURCES:
(ONTARIO REGULATION 97/04) REGULATION OF DEVELOPMENT, INTERFERENCE
WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES.

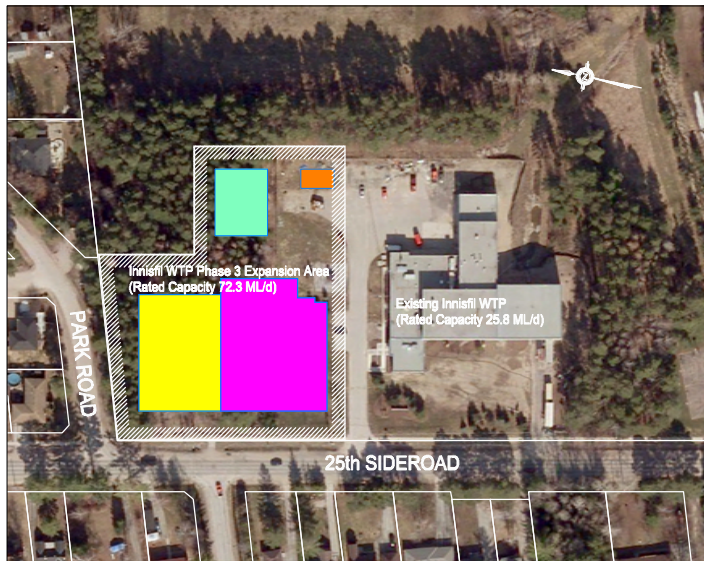
JUNE
2010

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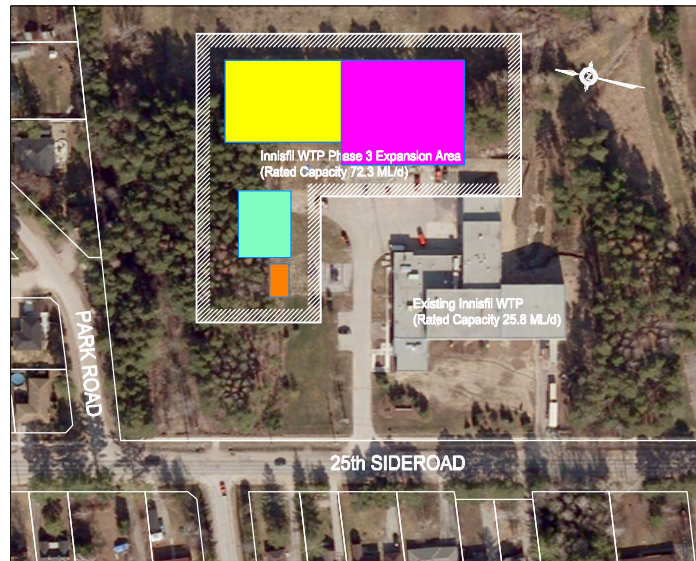


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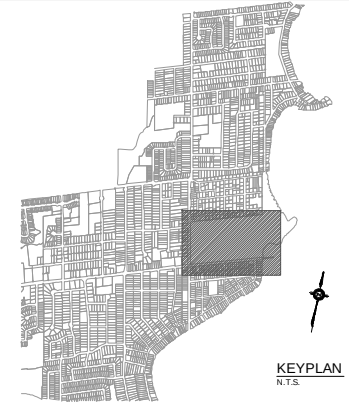
106449



ALTERNATIVE 1: WTP expansion to the north of existing WTP driveway (outside fenced area)



ALTERNATIVE 2: WTP expansion to the east of existing WTP driveway (outside fenced area)



LEGEND:

-  New 38 ML/d Expansion (Including chem. feed facilities)
-  Future Additional 38 ML/d Expansion
-  Residual Management Facility
-  Generator

**TOWN OF INNISFIL
LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT**

FIGURE
8-3

**ALTERNATIVE WATER TREATMENT
PLANT SITING OPTIONS**

BASE MAPPING PROVIDED BY:

ADDITIONAL SOURCES:
(ONTARIO REGULATION 97/04) REGULATION OF DEVELOPMENT, INTERFERENCE
WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES.

JUNE
2010

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20m 0 40m

106449

9. Evaluation of Low Lift Pumping Station Expansion Siting Options

The alternative LLPS expansion siting options that were evaluated include:

- **Alternative A:** Expand existing LLPS on north side; and
- **Alternative B:** Expand existing LLPS on south side.

The complete evaluation of alternative LLPS expansion siting options is presented in Table 9-1 (end of section). Significant findings of this evaluation are presented below.

9.1 Evaluation of LLPS Expansion Siting Options

Natural Environment

For both alternatives, based on the close proximity of the LLPS to Lake Simcoe and previous construction experience, dewatering will be required during construction. As such, hydrogeological investigations will have to be completed as part of detailed design and construction will require the implementation of a dewatering and monitoring program.

Alternatives A and B are both within the LRSCA regulated area and will require approvals under the Ontario Regulation 179/06 (Development, Interference with Wetlands and Alteration to Watercourse and Shoreline Regulation). Construction of both alternatives may result in potential impacts to fish habitat due to sedimentation, erosion and dewatering during construction but these impacts can be prevented or mitigated with appropriate protection measures.

Tree and vegetation removal is also required for both alternatives, however, Alternative A requires removal of 3-9 mature trees, whereas, Alternative B requires the removal of ornamental trees and shrubs. With respect to both alternatives, no aquatic or terrestrial species at risk were found.

Social/Cultural

Alternatives A and B will have moderate disturbances to park operations and users. Alternative A will also require the removal-relocation of the park gate house as it will be within the area of construction. This should not be a problem as a temporary gate house can be set up away from construction. In addition, the park gate house is expected to become redundant when the Town switches to an unmanned park user pay system. In addition, Alternative A will also require the relocation of two (2) monuments (e.g., Innisfil Centennial and Innisfil Township Park commemorative markers). During construction of Alternative B, access to the Town pedestrian causeway will be restricted but not closed.

Both alternatives will require the completion of a Stage 1 Archaeological Assessment.

With respect to long term impacts, Alternatives A and B both provide an opportunity to improve upon the existing LLPS building appearance and architectural detail. Regarding the recent Innisfil Beach Road Urban Design Guidelines, Alternative A complies as the LLPS does not block the view of Lake Simcoe from Innisfil Beach Road.

Opposite to Alternative A, Alternative B does not comply with the recent Innisfil Beach Road Urban Design Guidelines as the LLPS will partially block the view of Lake Simcoe from Innisfil Beach Road.

Economic/Financial

Alternative A results in slightly higher costs in relation to the need to relocate the park gate house and monuments. For both alternatives, the construction costs are similar.

Technical

Alternatives A and B will have moderate impacts on the existing LLPS operation and access. Alternative B also requires a raw water transmission main pipe crossing and can also utilize the existing powdered activated carbon (PAC) dosing facility (i.e., for storage). Alternative A, does not utilize the existing PAC facility as it will require demolition to accommodate the LLPS.

9.2 Preferred Low Lift Pumping Station Expansion Siting Option

Based on the evaluation of alternatives, the preferred LLPS siting option is Alternative A: Expand existing LLPS on the north side. Rationale for selecting Alternative A includes:

- Provides opportunity to improve upon existing LLPS building architectural design;
- Complies with Innisfil Beach Road Urban Design Guidelines (i.e., does not block view of Lake Simcoe from Innisfil Beach Road); and
- Avoids raw water transmission main pipe crossing.

Figure 12-1 (section 12) illustrates the overall preferred design concept for all WTP expansion components.

It is important to note that at the third Public Information Centre (PIC) held on May 18, 2010, Alternative B was presented as the recommended LLPS siting option primarily based on avoiding the removal of mature trees and not having to relocate the gate house and monuments. Following the PIC, the Innisfil Beach Road Urban Design Guidelines were further reviewed and in consultation with the project team, the importance of not blocking the view of Lake Simcoe from Innisfil Beach Road was given highest priority. As such, considering that any impacts can be mitigated, Alternative A has been confirmed as the preferred LLPS siting option.

Table 9-1 Evaluation of Alternative Low Lift Pumping Station Siting Options

Alternative Low Lift Pumping Station Siting Options	Evaluation Criteria												
	Natural Environment			Natural Environment Evaluation Summary	Social/Cultural		Social/Cultural Evaluation Summary	Economic/ Financial	Economic/ Financial Evaluation Summary	Technical		Technical Evaluation Summary	Evaluation Summary
	Potential Effects on Groundwater	Potential Effects on Surface Water Quality and the Aquatic Environment	Potential effects on the Terrestrial Environment		Short Term Impacts: Potential for Disturbing Existing Residences, Businesses, and/or Community, Institutional and Recreational Facilities	Long Term Impacts: Potential Impacts from Operations		Estimated Capital Costs, Operations and Maintenance Costs		Ability to Implement Alternative	Compatibility with Existing Facilities and Infrastructure		Most preferred
	Temporary change in groundwater quality and quantity during construction.	Direct or indirect loss of aquatic habitat and functions, aquatic species. Impact on species at risk, including rare, threatened, endangered and species of local concern.	Direct or indirect loss of terrestrial habitat and functions, terrestrial species. Impact on species at risk, including rare, threatened, endangered and species of local concern.		Temporary disturbance to traveling public, existing residences, businesses, archaeological/built heritage resources and/or community, institutional and recreational facilities.	Visual impact, truck traffic.		Construction costs. Total operations and maintenance costs.		Ease of Construction. Allowance for future servicing needs. Impacts to existing LLPS operations during construction. Ease of future operations.	Degree to which alternative maximizes use of existing infrastructure. Modifications to existing infrastructure and impact on existing utilities.		Most preferred Least preferred
Alternative A: Expand existing LLPS north side	- Complete hydrogeological investigations. - Implement dewatering and monitoring program.	- LLPS expansion within Lake Simcoe Region Conservation Authority regulated area – LSRCA approvals required. - Potential impact to fish habitat related to construction (e.g., sedimentation and erosion, dewatering). - No species at risk were found.	- Removal of 3-9 mature trees. - No species at risk were found.		- Moderate disturbances to park operations (i.e., relocate park gate house) and users during construction. - Requires relocation of monuments. - Complete a Stage 1 Archaeological Assessment.	- Provides opportunity to improve upon existing LLPS building appearance and architectural detail. - Complies with Innisfil Beach Road Urban Design Guidelines (i.e., LLPS does not impact view of lake from Innisfil Beach Road). - No truck traffic.		- Potential higher cost related to park gate house relocation during constriction and relocation of monument. - Similar LLPS construction cost.		- Moderate impact on the existing LLPS operation and access. - Avoids raw water transmission main pipe crossing. - Difficult to construct intake around pedestrian causeway.	Will demolish the unused Powdered Activated Carbon (PAC) facility.		- Provides opportunity to improve upon existing LLPS building. - Complies with Innisfil Beach Road Urban Design Guidelines (i.e., does not impact view of lake from Innisfil Beach Road). - Does not utilize existing infrastructure.
Alternative B: Expand existing LLPS on south side	- Complete hydrogeological investigations. - Implement dewatering and monitoring program.	- LLPS expansion within Lake Simcoe Region Conservation Authority regulated area – LSRCA approvals required. - Potential impact to fish habitat related to construction (e.g., sedimentation and erosion, dewatering). - No species at risk were found.	- Removal of ornamental trees and vegetation. - No species at risk were found.		- Moderate disturbances to park operations and users (need to relocate access to Town pedestrian causeway) during construction. - Complete a Stage 1 Archaeological Assessment.	- Does not comply with Innisfil Beach Road Urban Design Guidelines (LLPS blocks view of lake from Innisfil Beach Road). - Provides opportunity to improve upon existing LLPS building appearance and architectural detail. - No truck traffic.		Similar LLPS construction cost.		- Moderate impact on the existing LLPS operation and access. - Requires raw water transmission main pipe crossing.	Can use existing PAC dosing facility (i.e., storage).		- Provides opportunity to improve upon existing LLPS building. - Significant visual impact from Innisfil Beach Road. - Utilizes existing infrastructure.

10. Evaluation of Watermain Connection Options

The alternative watermain connection options that were evaluated include:

- **Route 1:** Twin existing watermain between WTP and LLPS (follow existing watermain alignment through Innisfil Beach Park); and
- **Route 2:** New watermain to extend from LLPS and follow Innisfil Beach Road to 25th Sideroad connecting to new WTP expansion.

The complete evaluation of alternative watermain connection options are presented in Table 10-1 (end of section). Significant findings of this evaluation are presented below.

10.1 Evaluation of Watermain Connection Options

Natural Environment

Similar to WTP and LLPS expansion operations, dewatering will also be required, based on the proximity of the watermain to Lake Simcoe. As such, hydrogeological investigations will have to be completed during detailed design and implementation of a dewatering and monitoring program will be required during construction.

Routes 1 and 2 both require one (1) directional drill or jack and bore (i.e., trenchless) watercourse crossing of Alcona Creek (also referred to as Watercourse No. 4). In addition, Routes 1 and 2 are also within the LSRCA regulated floodplain and as such will require approvals under the Ontario Regulation 179/06 (Development, Interference with Wetlands and Alteration to Watercourse and Shoreline Regulation).

With respect to effects on the terrestrial environment, Route 1 requires some tree and vegetation removal on the east side of the existing WTP while Route 2 does not require any removal of trees or vegetation.

For both aquatic and terrestrial, no species at risk were found.

Assessment of Significance

Routes 1 and 2 both require one trenchless crossing of Alcona Creek (also referred to as Watercourse No. 4) in the upper section of the creek where habitat conditions support a coolwater baitfish community consisting of Brook Stickleback, Northern Redbelly Dace, Blacknose Dace, Mottled Sculpin, Fathead Minnow and Creek Chub. These species are sensitive to environmental perturbations including siltation that may occur as a result of construction activities. As such, the crossing of Alcona Creek (also referred to as Watercourse No. 4) should be undertaken within the allowable timing window for in-water works as determined by MNR and confirmed during detailed design. Working within this timing window will avoid impacts to the spawning activities of coolwater fish species in Alcona Creek (also referred to as Watercourse No. 4) and will be a required condition in obtaining regulatory approvals from LSRCA.

Social/Cultural

For Route 1 there will be temporary disturbance to Innisfil Beach Park open space (baseball and soccer playing fields can be avoided) as the watermain alignment follows the existing watermain through the park. In comparison, Route 2 will result in significant temporary disturbances to residences, businesses fronting on Innisfil Beach Road and 25th Sideroad as well as the travelling public. In addition, compared to Route 2, Route 1 avoids interfering with access to the Innisfil Fire Hall as there will be no construction on Innisfil Beach Road.

Since Route 1 is sited through Innisfil Beach Park, a Stage 1 Archaeological Assessment will be required. However, because Route 2 is within the road right of way (previously disturbed), a Stage 1 Archaeological Assessment is not required.

For both routes, there will be no impacts from operations.

Economic/Financial

Since Route 1 is shorter in length, its construction cost is lower. Another advantage to this alternative is that it also has lower restoration costs and energy requirements. With respect to Route 2, construction costs are higher due to the longer watermain length and road restoration. In addition, for Route 2 there are higher energy requirements to pump raw water over a greater distance.

Technical

For Route 1, construction will be somewhat difficult in order to avoid disturbing the existing raw water transmission main. However, restoration is easier as the watermain will be constructed through Innisfil Beach Park and does not involve road restoration as does Alternative 2.

Route 2 construction time will be prolonged due to the longer watermain length, scheduling and need to minimize traffic impacts (i.e., temporary lane closures). Furthermore, Innisfil Beach Road will soon be reconstructed resulting in the need to restore the newly rebuilt road.

For Routes 1 and 2, there are no compatibility issues with existing facilities and infrastructure. However, both alternatives will require slight modifications to the LLPS.

10.2 Preferred Watermain Connection Option

Based on the evaluation of alternative routing options, the preferred watermain connection option is Route 1: Twin existing watermain between WTP and LLPS (follow existing watermain alignment through Innisfil Beach Park).

Rationale for selecting Route 1 includes:

- No construction impacts to residences and traveling public or Fire Hall on Innisfil Beach Road;
- Construction can be timed for winter when park usage is lower;
- Low construction cost;
- Avoids having to restore newly reconstructed Innisfil Beach Road; and

- Easy restoration.

Construction of the Alcona Creek (also referred to as Watercourse No. 4) water crossing is proposed to be completed by trenchless methods with sending and receiving pits to be located outside the LSRCA regulated floodplain. Figure 12-1 (section 12) illustrates the overall preferred design concept for all WTP expansion components.

Table 10-1 Evaluation of Alternative Watermain Connection Options

Alternative Watermain Connection Options	Evaluation Criteria												
	Natural Environment			Natural Environment Evaluation Summary	Social/Cultural		Social/Cultural Evaluation Summary	Economic/ Financial	Economic/ Financial Evaluation Summary	Technical		Technical Evaluation Summary	Evaluation Summary
	Potential Effects on Groundwater	Potential Effects on Surface Water Quality and the Aquatic Environment	Potential effects on the Terrestrial Environment		Short Term Impacts: Potential for Disturbing Existing Residences, Businesses, and/or Community, Institutional and Recreational Facilities	Long Term Impacts: Potential Impacts from Operations		Estimated Capital Costs, Operations and Maintenance Costs		Ability to Implement Alternative	Compatibility with Existing Facilities and Infrastructure		Most preferred
	Temporary change in groundwater quality and quantity during construction	Direct or indirect loss of aquatic habitat and functions, aquatic species. Impact on species at risk, including rare, threatened, endangered and species of local concern.	Direct or indirect loss of terrestrial habitat and functions, terrestrial species. Impact on species at risk, including rare, threatened, endangered and species of local concern.		Temporary disturbance to traveling public, existing residences, businesses, archaeological/built heritage resources and/or community, institutional and recreational facilities.	Visual impact, truck traffic.		Construction costs. Total operations and maintenance costs.		Ease of Construction. Allowance for future treatment expandability and servicing needs. Impacts to existing plant operations during construction. Ease of future operations.	Degree to which alternative maximizes use of existing infrastructure. Modifications to existing infrastructure and impact on existing utilities.		Least preferred
Alternative 1: Twin existing watermain between WTP and LLPS (follow existing watermain alignment through Innisfil Beach Park).	- Complete hydrogeological investigations. - Implement dewatering and monitoring program.	1 directional drill watercourse crossing (in Innisfil Beach Park). - Watermain crosses Lake Simcoe Region Conservation Authority regulated area – LSRCA approvals required. - No species at risk were found.	- Requires some tree/vegetation removal. - No species at risk were found.		- Temporary disruption to park open space during construction. - Avoids impact to Innisfil Fire Hall. - No disruption to traveling public - avoids Innisfil Beach Road and 25th Sideroad (construction through Innisfil Beach Park). - Complete Stage 1 Archaeological Assessment.	No impacts from operations.		- Lower cost due to shortest length (watermain pipe). - Lower restoration cost. - Lower energy requirements.		- Somewhat difficult construction in order to avoid potential disturbance to existing raw water transmission. - Easy restoration.	- No compatibility issues. - Requires slight modifications to LLPS.		- No impacts to residences and traveling public. - Construction can be timed for winter when park usage is lower. - Low construction cost. - Easy restoration.
Alternative 2: New watermain to follow Innisfil Beach Road to 25 th Sideroad and connect to new WTP expansion.	- Complete hydrogeological investigations. - Implement dewatering and monitoring program.	1 directional drill watercourse crossing (on 25th Sideroad). - Watermain crosses Lake Simcoe Region Conservation Authority regulated area – LSRCA approvals required. - No species at risk were found.	- No tree/vegetation removal. - No species at risk were found.		- Significant temporary disturbance to residences/businesses during construction. - Construction in front of and in close proximity to Innisfil Fire Hall. - Significant temporary disruption to traveling public on Innisfil Beach Road and 25th Sideroad (construction within road ROW). - May not require a Stage 1 Archaeological Assessment (work in road ROW).	No impacts from operations.		- Higher construction cost due to longer watermain pipe and road restoration. - Higher energy requirement for raw water pump.		- Prolonged construction time and construction scheduling to minimize traffic impacts. - Innisfil Beach Road soon to be reconstructed – will require restoration of newly reconstructed road. - More difficult restoration.	- No compatibility issues. - Requires slight modifications to LLPS.		- Significant disruption to residences and traveling public. - Higher construction costs. - Difficult restoration.

11. Evaluation of Water Treatment Plant Expansion Siting Options

The alternative WTP expansion siting options that were evaluated include:

- **Alternative 1:** WTP expansion to the north of the existing WTP driveway (outside fenced area); and
- **Alternative 2:** WTP expansion to the east of the existing WTP driveway (outside fenced area).

The complete evaluation of alternative WTP expansion siting options is presented in Table 11-1 (end of section). Significant findings of this evaluation are presented below. Following the identification of potential impacts, typical mitigation measures are considered and presented in section 13.

11.1 Evaluation of WTP Expansion Siting Options

Natural Environment

Considering experience from past Lakeshore WTP construction, both alternatives will require dewatering during construction. As part of detailed design hydrogeological investigations will have to be completed and a dewatering/monitoring program will have to be implemented in accordance with a MOE Permit to Take Water (PTTW), should water taking exceed 50,000 Litres per day.

Alternative 1 will require the relocation of a regulated water feature (small intermittent stream) that is within the forested area north of the WTP. While not mapped with regulated flood lines, input from LSRCA suggests that this water feature be considered as being regulated. With respect to Alternative 2, the WTP expansion would considerably encroach into the LSRCA regulated flood plain area associated with Alcona Creek (also referred to as Watercourse No. 4) and thus may result in potential impacts to fish habitat. It may also not comply with the Lake Simcoe Protection Plan. As such, a permit will be required under the Ontario Regulation 179/06 (Development, Interference with Wetlands and Alteration to Watercourse and Shoreline Regulation). For both alternatives, no aquatic species at risk were found.

Alternative 1 will require significant tree removal as the expansion is proposed to take place within a forested area, north of the WTP, whereas Alternative 2 will require somewhat less tree removal as the proposed expansion primarily encroaches into a treed buffer area east of the existing WTP. Similar to aquatic species, no terrestrial species at risk were found.

Assessment of Significance

Relocation of the unnamed watercourse is necessary for Alternative 1. As noted in the Existing Ecological Conditions section (section 5.5.2) of this report this intermittent watercourse, and the woodlot through which it flows, contribute to downstream fish habitat by attenuating storm flows received from the upstream urban catchment, contributing flow and nutrients downstream, and acting as a groundwater discharge/recharge area. These ecological functions would need to be protected and/or enhanced in the preparation of a stream relocation design. LSRCA indicated a stream relocation design should incorporate natural channel design principles and appropriate vegetated

buffers. A high groundwater table in this area would need to be considered in the design and construction of a stream relocation. Further consultation with LSRCA would be required during detailed design.

Alternative 2 would involve construction within the regulated area adjacent to Alcona Creek (also referred to as Watercourse No. 4) but would not result in direct impacts to Alcona Creek (also referred to as Watercourse No. 4) itself. Provided that appropriate construction mitigation measures are implemented no impacts to the aquatic environment are expected with Alternative 2. Less tree removal would be required in Alternative 2.

Social/Cultural

Short term potential impacts for Alternative 1 includes the relocation of the existing pathway through the forested area, north of the WTP located at 25th Sideroad and Park Road. With respect to Alternative 2, there will be a temporary loss of park open space/soccer field which will impact park user groups. For Alternative 1, temporary disturbance (e.g., dust, noise, vibration) to adjacent residences will result during construction. Alternative 2 construction impacts will be minimal for residences as there is a good separation distance, however, there will be a greater disturbance to park users as well as resulting visual impact related to the removal of treed buffer on the east side of the WTP. In addition, for Alternative 2 there may be conflict with a future Innisfil Beach Park Bike Route as identified in the Innisfil Beach Road Urban Design Study and Guidelines¹⁰.

With respect to traffic impacts, both Alternatives will result in an increase of truck traffic during construction.

For both alternatives, a Stage 1 Archaeological Assessment will also have to be completed.

Economic/Financial

Alternative 1 will have moderate costs related to relocation of the water feature and tree replacement. In addition operation and maintenance costs will also be moderate.

Alternative 2 will have higher costs related to building a replacement soccer field at another location, reinstating the existing soccer field following construction and the loss of revenue. Alternative 2 will also have moderate operations and maintenance costs.

Technical

With respect to implementation, Alternative 1 can be easily implemented and provides a good buffer for the residuals management facility. For Alternative 2 it may be more complicated to arrange the treatment facilities due to space limitations and the residuals management facility will be relatively close to residences and visible on 25th Sideroad. Lastly, Alternative 1 will require relocation of the existing transformer during construction while Alternative 2 does not.

11.2 Preferred Water Treatment Plant Siting Option

Based on the above, Alternative 1 (expansion north of existing WTP) was ranked most preferred. Rationale for selecting Alternative 1 includes:

¹⁰ Town of Innisfil, Innisfil Beach Road Urban Design Study and Guidelines, MBPD Inc., in association with Todhunter Associates and Cansult Tatham, May 2007.

- Avoids expansion into LSRCA Alcona Creek (also referred to as Watercourse No. 4) regulated floodplain and potential impacts to fish habitat;
- Avoids temporary loss of soccer field and significant disruption to park user groups;
- Avoids significant costs related to mitigating loss of soccer field and loss of revenue;
- Provides good buffer for WTP residuals management facility;
- Moderate capital costs; and
- Easier to arrange treatment facilities.

Figure 12-1 (section 12) illustrates the overall preferred design concept for all WTP expansion components.

Table 11-1 Evaluation of Alternative Water Treatment Plant Expansion Options

Alternative Water Treatment Plant Expansion Options	Evaluation Criteria												
	Natural Environment			Natural Environment Evaluation Summary	Social/Cultural		Social/Cultural Evaluation Summary	Economic/Financial	Economic/Financial Evaluation Summary	Technical		Technical Evaluation Summary	Evaluation Summary
	Potential Effects on Groundwater	Potential Effects on Surface Water Quality and the Aquatic Environment	Potential effects on the Terrestrial Environment		Short Term Impacts: Potential for Disturbing Existing Residences, Businesses, and/or Community, Institutional and Recreational Facilities	Long Term Impacts: Potential for Impacts from Operations		Estimated Capital Costs, Operations and Maintenance Costs		Ability to Implement Alternative	Compatibility with Existing Facilities and Infrastructure		
	Temporary change in groundwater quality and quantity during construction.	Direct or indirect loss of aquatic habitat and functions, aquatic species. Impact on species at risk, including rare, threatened, endangered and species of local concern.	Direct or indirect loss of terrestrial habitat and functions, terrestrial species. Impact on species at risk, including rare, threatened, endangered and species of local concern.		Temporary disturbance to traveling public, existing residences, businesses, archaeological/built heritage resources and/or community, institutional and recreational facilities.	Loss of parkland, Visual impact, truck traffic.		Construction costs. Total operations and maintenance costs.		Ease of Construction. Allowance for future treatment expandability and servicing needs. Impacts to existing plant operations during construction. Ease of future operations.	Degree to which alternative maximizes use of existing infrastructure. Modifications to existing infrastructure and impact on existing utilities.		Most preferred Least preferred
Alternative 1: WTP expansion to the north of existing WTP driveway (outside fenced area)	- Complete hydrogeological investigations. - Implement dewatering and monitoring program as per PTTW.	- Requires relocation of unnamed water feature that discharges to Park Road drainage system. - Avoids expansion into regulated floodplain. - Complies with Lake Simcoe Protection Plan. - No species at risk were found.	- Encroachment into treed area north of existing WTP. - Tree removal required - Scotch Pine plantation. - No species at risk were found.		- Will require relocation of existing pathway (25th Sideroad and Park Road and Innisfil Beach Park access point). - Temporary disturbance (e.g., noise, dust and vibration) to adjacent residences. - Moderate traffic impacts (i.e., increase in truck traffic during construction). - Complete Stage 1 Archaeological Assessment.	- Loss of park forest. - Visual impact from new WTP facilities on adjacent residences (loss of existing vegetation and screening). - Moderate increase in weekly truck traffic. - Good buffer for residuals management facility.		- Moderate cost for unnamed water feature relocation and tree replacement. - Moderate operations and maintenance costs.		No impacts.	Potential impact on the existing transformer during construction.		- Loss of park forest. - Avoids expansion into regulated floodplain. - Moderate visual impact to adjacent residences. - Moderate costs for relocation of unnamed water feature and tree replacement.
Alternative 2: WTP expansion to east of existing WTP (outside the fenced area)	- Complete hydrogeological investigations. - Implement dewatering and monitoring program as per PTTW.	- Close proximity to Watercourse No. 4 to the south that discharges through Innisfil Beach Park to Lake Simcoe. - Part of WTP expansion falls within Watercourse No. 4 regulated floodplain. - Potential impact to fish habitat related to construction (e.g., sedimentation and erosion, dewatering). - Difficult to comply with Lake Simcoe Protection Plan (30 m setback from Watercourse No. 4). - No species at risk were found.	- Encroachment into treed area east of existing WTP. - Tree removal required – Scotch Pine plantation. - No species at risk were found.		- Temporary loss of soccer fields/park open space – significant disruption to user groups. - Conflict with possible Innisfil Beach Park Bike Route. - Good separation distance from residences. - Temporary disturbance (e.g., noise, dust and vibration) to park users. - Moderate traffic impacts (i.e., increase in truck traffic during construction). - Complete Stage 1 Archaeological Assessment.	- Moderate loss of park forest. - Visual impact from new WTP facilities on park users (loss of existing vegetation and screening). - Moderate increase in weekly truck traffic. - Residuals management facility located closer to residences.		- Significant costs related to building replacement soccer field at another location, reinstating existing soccer field and loss of revenue. - Moderate cost for tree replacement. - Moderate operations and maintenance costs.		Relatively more complicated to arrange treatment facilities.	No impacts.		- Loss of park forest. - Temporary loss of soccer fields/park open space – significant disruption to user groups. - Part of WTP expansion falls within Watercourse No. 4 regulated floodplain. - Potential impact to fish habitat related to construction (e.g., sedimentation and erosion, dewatering). - Significant costs (e.g., building replacement soccer field and reinstating old soccer field and loss of revenue).

12. Implementation

12.1 Overview of the Preferred Design Concept

The following provides an overview of the preferred design concept which is illustrated on Figure 12-1.

The main components of the WTP expansion are described below.

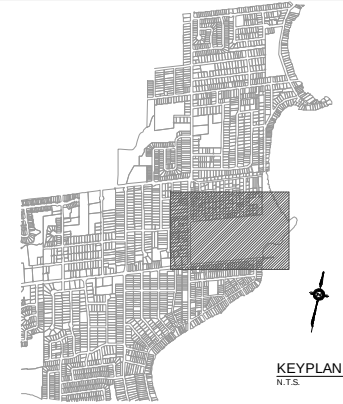
12.1.1 Intake

The existing raw water intake was only designed to have ultimate capacity of 49.6 ML/d, which is not sufficient for Phase 3 plant expansion. Therefore, it is required that a new intake be constructed at this phase. It has been decided that the new raw water intake will be essentially twinning the existing intake, with a design capacity of 55 ML/d. The new intake will at least include the following components:

- A 900 mm diameter intake pipe with an approximate length of 380m;
- A new intake structure;
- A small diameter chlorine line for Zebra Mussel control; and
- A small diameter sampling line.

Conceptually, the new intake will be parallel to the existing intake, but at the north side of the existing dock. Intake construction will be that the first 60% of pipe length will be buried, and the latter section will be laid over the lake bottom. Geotechnical investigation is required to confirm the lake bed conditions along the proposed pipe construction zone.

A new intake will be required in order to meet the new plant expansion. The proposed new 900 mm diameter intake pipe will be located north of the existing intake. The intake pipe and structure is the same size and design as the existing infrastructure. The new intake will be connected to the existing intake and low lift pumping station through a shore chamber. The main difference between the new intake and the existing intake is its location and where it is situated relative to the lake bottom. In order to minimize disruption to the existing plant operation, the new intake will be constructed below the lake surface to a distance of 330 m (Station 0+210) and then emerge from this position and located on the lake surface, the remainder of the distance up to the intake structure. The exposed intake pipe will be bedded in a granular envelope and protected by increasing in size outer layers of rip rap to armour rock along the length of intake positioned on top of the lake bottom. The intake pipe will be constructed with purpose made ballast collars to inhibit pipe floatation. Paralleling the intake pipe will be chemical lines in a protective carrier pipe for zebra mussel control. On an as required basis these lines will carry sodium hypochlorite from the LLPS to the intake structure. Also for a shorter distance a surge relief pipe will parallel the new intake pipe. This pipe will be used to limit hydraulic surges in the LLPS wet well during power outages or during LLPS control or power trip conditions.



LEGEND:

TOWN OF INNISFIL
LAKESHORE WATER TREATMENT EXPANSION
MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

FIGURE
12-1

**PREFERRED WATER TREATMENT
PLANT DESIGN CONCEPT**

BASE MAPPING PROVIDED BY:

ADDITIONAL SOURCES:
(ONTARIO REGULATION 97/04) REGULATION OF DEVELOPMENT, INTERFERENCE
WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES.

JUNE
2010

AECOM



50m 0 150m

106449

Constructing the new intake above the lake bottom will limit the erosion of the lake bottom and excessive turbidity and suspended solids entering the existing intake bottom and effects to the aquatic environment. During construction, siltation curtains will be mandated around the existing intake structure and in the area where intake bedding and protective cover is placed. Furthermore it will be further mandated that all bedding and protective material be placed rather than tipped or dumped.

Construction of the new intake could be facilitated by using cranes and excavators located on barges. The intake pipe will be fused on shore near the location of the intake and floated out to the new location and submerged under controlled condition to the final position. The final location of the on shore activity will be reviewed during detailed design and confirmed prior to construction.

The final intake profile above the lake bottom will be approximately 2.5 to 3.0 metres above the lake bottom and extend approximately 3 to 4 metres each side of intake pipe center line.

12.1.1.1 Intake Dive

AECOM retained Watech Services Ltd. to conduct a SCUBA dive survey of the lake bottom to help characterize fish habitat along the two proposed intake lines: North line, and South line. The survey was documented on a video recording.

The proposed North line intake pipe was surveyed June 1 and 2, 2010. The survey along the 300 m line into shore spanned 20 m in width (10 m on each side of proposed intake line location); therefore it is assumed that there is sufficient data recorded should there be any inconsistencies in the survey line. GPS co-ordinates of the survey line were recorded by Watech Services Ltd.

Review of the live underwater video feed was conducted by AECOM staff on board the dive boat. In general the conditions were uniform throughout the 300 m survey. The substrate of the lake consisted of a soft silty, sand bottom, with patches of zebra mussels and algae scattered throughout. There were larger patches of aquatic vegetation (filamentous and algae) at the 170 m, and 130 m marks from shore, however there was no evidence of fish presence or spawning activities. Several logs approximately 2-3 m in length were noted in the survey area, but no evidence of fish presence or spawning activities were noted. Fish were observed at the 250 m mark and again at the 70 m mark; a review of the video recordings will confirm these sightings. There were no areas of significance noted on the video as it pertains to fish habitat.

The South line survey was conducted on June 2, 2010. Again, there was difficulty in setting up the line however through the Watech Services Ltd. dive investigations the current intake was located and then the survey line was plotted 30 m south. The survey spanned 20 m in width (10 m on each side of the proposed intake line location). GPS co-ordinates of the survey line were recorded by Watech Services Ltd.

The live underwater video feed was reviewed by AECOM staff on board the dive boat. In general the conditions were uniform throughout the 300 m survey. The substrate of the lake consisted of a soft silty, sand bottom, with patches of zebra mussels and algae scattered throughout. There were larger patches of aquatic vegetation (filamentous and algae) at the 130 m mark from shore, however there was no evidence of fish presence or spawning

activities. A few logs approximately 1-3 m in length were noted in the survey area, but no evidence of fish presence or spawning activities were noted. Boulders were noted at the 150 m mark and covered approximately 10% of the ground. The scattered boulders continued into the shoreline; however no evidence of fish presence or spawning activities were observed around the rocks. There were no areas of significance noted on the video as it pertains to fish habitat. LSRCA has indicated that Lake Simcoe provides habitat for warm water sport fish such as Smallmouth Bass and that there are no known Lake Trout spawning shoals.

12.1.2 Low Lift Pumping Station

Same as intake, the existing low lift pump station (LLPS) is required to be expanded to provide sufficient raw water pumping capacity for Phase 3 plant expansion. It has been determined that the north expansion to the existing LLPS is preferred. The new expansion will be essentially same as the existing pumping station, but with larger low lift pumps and pumping wet well, which are sized to serve the Phase 3 expansion capacity.

To correspond to the two-stage approach of Phase 3 water treatment plant expansion (please see section 12.1.4), the LLPS infrastructure will be constructed in full, however, the pumping capacity will only be installed to serve for Phase 3a. Space and piping should be available for an additional pump to provide the increased capacity for the Phase 3b expansion. Pumping well design will provide two inter-connected compartments, separated by a divider wall. There will be an opening in the divider wall that will be equipped with a normally opened sluice gate. The new pumping well will also connect to the existing pumping well using an inter-connecting pipe and a sluice gate. This gate will be normally opened which enables the expanded LLPS to have a combined capacity of 106 ML/d. Design criteria for the low lift pumps are presented in Table 12-1. The required TDH of low lift pumping remains to be determined based on the plant hydraulic profile during preliminary design.

Table 12-1 Design Criteria for the Low Lift Pumps

Design Criterion	Value
Design Capacity	75.9 ML/d
Number of Pumps	2 duty, 1 standby (Phase 3a), additional 1 duty (Phase 3b), 4 total
Single Pump Rated Capacity	293 L/s
Motor	Variable Speed Drive

12.1.3 Watermain Connection

Raw water from the new low lift pumps will be conveyed to the Phase 3 plant using a new 850 mm diameter raw water transmission main, which has a design capacity of 76 ML/d. The new raw water main will follow existing raw water main alignment through Innisfil Beach Park, and then lead to the head valve chamber of Phase 3 WTP. Another new valve chamber will be installed, to allow new raw water main to be connected with the existing one.

12.1.4 Phase 3 Water Treatment Plant Expansion

For the purposes of conceptual design, the WTP plant includes the following unit processes in series:

- Raw water flash mixing, using jet flash mixing devices;

- Mechanical flocculation, using vertical, hydrofoil style flocculators;
- Conventional dissolved air flotation (DAF) clarification;
- Granular Media Filtration, using a conventional anthracite over sand design;
- UV Disinfection-Advanced Oxidation;
- Treated water storage, using a concrete cast-in-place reservoir, with internal baffling to provide required disinfection credit using free chlorine; and
- Secondary disinfection using free chlorine (or possibly chloramines if DBP goals cannot be met).

Due to significant overall expansion in net plant capacity, from 26 ML/d to 100 ML/d, it is recommended that the expansion be undertaken in two discrete phases, as follows:

- Phase 3a: A 37 ML/d expansion, raising net plant capacity from 26 ML/d to 63 ML/d; and
- Phase 3b: A second 37 ML/d expansion, raising net capacity to the design horizon of 100 ML/d.

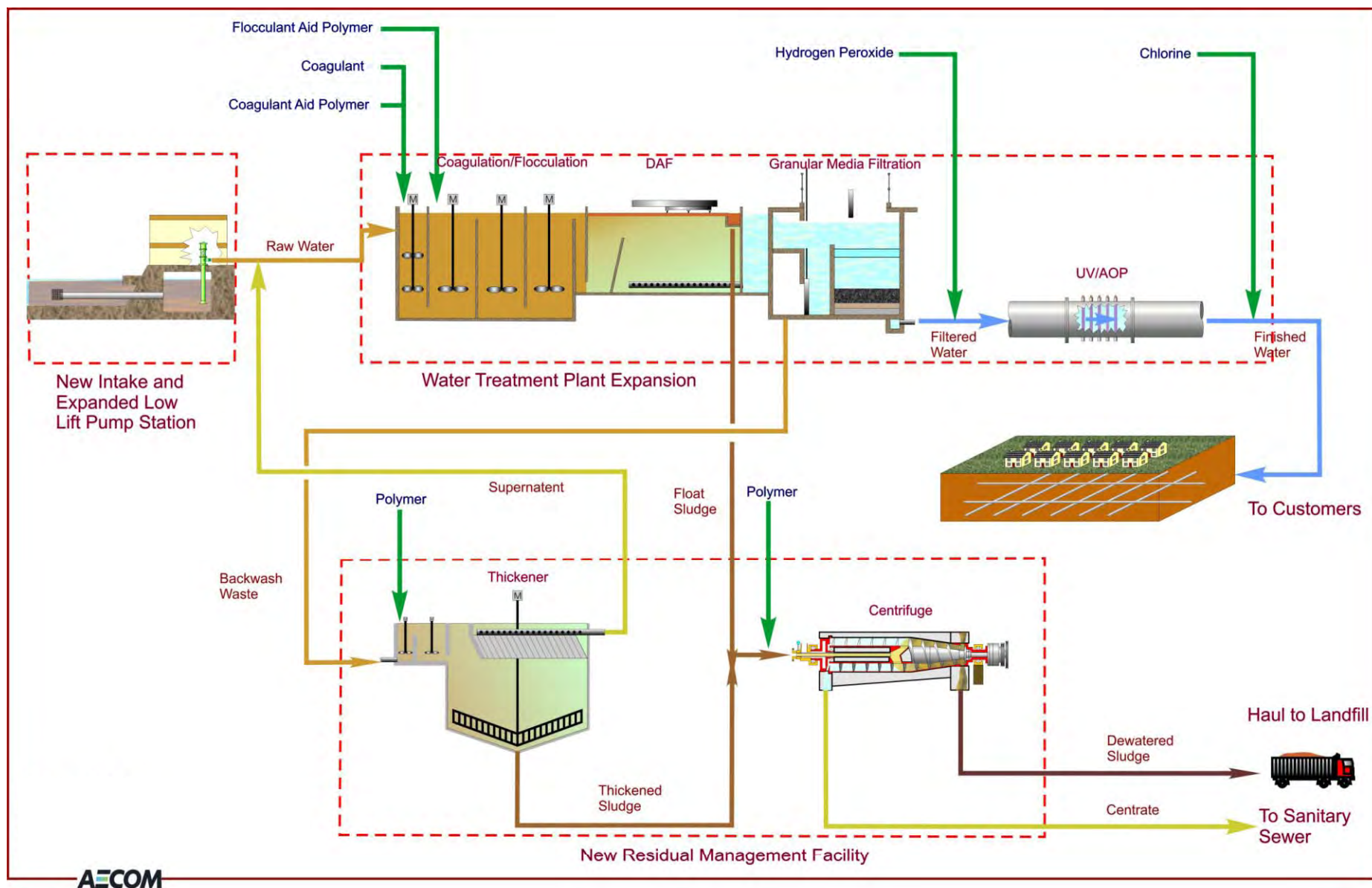
Table 12-2 presents process design criteria for the conceptual design of the WTP. Figure 12-2 demonstrates the WTP process.

Table 12-2 Summary of Design Criteria of Water Treatment Plant Phase 3 Expansion

Design Criterion	Value
Phase 3 Design Capacity	72 ML/d
Phase 3 Stage 1 Design Capacity	36 ML/d
Phase 3 Stage 2 Design Capacity	36 ML/d
Rapid Mix	
Hydraulic Capacity	76 ML/d
Mixing G-Value	600 to 1,000 s ⁻¹
No. Of Parallel Mixers	1 (Phase 3a), 1 (Phase 3b), 2 total
Flocculation	
Design Capacity	76 ML/d
Mixing G-Value	100 s ⁻¹
Flocculation Time	15 mins
Number of Flocculation Basins	4 (Phase 3a), 4 (Phase 3b), 8 total
Number of Flocculation Stages	2, each with two parallel hydrofoil type mixers
DAF	
Design Capacity	76 ML/d
Max. Net Surface Loading Rate	12 m/h
Number of DAF Trains	4 (Phase 3a), 4 (Phase 3b), 8 total
Recycle Ratio	10%
Number of Recycle Systems	2 (Phase 3a), 2 (Phase 3b), 4 total
Max. Air Requirement	10 g air per m ³ of water
Granular Media Filtration	
Design Capacity	76 ML/d
Max. Surface Loading Rate	12 m/h
Number of Filters	4 (Phase 3a), 4 (Phase 3b), 8 total
Filter Media	700 mm Anthracite over 300 mm sand
Backwash Rate	45 m/h
Air Scour Rate	54 Sm ³ /m ² /h
Number of Backwash Pumps	1 duty, 1 standby
Number of Air Scour Blowers	1 duty, 1 standby
UV-AOP	
Design Capacity	76 ML/d
Design Flow to each Reactor	146 L/s
Number of Reactors	4 (Phase 3a), 4 (Phase 3b), 8 total
Min. Design UVT	89 % (to be confirmed by lab test)
Average H ₂ O ₂ Dosing (used only in AOP mode)	10 mg/L
Required Min. MIB and Geosmin Removal	1-log
Required Minimum <i>Cryptosporidium</i> Removal	1-log

Design Criterion	Value
Clearwell	
Required Min. <i>Giardia</i> Removal	0.5-log
Required Min. Virus Removal	2-log
Design Temperature	0.5 °C
Design Capacity	76 ML/d
Design Baffling Factor	0.7
Number of Cells	1(Phase 3a), 1 (Phase 3b), 2 total, each 4.6 ML
High Lift Pumping	
Firm Pumping Capacity	72.3 ML/d
Number of High Lift Pumps	3 duty, 2 standby + 1 duty
Single Pump Rate	280 L/s
Estimated TDH	69 m
Residual Management Facility	
Design Backwash Waste Thickening Capacity	4.7 ML/d
Design Dewatering Centrifugation Hydraulic Capacity	250 m ³ /d
Target Sludge Cake Solid Content	18 – 22 %
Number of Thickeners	1 duty, 1 standby (Phase 3a) + 1 duty (Phase 3b)
Number of Centrifuges	1 duty, 1 standby (Phase 3a) + 1 duty (Phase 3b)
Number of Equalization Basins (for BWW)	2 (Phase 3a), 1 (Phase 3b), 3 total
Min. Effective Volume of Each Equalization Basin	2 full backwash volumes per basin

Figure 12-2 Preferred Phase 3 Expansion Process Schematic



The phase 3 plant will be divided into 2 stages, and the raw water header will be divided into 2 x 650 mm mains, one to feed each stage. The following contents describe the Phase 3a expansion. Phase 3b will be essentially similar to the Phase 3a design.

A jet flash mix assembly will be installed on 650 mm raw water main, to provide flash mixing of coagulant to each of the flocculation trains. The jet mixing approach is used as it has been proven to be the most energy efficient and effective means to inject coagulant. Intensive mixing of coagulant is important as coagulation reactions are very quick (of the order of a few seconds when coagulating coloured water using so-called "sweep coagulation").

Coagulated water will then be sub-divided into 4 parallel treatment units, accomplished using a manifold of flow meters and control valves, to ensure that each unit in service receives an equal portion of the raw water flow. The water will be introduced into the flocculation basins using an energy dissipater, to direct the flow downward into the basin, to mitigate short circuiting.

Each flocculation basin will be sub-divided into two cells in series, and with two vertical, hydrofoil style flocculation mixers mounted in parallel in each basin. Each flocculation basin (both cells combined) will provide a nominal flocculation of 15 minutes at peak flow. Each of the two flocculation cells will be segregated using a perforated baffle wall, to control short circuiting, and provide even flow distribution between cells without causing floc damage. Mud valves will be provided within each cell to allow the basins to be drained.

Each flocculation basin will be directly coupled to a corresponding DAF basin, to ensure even distribution of flow into the DAF basin. Flocculated water will leave the flocculation basins over an over-under baffle arrangement, so as to enter the DAF basin near the floor. As the flocculated water enters the DAF basin, a stream of super-saturated recycle water under pressure will be introduced into the basin using two manifolds of fixed orifice nozzles. As the recycle water leaves the nozzles, the pressure will be released, and the excess air previously dissolved in the recycle water will be precipitated in the form of an enormous quantity of small air bubbles (ideally in the 20 - 100 micron size range). These micro-bubbles will interact with and bind to the floc particles, forming floc-bubble aggregates with a net density significantly lower than the water itself, and as a result the floc-bubble aggregates will float to the surface (see Figure 4-2A for a schematic of the DAF process).

Each DAF basin will be designed to a maximum net surface loading of 12 m/h. An internal baffle, sloped at 70 degrees to the horizontal, will segregate the DAF basin into two discrete halves, with the upstream side of the baffle forming the comparatively turbulent reaction zone, where the flocculated water is mixed with the recycle water, while downstream of the baffle a zone of relative quiescence is formed, wherein the floc-bubble aggregates are allowed to separate from the water, thereby clarifying the water. A dense blanket of float forms at the surface, as the flocs accumulate, and the surface of the basin will be scraped intermittently using a reciprocating style scraper, to remove the float from the DAF basin for residuals handling.

Clarified water will flow downward in the clarification zone, towards the floor of the basin, where it will be withdrawn through a series of parallel, perforated PVC pipes. Clarified water will then leave the DAF basin via a fixed effluent weir, cascading into the DAF effluent channel.

A portion of the DAF effluent water (typically 8-10% of the total flow) will be drawn from the DAF effluent to form the recycle stream to be re-injected into the DAF basins. Two (2) recycle systems will be designed to provide super-saturated recycle water to four DAF basins.

DAF float will be intermittently scraped from the surface of the DAF basins into a float trough using a reciprocating style scraper, which will typically yield a thick sludge of 2 - 3 %TS. The float trough in each basin will be steeply sloped, and fitted with spray headers, to facilitate transport of the float into centralized float sumps. Screw centrifugal pumps will pump float from these sumps directly over to the RMF.

The DAF effluent channel will convey DAF effluent to the granular media filters. There will be 4 filters (3 duty, 1 standby), each designed to a surface loading of 12 m/h, and fitted with a deep bed anthracite over sand design, and lateral style underdrains. Inlet weirs along the filter inlet channel will equally split flow between the filters in service, and each filter will be controlled at a constant level using a modulating filter effluent valve.

Each filter will be provided with the capability for water backwash, air scour, and filter-to-waste. Backwash water will be pumped from the clear well on-site using 1 duty, 1 standby filter backwash pumps. Centrifugal air scour blowers will be used to provide enhanced washing of the filters.

Backwash waste and filter-to-waste water will be diverted to waste equalization basins (2 total), designed to attenuate the short term large flow of wastewater. These equalization basins will be mixed, to keep solids in suspension. The wastewater will then be pumped to a wash water clarification/thickening system to achieve final clarification of the backwash waste prior to discharge of the supernatant to sanitary sewer. Thickened sludge from the thickeners will be blended with DAF float, and then pumped to centrifuges for dewatering.

Filtered water from each filter will flow through the dedicated UV-AOP reactor, which is installed on each filtered water effluent pipe. Each reactor will be designed to same capacity of each filter. Under normal conditions, the UV system is operated in "Disinfection-Only-Mode", in which hydrogen peroxide (H_2O_2) is not dosed and a significant percentage of the lamps are turned off and/or turned down to levels sufficient for disinfection. During T&O events, the system is operated in "T&O Control + Disinfection Mode." This mode requires that the system deliver more UV energy into the water (by activating additional lamps and/or increasing lamp power) and requires the dosing of H_2O_2 .

Filtered water from UV reactors will be conveyed to the new underground treated water clearwell/reservoir, and injected with chlorine solution immediately prior to the reservoir. Hypalon baffling will be provided within the reservoir, to minimize short circuiting, and to provide at least 0.5-log Giardia credit required to complete the overall primary disinfection requirements of the plant.

The chlorinated water will eventually flow into high lift pumping wet well. A high lift pump station (HLPS) will be designed to have an ultimate firm pumping capacity of 72.3 ML/d. At Phase 3a, only 3 pumps (2 duty, 1 standby) will be installed, each with a rated capacity of 280 L/s. It is preferable that all pumps equipped with variable speed drive (VFD) in order to improve operation efficiency.

Chemical storage facilities within the WTP will include bulk storage and dosing facilities for all chemicals to be used at the plant. The design shall consider the overall requirement of Phase 3. Chemical systems will consist of:

- Coagulant (Poly-aluminium chloride);
- Gas chlorine, using tonne cylinders;
- Sulphuric acid dosing for pH adjustment;
- Hydrogen peroxide storage and dosing;
- Aqueous ammonia, for an eventual conversion to chloramines;
- Possible Soda ash (or other chemicals) for corrosion control.

Phase 3a RMF will handle all the process wastes from Phase 3a plant expansion (DAF float sludge and filter backwash waste) and from existing water treatment plant (clarifier wash water, and filter and GAC contactor wash water). Two underground equalization basins will receive backwash waste from the main plant. Equalized wastewater will be pumped to two backwash waste clarifier-thickeners for processing. Supernatant from the thickening process would be recycled back to the head of WTP. Thickened sludge will drain to the underground sludge storage tanks, where it blends with DAF float sludge. Two progressive cavity pumps will deliver the thickened sludge to two centrifuges for dewatering. Centrifuges will be placed on the second floor, directly under which there will be a sludge cake truck loading bay. Sludge cake produced by centrifuges would be hauled to the landfill¹¹. Centrate from the centrifuge (a low overall waste volume) would be sent to the sanitary sewer. To improve thickening and dewatering processes, it is required that an independent polymer system consisting of a polymer make-down system and a polymer dosing system be installed at the RMF.

During detailed design, appropriate screening, landscaping and architectural design will be developed that considers surrounding land uses. Where possible, new WTP components should incorporate Leadership in Energy and Environmental Design (LEED) principles.

12.1.5 Stormwater Management

On-site stormwater management will be incorporated into the site grading and drainage design for the plant expansion, to appropriately manage stormwater runoff leaving the site. Stormwater controls will be designed in accordance with Town of Innisfil requirements. As the site is located in the downstream portion of the Alcona Creek (also referred to as Watercourse No. 4) watershed, the on-site detention of stormwater for quantity control is not required to avoid the coincident timing of peak release rates with the peak flow in Alcona Creek.

¹¹ Phone conversations between AECOM and the Simcoe Waste Management Division took place in June 2010 to discuss the possibility of disposal of sludge cake at the Oro Landfill. It was discussed that the estimated quantities of sludge cake to be disposed of is anticipated to range between 1m³/day (under average flow and average raw water conditions) up to approximately 7m³/day (under peak flow and worst-case raw water quality conditions). As such, this translates to between a truckload every week (average) to everyday 2 days (peak). Based on the information above, the representative from the Simcoe County Waste Management Division indicated that the sludge cake would be acceptable for disposal at the Oro Landfill.

12.2 Emergency Overflow and Discharge of Residuals

Emergency Overflows

As with most modern water treatment facilities, emergency overflows are provided at the “front end” of the treatment process typically upstream of the coagulation/flocculation process and also at the “back end” of the treatment plant typically in the clear well/reservoir/highlift pumping station wet well. These emergency relief structures are set to prevent damage and flooding to the treatment facility during abnormal events such as:

- Loss of automation and the flow into the plant does not stop;
- Errors in manual operation of the upstream processes i.e. all filter outlet valves are closed and low lift pumps continue to operate; and
- Power outages creating a hydraulic surge within the plant.

The worst case condition from emergency overflow would be 106 ML/d (gross plant capacity). In most cases this event would have duration of 60 seconds or less. This would be the time required to go from 106 ML/d to zero flow. It is proposed that these emergency overflows would be directed to the existing outdoor forebay situated on the south side of the existing water treatment plant. The forebay outlets to Alcona Creek (also referred to as Watercourse No. 4). The emergency overflow pipe outletting to this forebay will be equipped with a duck bill check valve in order to prevent backflow up into the overflow pipe. As the flow enters the forebay area rip rap will be provided to inhibit erosion to an area of 5 diameters downstream of the emergency overflow pipe. The flow exiting the forebay will be protected with a rock check dam in order that the exit velocity is dissipated through the rip rap core in the rock check dam. The forebay outlet channel will be protected with rip rap up to the confluence of Alcona Creek (also referred to as Watercourse No. 4) in order to limit erosion of the channel bottom and side walls.

Discharge of Residuals

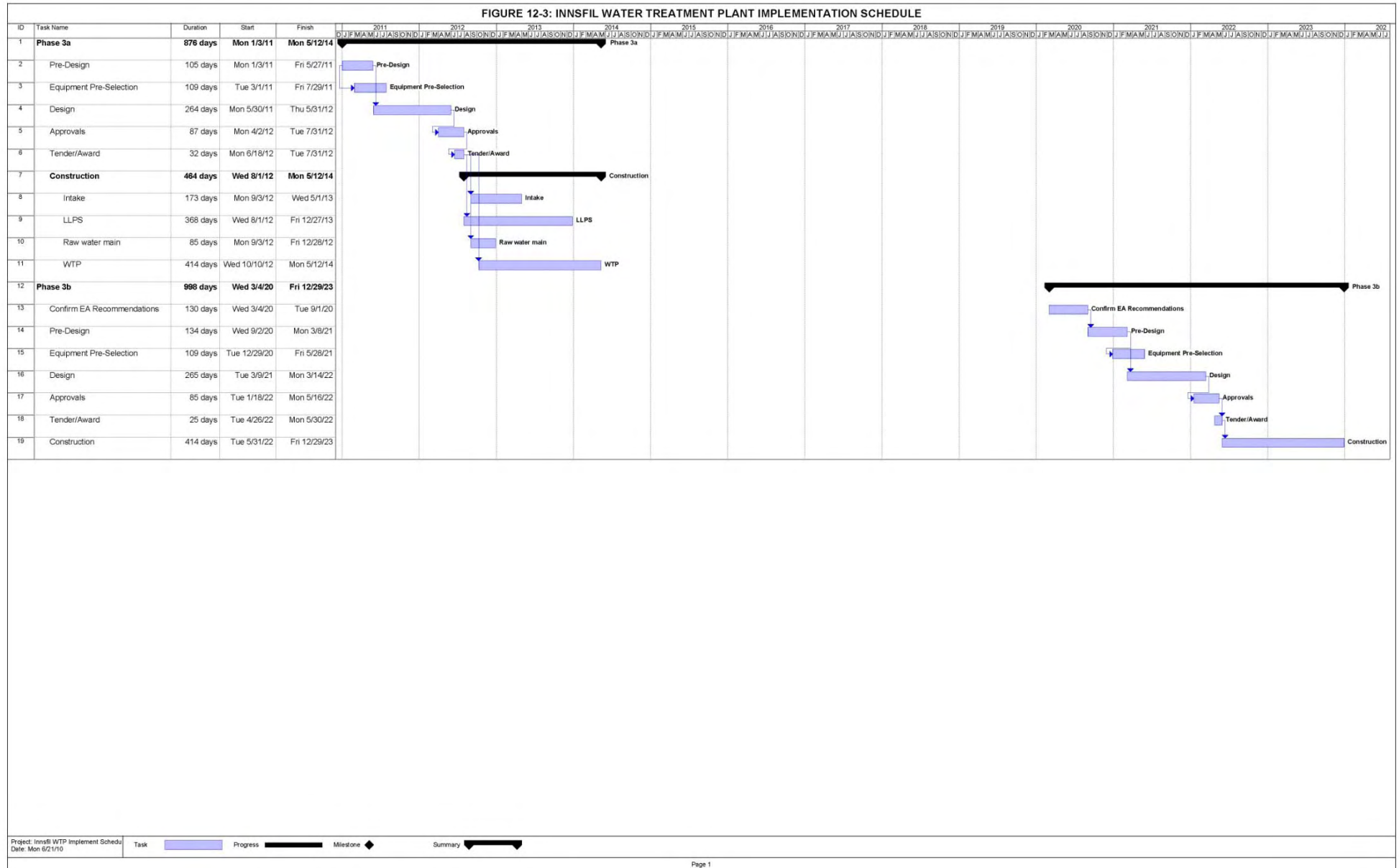
The residuals management facility (RMF) will have two outputs. 1) sludge cake, the solids portion of the residues which is intended to be disposed of at the local landfill(s); and 2) the centrate, the liquid fraction of the residuals which is intended to be discharged to the local sanitary sewer over a 2 hour period in order to minimize the hydraulic impact to the local sewer system. The ultimate fate of the centrate will be treatment at the Town's wastewater treatment plant. It is projected that the centrate flows for the plant are as follows:

- Stage 1 240 m³/d
- Stage 2 480 m³/d

12.3 Implementation Schedule

Figure 12-3 presents the estimated project schedule for WTP expansion design and construction.

Figure 12-3 Estimated Project Schedule



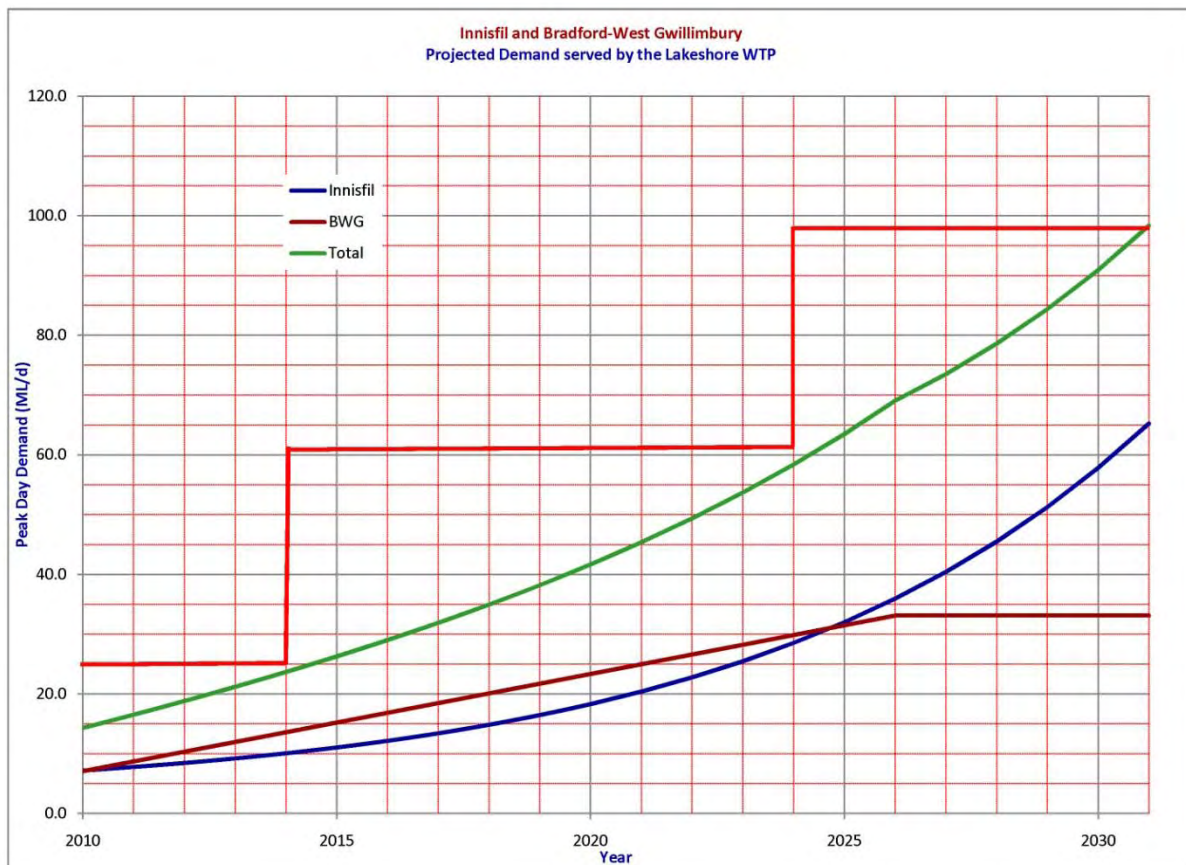
Note: Schedule to be updated based on date of EA clearance.

12.4 WTP Capacity Staging

In order to plan appropriate staging of the upgrades, projected demands have been developed based upon expected population growth rates in both Innisfil and Bradford West Gwillimbury. These projections are depicted in the following figure, and show that the Phase 3a expansion would need to be completed as soon as possible and phase 3b completed approximately by 2024 to keep pace with projected demands.

Demands are projected to reach the “ultimate” capacity of the combined Phase 3a and 3b expansion by 2031 and are illustrated in the following figure.

Figure 12-4 Projected Demand Served by the Lakeshore WTP



12.5 Construction Costs and Funding

12.5.1 Construction Costs

Conceptual estimates of probable capital cost have been developed for the proposed Phase 3a and Phase 3b Water Treatment Plant Expansion, Residual Management Facility, Low Lift Pumping Station, and Raw Water Intake and Raw Water Transmission Main. A summary of these costs is presented in Table 12-3.

At this design level, the construction costs of process components were estimated mainly based on the empirical data in our possession from projects similar in nature and scope and the cost curves published in “Estimating Water Treatment Costs¹²” and “2003 Drinking Water Infrastructure Needs Survey¹³” by US EPA. However, it should be noted that the actual cost may be significantly affected by a number of factors. The type of estimates are based on the major components contained in proposed WTPs, thus not considered in detail enough on some ancillary equipment. Additionally, some unpredictable factors, such as the volume of work in hand or in prospect for contractors and supplier at the time of tender calls, future labour contract settlements, inflation and market escalation, would also contribute to the contingency of the estimated costs. For this reason, while a more detailed design is prepared and competent personnel have carefully prepared the estimate, the actual costs may be above or below those outlined.

The following notes are relevant to the estimates presented in Table 12-3:

- The presented costs are our estimate of the current project costs. This project will not be tendered for several months. Inflation and escalation to account for actual expected prices at the time tendering are not included;
- A geotechnical investigation was not completed during the preparation of the estimates. The actual surface conditions may dramatically impact the capital estimates;
- Financing and legal fees are not included;
- HST is not counted in;
- Other natural environmental restoration costs are not included in this estimate; and
- The costs for low lift pumping and high lift pumping were estimated based on available information. However, it is anticipated that the plant and distribution system hydraulic profiles will be significantly changed due to the expansion. A detailed hydraulic analysis should be completed to properly adjust these costs.

¹² U.S. Environmental Protection Agency – “Estimating Water Treatment Costs”, 1979

¹³ U.S. Environmental Protection Agency – “2003 Drinking Water Infrastructure Needs Survey – Modeling the Cost of Infrastructure”, 2006

Table 12-3 Estimate of Probable Capital Costs

System Component	Phase 3a Construction Cost	Phase 3b Construction Cost
Coagulant Feed System	\$200,000	\$50,000
Polymer Feed System	\$200,000	\$50,000
Sulphuric Acid Feed	\$180,000	\$20,000
Jet Flash Mixer	\$150,000	\$150,000
Flocculation	\$1,500,000	\$1,500,000
DAF	\$1,800,000	\$1,800,000
Granular Media Filtration	\$4,060,000	\$3,400,000
UV-AOP	\$3,100,000	\$3,100,000
Chlorine Storage and Feed System	\$620,000	\$60,000
Underground Clearwell	\$2,500,000	\$2,000,000
Water Treatment Building	\$5,500,000	\$3,500,000
High Lift Pumping Station	\$3,500,000	\$500,000
SCADA System Upgrade	\$1,000,000	\$300,000
Subtotal – Water Treatment Plant	\$24,310,000	\$16,430,000
Wastewater Storage Tanks	\$1,000,000	\$400,000
Clarifier / thickeners	\$1,400,000	\$700,000
Centrifuge Facility	\$1,500,000	\$800,000
RMF Building	\$1,100,000	\$500,000
Subtotal – Residual Management Facility	\$5,000,000	\$2,400,000
Standby Power	\$1,000,000	\$0
Low Lift Pumping Station	\$6,000,000	\$500,000
Raw Water Transmission Main	\$1,100,000	\$0
Raw Water Intake	\$4,000,000	\$0
Subtotal	\$41,410,000	\$19,330,000
Sitework, Yard Piping, Roads @ 10%	\$4,141,000	\$1,933,000
Subtotal	\$45,551,000	\$21,263,000
General Contractor's Overhead and Profit @ 10%	\$4,600,000	\$2,100,000
Subtotal	\$50,151,000	\$23,363,000
Professional Service and Administration @ 12%	\$6,000,000	\$2,800,000
Total Capital Cost	\$56,151,000	\$26,163,000

12.5.2 Project Funding

The costs associated with each phase of the WTP expansion will be shared between the Town of Innisfil and the Town of Bradford West Gwillimbury in proportion with the projected capacity allocation to each municipality. A significant portion of the expanded capacity is intended to service growth, and development charge reserve funding will be applied to the growth-related proportion. Any portion of the expansion capacity that services existing

development will be funded from other sources. Debenturing (i.e. borrowing) may be required to supplement reserve fund balances if required at the time of the expenditures.

From time to time provincial and federal grant or financing programs become available to assist municipalities with capital projects. Any such opportunities will be considered and applied to this project to the extent possible in consideration of overall capital funding priorities.

12.6 Review Agency Approvals

During detailed design and prior to construction, approvals will be required from several review agencies including the MOE, LSRCA, MNR and Ministry of Tourism and Culture in addition to various utility companies, as further described below.

12.6.1 Ministry of the Environment

12.6.1.1 Drinking Water Works Permit and Permit to Take Water

MOE Drinking Water Works Permit (DWWP) will be required as part of the Municipal Water Licensing Program. Other MOE approvals will include a Permit to Take Water (PTTW) related to increased water taking (intake twinning) and should there be groundwater taking of more than 50,000 litres per day. This will be confirmed through the completion of the hydrogeological study as part of detailed design. It is also noted that, dependent on the groundwater discharge type and location, MOE approval under Section 53 of the *Ontario Water Resources Act* may be required.

12.6.1.2 Certificate of Approval

The proposed works are consistent with a typical WTP expansion. Once detailed design has been completed, the Town will be required to obtain amendments to existing C of A (Water). The C of A (Water) will address the treatment components of the project. The C of A will also address the noise and odour emissions from the expanded plant.

12.6.2 Lake Simcoe Region Conservation Authority

This project should be able to proceed under a LSRCA Letter of Advice provided that appropriate design considerations are in place, including a robust sediment control and management plan for in-lake works (i.e., intake twinning). Separate permits will be required under the *Conservations Authorities Act* (i.e., Ontario Regulation 179/06 Development Interference with Wetlands and Alteration to Watercourse and Shoreline Regulation) prior to construction within or near any watercourse crossings (i.e., Alcona Creek which is also referred to as Watercourse No. 4, and Lake Simcoe), including works within floodplains, wetlands and valleys. However, these permits can be combined under a single Letter of Advice.

12.6.3 Ministry of Natural Resources

In accordance with the *Lakes and Rivers Improvement Act* (December 15, 2009), an approval is required for the construction of the intake pipe. An MNR work permit under the *Public Lands Act* will also be required for the intake pipe.

12.6.4 Transport Canada

As part of detailed design, a permit under the *Navigable Waters Protection Act* will be required as construction will affect navigation in the area of the intake twinning.

12.6.5 Ministry of Tourism and Culture

As part of preliminary and detailed design, a Stage 1 Archaeological Assessment (land and possibly marine) will be completed or other level of investigation, as required to obtain archaeological clearance from the Ministry of Tourism and Culture prior to construction of the proposed works.

13. Mitigation Measures and Commitments

Based on the preferred design concepts and proposed construction techniques, the Innisfil WTP expansion is expected to have varying environmental effects. In order to address the effects, the following approach was taken:

- **Avoidance:** The first priority is to prevent the occurrence of negative effects (i.e., adverse environmental effects) associated with the implementation of an alternative.
- **Mitigation:** Where adverse environmental effects cannot be avoided, it will be necessary to develop the appropriate measures to eliminate or reduce to some degree, the negative effects associated with implementing the alternative.
- **Enhancement/Compensation:** In situations where appropriate mitigation measures are not available, or significant net adverse effects will remain following the application of mitigation, enhancement or compensation measures may be required to counterbalance the negative effect through replacement in kind, or provision of a substitute or reimbursement.

Based on conceptual design and considering the above, in some cases avoidance measures were able to be applied more extensively regulated area and construction of watermain on Innisfil Beach Road), thus reducing the extent and magnitude of potential adverse environmental effects requiring the application of mitigation measures.

The following mitigation measures are recommended to ensure that any short-term disturbances are managed by the best available methods. These measures will be further confirmed and defined during detailed design.

13.1 Construction Related Impacts

Impacts related to construction of the WTP expansion will be limited to the duration and location of construction. Perhaps the most significant impact will be the removal of trees to accommodate the WTP and LLPS expansions, alteration and disruption of fish habitat related to the new intake pipe, and alteration to hydrologic conditions related to relocation of the unnamed watercourse and associated effects on local groundwater discharge/recharge and downstream fish habitat. By incorporating proper best management practices and construction techniques/controls, these impacts can be minimized. Anticipated and/or potential construction related impacts and their associated mitigative measures are described in the following sections and summarized in Table 13-1 (end of section). It is recommended that these measures be used to reduce the potential impacts during construction of the proposed works.

Table 13-1 Potential Construction and Long Term Operations Related Impacts and Associated Mitigation Measures

Impacts	Mitigation
Short Term Construction	
Impacts to water resources(e.g., surface and groundwater, sediment desposition) and fisheries • Intake Twinning • LLPS Expansion	• Obtain LSRCA Letter of Advise and Permits (Development, Interference with Wetlands and Alterations to Shorelines and Watercourses). • Where construction occurs in proximity to watercourses, proper

Impacts	Mitigation
- Interconnecting Watermain - WTP Expansion	sedimentation/erosion controls (in accordance with Ontario Provincial Standards) will be employed to the satisfaction of all relevant agencies including MOE, MNR and LSRCA. - Complete hydrogeological investigations to determine dewatering and groundwater control. - For interconnecting watermain, establish appropriate clearance between bottom of Creek and top of pipe to prevent scouring. - Construction timing to avoid fish spawning sensitive periods. - Habitat enhancement and/or compensation. - Restore disturbed areas/habitat to natural or better conditions. - Engage DFO at preliminary design to identify and address HADD issues. - For intake construction, avoid wavy weather on lake. - Proper Sedimentation and Erosion Control (e.g., silt curtains installed at perimeter) as well as near shore. - Provide and maintain sediment control fencing around construction areas and top of bank (and in water) to satisfaction of all applicable agencies. - Provide straw-bale check dams at points of overland flow that cross or drain the watermain alignment area. - Proposed erosion and sediment control plan will, at a minimum, be consistent with the recommendations contained within the MOE "Guidelines for Evaluation Activities Impacting Water Resources". - Ensure proper onsite monitoring of erosion and sediment control, especially during in-water works. - Any areas disturbed by construction will be restored and stabilized as soon as practically possible.
Tree protection and removal	- Complete tree inventory/construction impact assessment and prepare tree relocation and protection plan, as required. - Replace any removed trees, as required.
Contamination of Soils Through Spills and Leaks	- This can be avoided by ensuring that fuel storage, refueling and maintenance of construction equipment are handled properly and not allowed in or adjacent to watercourses/bodies. - Contingency plans must be prepared before projects begin for the control and clean up of a spill if one should occur.
Archaeological/Built Heritage and Cultural Landscape	- Complete a Stage 1 Archaeological Assessment (land and possibly marine) or other level of investigation, as required to obtain archaeological clearance as part of preliminary and detailed design and implement recommendations accordingly. - If any archaeological and/or historical resources are discovered during the performance of construction work, the performance of the work in the area of the discovery is to halt. The Ministry of Culture (Archaeological Unit) will be notified for an assessment of the discovery. Work in the area of the discovery would not resume until cleared to do so by the Ministry. - As part of preliminary and detailed design, complete a scoped Built Heritage and Cultural Landscape Assessment based on the

Impacts	Mitigation
	preferred undertaking (WTP and LLPS northerly expansions) and incorporate recommendations in the design and construction of WTP and LLPS facilities.
Noise, Vibration, Traffic and Dust	- Comply with Town Noise By-Law. - To address construction related vibration impacts in nearby buildings, pre-construction surveys will be completed prior to construction. The surveys will document existing building conditions, as well as identify sensitive structures to be considered during construction. - Prepare a traffic management plan, as required. - Dust control by spraying water, street sweeping, use of calcium chloride.
Access to Park	- Access to park including westerly access off of Park Road will be maintained during and after construction. - WTP and LLPS watermain interconnection to be completed in winter when park usage is low. - Access to playing fields and baseball diamond will also be maintained during construction, if required.
Communication	- Advanced notification. - Dedicated project contacts.
Long Term Operations	
Visual Impact	- Appropriate screening and landscaping including building architectural design. - Comply with Innisfil Beach Road Urban Design Guidelines.

13.2 Enhancements

Mitigation of potential environmental impacts is discussed in the preceding section and represents efforts to reduce negative effects on the environment during construction. Further to this, environmental enhancements can be implemented following construction to restore or enhance ecological functions of the study area. One of the best opportunities for creating ecological enhancements in Innisfil Beach Park is to develop a riparian buffer plan for Alcona Creek (also referred to as Watercourse No. 4) to include plantings of native trees and shrubs and prescriptions for lawn maintenance setbacks from the creek. This work has already been started but could afford to be enhanced even further. Alcona Creek (also referred to as Watercourse No. 4) is the primary ecological feature in Innisfil Park. The creek is host to both coolwater fish populations and warmwater sport fish populations, and provides a considerable natural amenity for park users. Riparian buffers are a key component contributing to the health and ecological function of watercourses. Riparian buffers provide the following benefits:

- shading to moderate water temperatures;
- filter and intercept runoff and nutrients, thereby contributing positively to water quality;
- provide food chain dynamics that benefit aquatic and terrestrial wildlife; and
- provide habitat linkages for wildlife.

The following further expands on how enhancements will be developed and applied for key WTP components.

Component	Description
1) Intake	The intake pipe alignment is sparsely vegetated and any aquatic vegetation in Lake Simcoe disturbed by intake pipe installation is expected to recover within a short time frame (~2 years). Opportunities for habitat enhancement in Lake Simcoe are otherwise limited.
2) Interconnecting Watermain	- Restore disturbed areas and plant trees and/or shrubs near Alcona Creek (also referred to as Watercourse No. 4). - Improve Alcona Creek (also referred to as Watercourse No. 4) water quality and fish habitat by increasing the width of vegetation buffers on either side of the creek.
3) Low Lift Pumping Station	Plant trees to restore shading of Innisfil Beach shoreline.
4) WTP Expansion	Plant trees based on new Innisfil Beach Park master plan.

13.3 Mitigation – Post Construction/Monitoring Requirements

The following table outlines post construction/monitoring requirements.

Component	Post Construction/Monitoring Requirements
1) Intake	Post-construction monitoring may be required following installation of the intake pipe in Lake Simcoe to ensure alterations to fish habitat have not resulted in unacceptable or irreversible damage.
2) Interconnecting Watermain	Post-construction monitoring will be required following a trenchless crossing of Alcona Creek (also referred to as Watercourse No. 4) to ensure any disturbances within the regulated flood plain have been properly restored and to ensure survival of any new tree or shrub plantings.
3) Low Lift Pumping Station	Post-construction monitoring will be required following construction of the LLPS expansion to ensure survival of replaced trees.
4) WTP Expansion	Post-construction monitoring will be required following relocation of the unnamed watercourse and planting of vegetated buffers to ensure restoration has been successfully achieved.

14. Communications and Consultation Program

14.1 Public Consultation

14.1.1 Public Notification

At the beginning of the study, a Notice of Study Commencement and Public Information Centre (PIC) # 1 was mailed to property owners (Town assessment roll) within the study area outlining the project and to inform the local community of the project and solicit comments. The following table outlines the Notices and respective publishing dates.

Notice	Newspaper/Publication Dates
Notice of Study Commencement and Public Information Centre # 1	Bradford West Gwillimbury Times – November 13 and 20, 2008.
Notice of Public Information Centre # 1	Innisfil Examiner – November 14 and 21, 2008.
Notice of Public Information Centre # 2	- Innisfil Examiner – January 15 and 22, 2010. - Bradford West Gwillimbury Times – January 14 and 21, 2010,
Notice of Public Information Centre # 3	- Innisfil Examiner – May 7 and 14, 2010. - Bradford West Gwillimbury Times – May 6 and 13, 2010.
Notice of Study Completion	- Innisfil Examiner – January 20 and 27, 2011. - Bradford West Gwillimbury Times – January 21 and 28, 2011.

A copy of the notices can be found in Appendix D.

14.1.2 Public Information Centre #1 – November 27, 2008

The first of three (3) PICs was held on November 27, 2008 at the Town Hall-Committee Room from 3:00 pm to 5:00 pm and 6:00 pm to 8:00 pm. The purpose of this PIC was to:

- Inform stakeholders of the study purpose and to present the evaluation of alternative water supply planning solutions, the preliminary recommended planning solution (Alternative 5: Expand the Lakeshore WTP and Storage including new intake and Low Lift Pumping Station in combination with Alternative 3: Reduce Water Demands) and next steps; and
- Gather feedback from stakeholders on the presented study information.

This venue followed an informal “drop in” format with display boards presenting the following relevant project information:

- Welcome/Project Contacts;
- Background Information;

- Current and Approved Servicing Areas;
- Overview of Class EA Process;
- Problem Statement;
- Projected Population and Water Demands;
- Water Conservation;
- Natural Environmental Features;
- Class EA Water Supply Alternative Solutions;
- Evaluation Criteria;
- Evaluation of Water Supply Alternative Solutions;
- Preliminary Recommended Alternative Solution and Rationale; and
- Overview of Public Consultation/Class EA Process/Next Steps.

Over the course of the PIC, eighteen (18) people signed in. Attendees included local residents and newspaper media as well as representatives from the Town's of Innisfil and Bradford West Gwillimbury and consultants.

A copy of PIC # 1 display boards can be found in Appendix D.

14.1.3 Public Information Centre #2 – January 26, 2010

The second PIC was held on January 26, 2010 at the Town Hall, Main Floor Community Rooms from 4:00 pm to 8:00 pm and followed an informal "drop in" format.

Following PIC # 1, a significant increase in water demand projections resulted due to the approval of Innisfil's Official Plan Amendment # 1 and Bradford West Gwillimbury Official Plan Amendments No. 15 and No. 16. The new Official Plan Amendments result in new development areas that require servicing. As such, revised water demand projections, associated WTP capacity requirements (changed from 61,000 m³/day as presented at PIC # 1 to approximately 106,000 m³/day) and an updated description of the recommended solution was presented at a second PIC to receive comments.

Over the course of the PIC, sixteen (16) people signed in. Attendees included local residents and newspaper media as well as representatives from the Town's of Innisfil and Bradford West Gwillimbury and consultants.

A copy of PIC # 2 display boards can be found in Appendix D.

14.1.4 Public Information Centre #3 – May 18, 2010

The third PIC was held on May 18, 2010 at the Town Hall, Main Floor Community Rooms from 4:00 pm to 8:00 pm. Similar to PIC # 1 and # 2, PIC # 3 followed an informal "drop in" format with large display boards presenting the information listed below. The purpose of PIC # 3 was to describe and obtain comments on the following:

- Water Treatment Process Evaluation;
- Residuals Management Strategy;
- Identification and Evaluation of Alternative WTP Expansion Design Concepts based on:
 - WTP Expansion to the north or east of existing WTP;
 - LLPS to the north or south of existing LLPS; and
 - Watermain connection – through Innisfil Beach Park or following Innisfil Beach Road and 25th Sideroad.
- Preliminary Recommended Design Concepts;
- Proposed Mitigation Measures; and
- Next Steps.

Over the course of PIC # 3, thirteen (13) people signed in. Attendees included local residents and newspaper media as well as representatives from the Town's of Innisfil and Bradford West Gwillimbury and consultants.

A copy of PIC # 3 display boards can be found in Appendix D.

14.1.5 Comments Received and Responses

PIC # 1

Following PIC # 1, three (3) comment sheets were received. From discussions with PIC attendees, the general consensus was that Alternative 5 (Expand the Lakeshore WTP and storage including new intake and low lift pumping station) and Alternative 3 (Reduce Water Demand), as recommended was the best option. Comment sheets and responses are provided in Appendix D.

PIC # 2

Following PIC # 2, one (1) comment sheet and two (2) emails were received. The general consensus of the comment sheet and emails was that Innisfil Beach Park, particularly the treed area to the north of the WTP, is very important to the local community, and the expansion to the north was not favoured. Another individual requested whether the access point to Innisfil Beach Park at Park Road and 25th Sideroad will be closed. The comment sheet, emails and responses can be found in Appendix D.

PIC # 3

Following PIC # 3, one (1) comment sheet and one (1) email were received. The comment sheet outlined the acceptance of the recommended design concept including input with respect to architectural design and tree buffer/removal. The email was a request to be added to the project mailing list. The comment sheet, email and responses can be found in Appendix D.

Notice of Study Completion



During the 30 day review period, one (1) comment was received from a resident who enquired about possible impacts from construction on their property. Following review of the Preferred Water Treatment Plant Design Concept the resident was satisfied that construction of the WTP expansion would not directly affect their property. Lastly, no Part II Order requests were received from the public.

14.2 Review Agency and First Nations Consultation

14.2.1 Agency and First Nations Notification

Similar to the notification process used to inform the public, Notices of Study Commencement and PIC # 1, PIC # 2, PIC # 3 and Study Completion were sent to commenting review agencies and First Nations.

14.2.2 Review Agency Consultation

14.2.2.1 Ministry of the Environment

On February 2, 2010, the Ministry of the Environment (MOE) requested a copy of PIC # 2 display boards. In a reply email, AECOM sent the MOE a copy of the boards in addition to requesting comments in which MOE stated they will provide comments on the draft ESR. On August 4, 2010, a meeting was held with AECOM and MOE to discuss the draft ESR and to provide MOE with an update on the progress of the project and status of the Notice of Completion. The ministry also requested this meeting to discuss in more detail the need for a water conservation plan for this Class EA. Following the meeting, written comments were provided by the MOE on August 13, 2010 regarding the following topics:

- Treatment processes (see section 7);
- Permit to Take Water (see section 12.6.1.1);
- Water Conservation (see section 2.4); and
- Green Development Initiatives (i.e., LEED), see section 12.1.4.

In a letter dated February 18, 2011, the MOE responded to the Notice of Study Completion stating that the ESR was revised as per the August 13, 2010 comments. As such, at this time, the MOE does not have any further comments or concerns. An email was received from MOE on March 4, 2011 that confirmed no Part II Order requests were received.. Correspondence can be found in Appendix E.

Correspondence with the MOE can be found in Appendix E.

14.2.2.2 Lake Simcoe Region Conservation Authority

On May 25, 2010 a meeting was held with LSRCA to explain the project, gather input regarding Alcona Creek (also referred to as Watercourse No. 4) and the unnamed watercourse, to discuss AECOM's ecological field investigations as well as LSRCA, DFO and MNR approval and permit requirements. Regarding LSRCA approval, LSRCA anticipates that the Innisfil WTP project should be able to proceed under a Letter of Advice provided that appropriate design considerations are in place, including a robust sediment control and management plan for in-lake works. Although separate permits will be required under the *Conservation Authorities Act* for works at Alcona Creek

(watermain interconnection creek crossing) and the unnamed watercourse, these permits can be combined under a single Letter of Advice.

A copy of the draft ESR was sent to LSRCA for review. In a letter dated August 20, 2010 LSRCA provided comments on the draft ESR which included:

- Specific dates to which in water works are not permitted;
- LSRCA would prefer that the expansion be built to the east, rather the north-if not possible, then the unnamed watercourse should be relocated;
- Proposed discharge to Alcona Creek must be analyzed for potential negative impacts on the creek and fish population;
- A mitigation monitoring strategy is required for the construction of the intake; and
- Stone used to cover the intake pipe, any in water works or bank erosion control must be rounded granite.

Correspondence with LSRCA can be found in Appendix E.

14.2.2.3 Ministry of Transportation

The Ministry of Transportation (MTO) responded to the Notice of Study Commencement and PIC # 1 stating that MTO has no concerns and requested that MTO not be circulated as the Lakeshore WTP is beyond the permit control area. MTO correspondence can be found in Appendix E.

14.2.2.4 Ministry of Tourism and Culture

In a letter dated March 4, 2011, the Ministry of Tourism and Culture (MTC) raised concerns regarding the level of detail used for assessing impacts to archaeological (land and marine) and built heritage and cultural landscape resources and suggested that this be addressed through an EA addendum.

AECOM responded to the above comments on March 24, 2011 by making a commitment to address their concerns at the preliminary and detailed design stage.

MTC correspondence can be found in Appendix E.

14.2.3 First Nations Consultation

Consultation with First Nations included all mandatory and discretionary Class EA contact points. The following First Nations were contacted:

- Chippewas of Georgina Island;
- The Chippewas of Rama First Nation;
- Mnjikaning First Nation;
- Nation Hurrone Wendat;
- Mississaugas of Scugog;

- Ojibways of Hiawatha First Nation;
- Mississaugas of Alderville First Nation;
- Chippewas of Beausoleil First Nation;
- Curve Lake First Nation;
- Moose Deer Point First Nation;
- Wahta Mohawk; and
- Metis Nation of Ontario.

The Chippewas of Rama First Nation responded to the Notice of PIC # 2 on February 11, 2010 stating that a copy of the Notice of PIC # 2 (including letter) was forwarded to their Barrister & Solicitor coordinator for Williams Treaties First Nations for further review and response. After PIC # 3, follow up telephone calls were made to all the above First Nations including the Chippewas of Rama First Nation's Barrister and Solicitor. To date no responses have been received from the Chippewas of Rama First Nation's Barrister and Solicitor. Through additional follow up phone calls, the Mississaugas of Scugog requested additional information on January 3, 2011. In order to fulfill their request, AECOM sent PIC # 1, 2 and 3 display boards.

14.2.3.1 First Nations Responses to Notice of Study Completion

Chippewas of Rama First Nation

In a letter dated January 31, 2011, Chippewas of Rama First Nation acknowledged receipt of the Notice of Study Completion and a copy of the notice was forwarded to their Barrister & Solicitor coordinator for William Treaties First Nations for further review and response.

Beausoleil First Nation

In a letter dated February 9, 2011, Beausoleil First Nation acknowledged receipt of the Notice of Study Completion and a copy of the notice was forwarded to their Barrister & Solicitor coordinator for William Treaties First Nations for further review and response.

Chippewas of Georgina Island

In a letter dated January 27, 2011, Chippewas of Georgina Island acknowledged receipt of the Notice of Study Completion.

Correspondence with First Nations can be found in Appendix F.

15. Conclusions and Recommendations

15.1 Conclusions

Through the completion of this Municipal Class EA study and supporting studies and investigations, the preferred design concept for the expansion of the Lakeshore Water Treatment Plant (WTP) includes:

- Twin the existing Lake Simcoe intake and watermain between the WTP and LLPS (follow existing watermain alignment through Innisfil Beach Park).
- Expand the LLPS north of the existing LLPS;
- A treatment process consisting of dissolved air flotation (DAF), granular media filtration (GMF), ultraviolet (UV) disinfection and advanced oxidation process (AOP) unit; and
- WTP expansion to the north of the existing WTP driveway (outside the current fenced area).

The Notice of Study Completion was issued on January 20, 2011 with the 30 day public review period of this Class EA Environmental Study Report commencing on January 21, 2011 and finishing on February 19, 2011. In early March 2011, MOE confirmed that no Part II Order requests were received by the Ministry.

15.2 Recommendations

Given the above, this Municipal Class EA report ensures that the proposed Lakeshore WTP expansion project meets the requirements of the *EAA*. Therefore, it is recommended that:

- The Town proceed with the preliminary and detailed design of the preferred design concept;
- The Town proceed with the planning and implementation of a Water Conservation and Efficiency Strategy in conformance with the Lake Simcoe Protection Plan;
- Through detailed design, proceed to secure remaining approvals including MOE, LSRCA, MNR, Transport Canada and Ministry of Tourism and Culture as described in section 12.6;
- The mitigation measures identified in section 13 of this report should be confirmed and further elaborated upon during preliminary and detailed design, and implemented as part of the construction process; and
- Proceed to revise Innisfil and Bradford West Gwillimbury water supply agreement based on new capacity allocations.