OUR WATER, OUR FUTURE

Water Conservation and Efficiency Strategy, 2014

Corporation of the Town of Innisfil

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1 Introduction

Although water conservation and efficiency has been promoted by the Town of Innisfil for many years through various informal initiatives, the evolving regulatory and environmental landscape has brought water conservation front and center.

The development of this Water Conservation and Efficiency Strategy has been mandated by the Lake Simcoe Protection Plan, with additional requirements added by a letter received by the Town from the Ministry of the Environment in response to the submission of project documentation related to the expansion of the Lakeshore Water Pollution Control Plant.

Water efficiency is also a requirement of the recently amended Permit To Take Water Program administered by the Ontario Ministry of the Environment, and is recognised as a utility Best Management Practice (BMP) by the Federation of Canadian Municipalities (FCM), National Research Council (NRC) and the American Water Works Association (AWWA).

Both property owners and the Town will realize benefits from the efficient use of water being promoted through the implementation of this Strategy. The potential benefits include:

- Water savings
- Reduced wastewater flows
- Deferred capital infrastructure costs due to reduced water use and wastewater flows
- Sustainability and accountability in the production and distribution of the water resource
- Reduced costs for energy and chemicals to treat drinking water and wastewater
- Reduced costs for water, sewer, and associated electric and gas utility services
- Reduced size and extended septic system life for those not serviced by the wastewater system
- Improved safe yield and pumping reliability in wells
- Improved local environment
- Pollution prevention

This Water Conservation and Efficiency Strategy sets water saving and inflow and infiltration reduction targets for the Town of Innisfil, complete with initiative implementation timeline and projected expense report. The Strategy seeks continuous improvement in water efficient use and requires that the Town monitor progress and report on accomplishments made in the conservation of water and reduction in wastewater flows.

Water Conservation is similar to recycling’s blue box programs. A strong education campaign motivated people through the understanding of the “waste stream” of why it is important to the environment to participate. The program evoked an environmental consciousness and now the same must be done for water use. The complete story of water needs to be conveyed to the public, not just tips on how to conserve. It is our water, our future, and it is time to take steps to change our wasteful ways!

2 Legislative and Regulatory Influences

The following section provides an overview of the major legislation, regulations, guidelines and policies with which the Town must comply while undertaking the Water Conservation and Efficiency Strategy (WCES).

2.1 *Lake Simcoe Protection Plan*

In June 2009, as part of the *Lake Simcoe Protection Act, 2008* the Government of Ontario released the Lake Simcoe Protection Plan (LSPP). The LSPP was developed to direct efforts to restore the health of Lake Simcoe. The LSPP focuses on the most critical issues to the watershed including:

- Restoring the health of cold water fisheries and other aquatic life;
- Improving and maintaining water quality, reducing the amount of Phosphorus entering the lake;
- Protecting and rehabilitating important natural areas and addressing impacts of invasive species, recreational activities and climate change.

Policy 5.3 of the LSPP requires that the Town prepare and begin implementation of this WCES.

2.2 *Ministry of the Environment Letter Dated July 12, 2011*

The Ministry of the Environment (MOE) issued a letter to the Town on July 12, 2011 (MOE Letter) in response to the Town's submission of Project documentation for the proposed Lakeshore Water Pollution Control Plant Expansion/Upgrade to which the MOE received two Part II Orders. The MOE Letter outlined an additional requirement for the Town to develop a WCES in compliance with LSPP Policy 5.3, and include within, a strategy for the reduction of Inflow and Infiltration into the Town's wastewater collection system. The Town's requirement to produce the aforementioned strategy was deemed satisfactory to the Minister, in lieu of requiring an individual EA to be completed in response to the receipt of the Part II Orders. The MOE Letter is attached as Appendix "A".

2.3 *Safeguarding and Sustaining Ontario's Water Act, 2007*

The Ontario government passed the *Safeguarding and Sustaining Ontario's Water Act, 2007* (SSOWA) to enable implementation of the Great Lakes - St. Lawrence River Basin Sustainable Water Resources Agreement and other amendments to the Permit to Take Water program. With respect to water conservation, SSOWA amended the *Ontario Water Resources Act, RSO 1990* to enable an MOE director to require water conservation plans by Permit to Take Water (PTTW) holders and for proposed intra-basin transfers. In addition, regulations can be made under the *Ontario Water Resources Act, RSO 1990* requiring persons to develop and implement water conservation plans or to take other measures to promote the efficient use of water or reduce water losses through consumptive use.

2.4 *Building Code Act, 1992*

Ontario's Building Code (OBC) is a regulation under the *Building Code Act, 1992* that sets out technical and administrative requirements that must be met when a building is constructed, renovated or undergoes a change of use. Plumbing requirements are included in the OBC. Provisions that support water efficiency (e.g., through mandating low flow toilets in new construction and additional bathrooms added to existing buildings) were added to the OBC in 1996 to improve water efficiency in any new construction/renovation. In addition, the OBC enables certain "green" technologies, some of which encourage water conservation such as rainwater harvesting and grey water re-use.

2.5 *Clean Water Act, 2006*

The purpose of the *Clean Water Act, 2006* is to protect existing and future sources of drinking water in Ontario in terms of both quality and quantity of water. It is part of the Ontario government's commitment to ensure the sustainability of clean, safe drinking water for all Ontarians and to implement the recommendations of the Walkerton Inquiry. If there are significant drinking water threats associated with water quantity, the source protection plan must include policies to address those threats. Such policies can address water conservation.

2.6 *Provincial Policy Statement*

The Provincial Policy Statement (PPS) is a key component of Ontario’s planning system as it sets policy direction on matters of provincial interest related to land use planning, growth management, environmental protection, and public health and safety. It aims to provide a stronger policy framework that guides communities in Ontario toward a higher quality of life and a better long-term future. The PPS identifies that planning for sewage and water services must direct and accommodate expected growth in a manner that promotes the efficient use of existing municipal and private communal sewage and water services.

2.7 *Ontario Water Resources Act and O.Reg. 387/04: Water Taking*

Water takings in Ontario are governed by the *Ontario Water Resources Act* (OWRA) and the Water Taking Regulation (Ontario Regulation 387/04). The purpose of the OWRA is to provide for the conservation, protection and management of Ontario's waters and for their efficient and sustainable use to promote Ontario's long-term environmental, social and economic well-being. The Permit to Take Water (PTTW) program provides for the conservation, protection, and wise use and management of Ontario's waters. The regulation and accompanying guidelines and procedures manual establish clear technical requirements and standards to promote consistent, sound, defensible decisions related to permit applications and to promote stronger conservation measures.

3 Related Documents and Projects

The following documents and project files were reviewed, referenced and/or have provided input to the development of this strategy. Their pertinent aspects are described in brief:

3.1 *Town of Innisfil Official Plan (Adopted July 26, 2006; Approved by OMB May 2009 & May 2010) & Official Plan Amendment No. 1*

The Town of Innisfil Official Plan (OP) is a statement of goals, objectives and policies intended to guide future land use activity and change to the year 2026 that has been prepared and enacted in accordance with the provisions of the policies of the Province of Ontario and the County of Simcoe's Official Plan. The policies of the OP are intended to promote long-term community sustainability by promoting concepts to ensure that the timing of development within the Town coincides with its ability to provide the required services, including but not limited to: municipal infrastructure, roads, schools, parks, libraries and other services required for new development.

3.2 *Lakeshore Water Treatment Plant Expansion Class EA (AECOM, Jan 2011)*

The Lakeshore Water Treatment Plant (WTP) Expansion Class EA was completed in early 2011. The Class EA was conducted to determine the preferred solution for expanding the plant to provide treated municipal water to accommodate full build of the Town's approved 2008 Official Plan. The purpose of the Class EA was to identify the preferred water treatment process to be implemented for expansion of the existing Lakeshore WTP from 26 MLD to 100 MLD. The Class EA also evaluated alternative locations for a new Lake Simcoe intake, the expansion of the existing Low Lift Pumping Station (LLPS) and for the new watermain connection between the LLPS and the WTP. The preferred solution for the expansion includes the use of a Dissolved Air Flotation (DAF)-Granular Media Filtration-Ultraviolet Advanced Oxidation Process (UV-AOP) treatment process coupled with the implementation of a Town-wide water reduction strategy.

3.3 *Lakeshore Water Pollution Control Plant Class EA (Ainley Group, 2011)*

The Lakeshore Water Pollution Control Plant Class EA was completed in the early 2011. The Class EA was conducted to determine the preferred solution for expanding the existing Lakeshore Water Pollution Control Plant (WPCP) in Alcona, to service existing and future populations within the Town, as approved under the Town of Innisfil 1996 Official Plan. The purpose of the Class EA was to identify technologies that would permit the necessary expansion to the plant while staying within the Interim Phosphorus Regulation (O.Reg 60/08) limit of 351 kg per annum.

The preferred servicing alternative is a two-stage expansion (Stage III and IV) of the plant on lands owned by the Town. The Stage III expansion involves the expansion of the plant 14 MLD to 25 MLD and will be required by 2015 to service populations until 2024. The Stage IV expansion involves the expansion of the plant from 25 MLD to 40 MLD will be required by 2024 to service growth until 2035. The wastewater flows calculated within the Water Pollution Control Plant Class EA will be used as a baseline for wastewater flow reduction targets made in the WCES. Another key component of the WPCP expansion is to develop and implement a water conservation and efficiency strategy and to include a program for the reduction of inflow and infiltration from the WPCP collection system.

3.4 *Town of Innisfil Master Servicing Plan (Water / Wastewater) (GENIVAR, 2012)*

The Town-Wide Water and Wastewater Master Servicing Plan (MSP) was completed in early 2012. The MSP was completed to identify long term servicing strategies for water and wastewater servicing within the Town of Innisfil to the year 2031. The MSP evaluated alternative servicing strategies for existing and future development, up to 2031.

The plan outlines the methodology followed for the analysis of the existing systems and the requirements for future development.

The MSP was undertaken to identify and evaluate alternatives to provide water and wastewater servicing options for existing development, currently un-serviced areas and future development in the Town of Innisfil, as planned for in the Official Plan, including OPA #1, the 6th Line Campus Node and the industrial/commercial area located at the intersection of Highways 400 and 89. This includes identifying wastewater treatment options for Cookstown and water supply options for Stroud, Fennell's Corners and Churchill.

3.5 *Technical Memo – BWG Water Supply Options Update / Lakeshore WTP Staging Plan – REVISED (CC Tatham, 2013)*

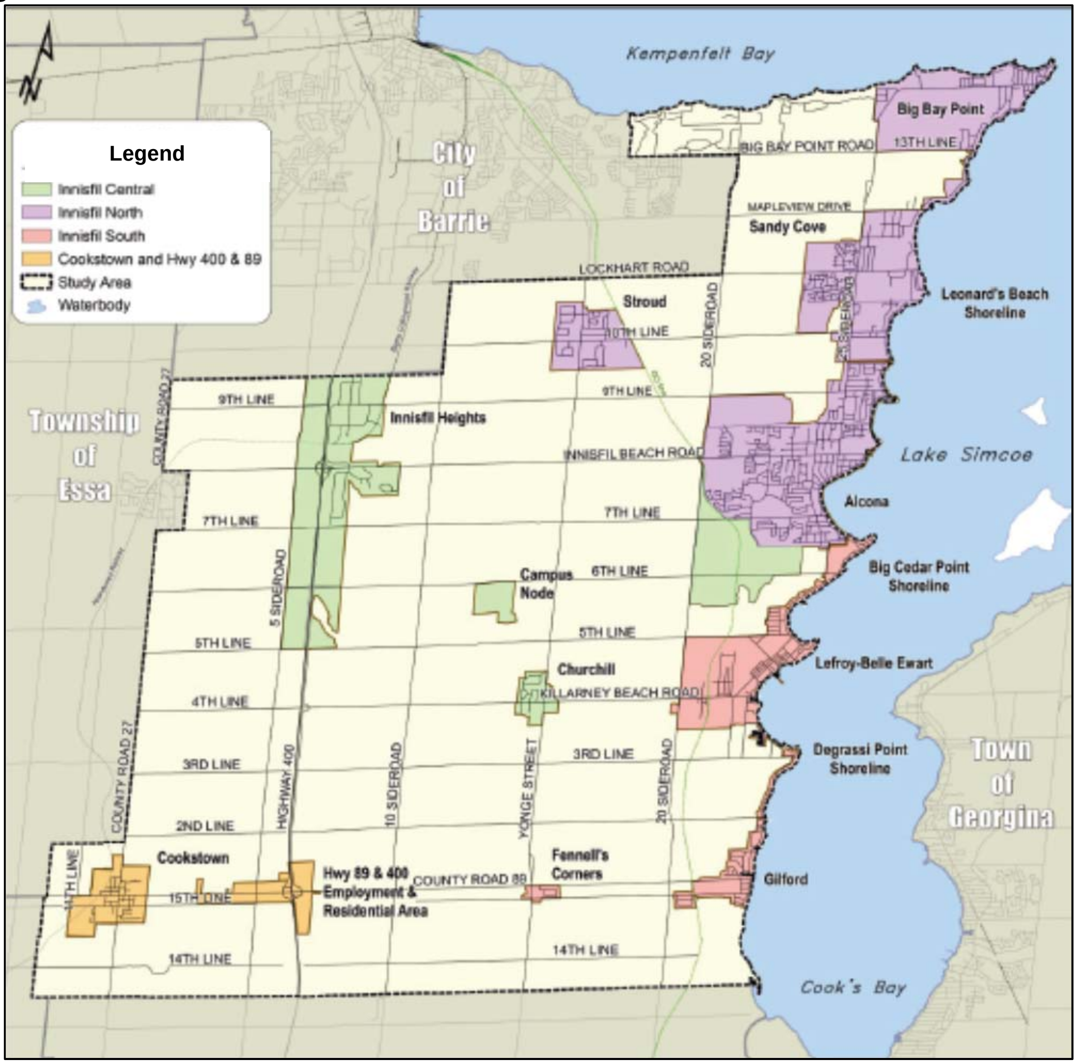
The BWG Water Supply Options Update and Lakeshore WTP Staging Plan – REVISED Technical Memo was completed in June of 2013. The Technical Memo was completed to provide updated projected water demand information, develop an alternative construction staging plan and estimate of probable costs in order to identify a staging plan that more closely matches the needs of the Town of Innisfil and the Town of Bradford-West Gwillimbury (BWG). The water demand and probable construction costs outlined in the Technical Memo form the basis of the benefit of water conservation initiatives calculations completed for the Lakeshore WTP service area within this Strategy.

4 Description of the Town of Innisfil

4.1 *Community Characteristics*

The Town of Innisfil is one of sixteen area municipalities located within the County of Simcoe and is located on the west shore of Lake Simcoe, approximately 80 km north of the Greater Toronto Area (GTA), with a current population of approximately 35,000. The Town is comprised of a collection of smaller settlement areas, combining the charm of a rural landscape with the convenience and amenities of a vibrant urban municipality. It is comprised of the following settlement areas (neighbourhoods): Big Bay Point Shoreline, Innisfil Heights, Fennell's Corners, Churchill, Stroud, Alcona, Cookstown, Gilford, Lefroy-Belle Ewart, Sandy Cove, Leonard's Beach, Big Cedar Point Shoreline, and Degrassi Point Shoreline, and the Highway 400 and 89 employment areas as illustrated below.

Diagram 4.1: Town of Innisfil settlement areas



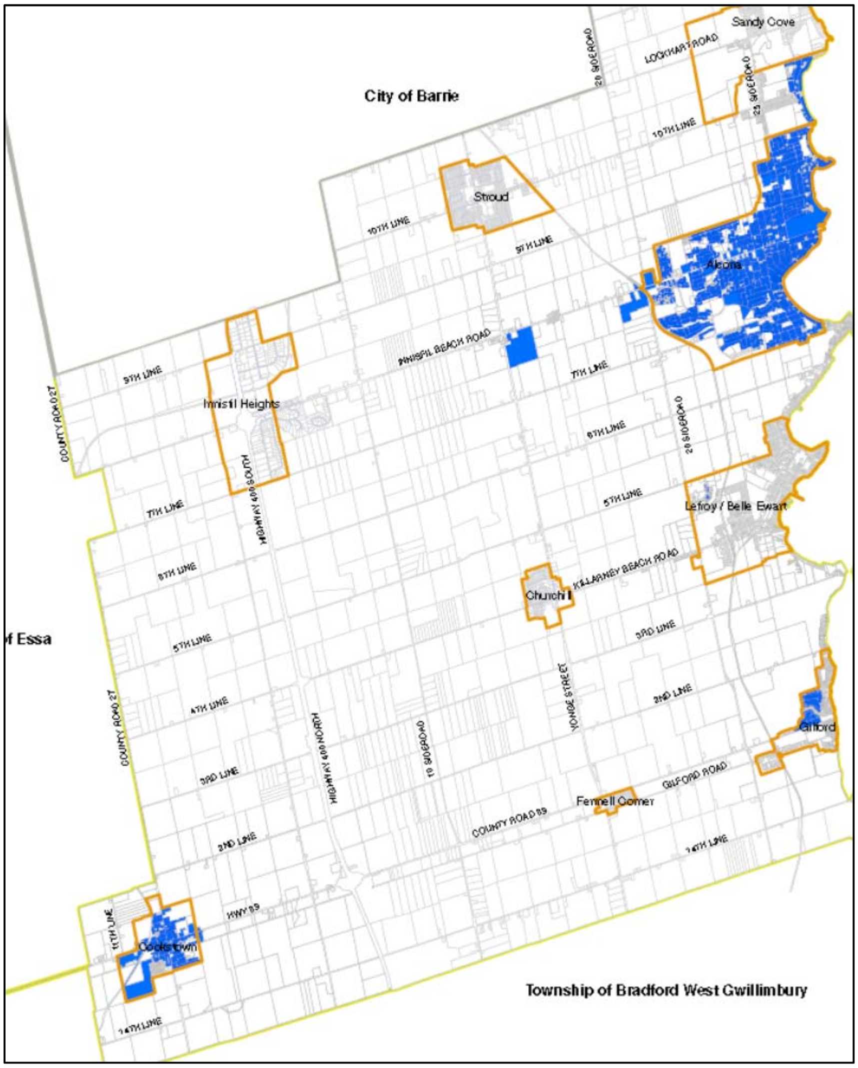
4.2 *Existing Water Supply Systems within the Town of Innisfil*

Within the Town of Innisfil, the following water supply systems are currently operated and maintained:

4.2.1 Lakeshore Water Treatment Plant and Distribution System

The Alcona-Lakeshore Drinking Water System consists of one (1) surface water treatment plant, two (2) water storage standpipes, three (3) storage reservoirs and pumping stations, three (3) booster pumping stations, distribution watermains, and the associated appurtenances. This drinking water system currently provides water servicing to residents and businesses within the areas of the Town of Innisfil highlighted in Diagram 4.2, and also provides water to the Town of Bradford-West Gwillimbury to complement their well supply systems.

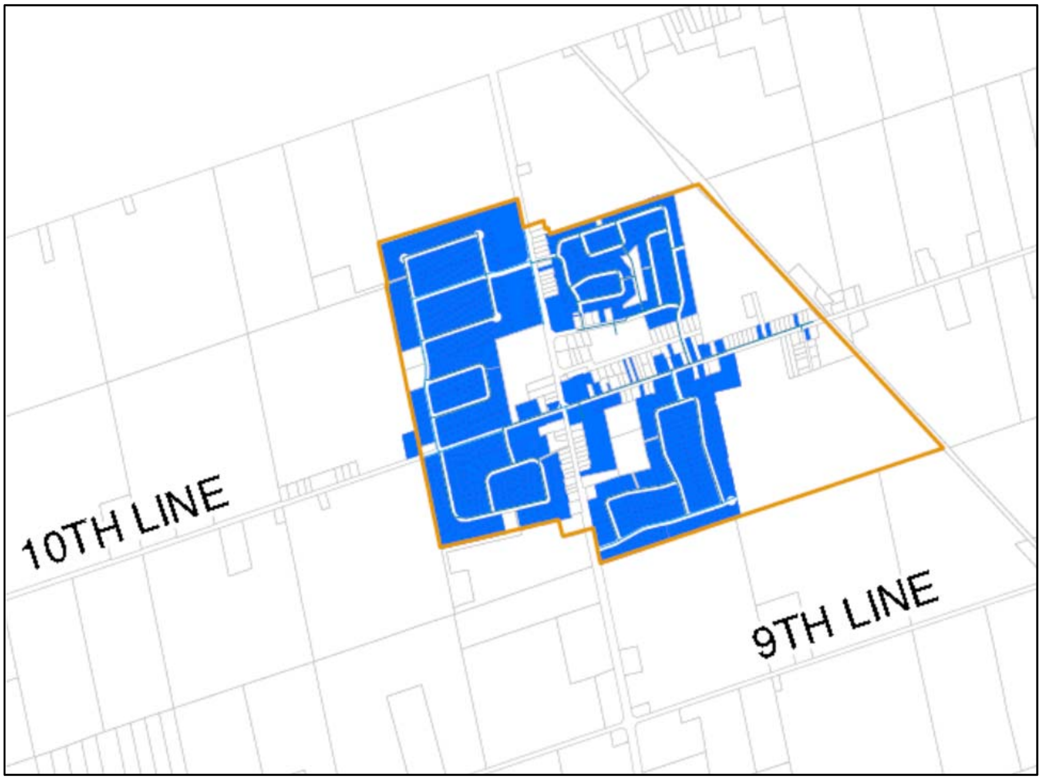
Diagram 4.2: Lakeshore Water Treatment Plant and Distribution System existing service area



4.2.2 Stroud Water Treatment Facility and Distribution System

The Stroud Drinking Water System consists of three (3) Wells, one clearwell with intrabasin baffling, one pumphouse, housing high lift pumps, a sodium hypochlorite disinfection system, and a Duplex Greensand Pressure Filter System, distribution watermains, and the associated appurtenances. The Stroud Drinking Water System currently provides water servicing to residents and businesses located within the area of Town highlighted in Diagram 4.3.

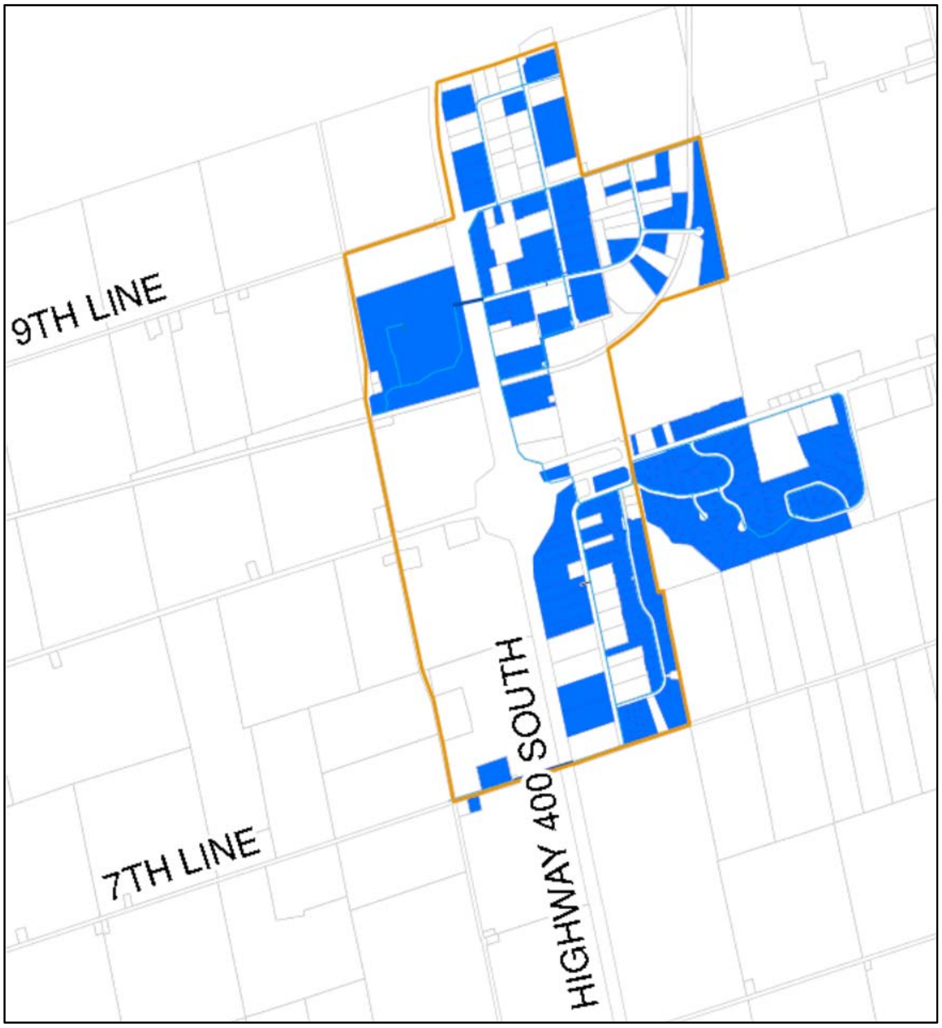
Diagram 4.3: Stroud Water Treatment Facility and Distribution System existing service area



4.2.3 Innisfil Heights Water Treatment Facility and Distribution System

The Innisfil Heights Drinking Water System consists of two (2) wells, one (1) well pumphouse, one (1) high lift pumping station and in-ground reservoir, distribution watermains, and associated appurtenances. The Innisfil Heights Drinking Water System currently provides water servicing to the residents and businesses located within the area of Town highlighted in Diagram 4.4.

Diagram 4.4: Innisfil Heights Water Treatment Facility and Distribution System existing service area



4.2.4 Goldcrest Water Treatment Facility and Distribution System

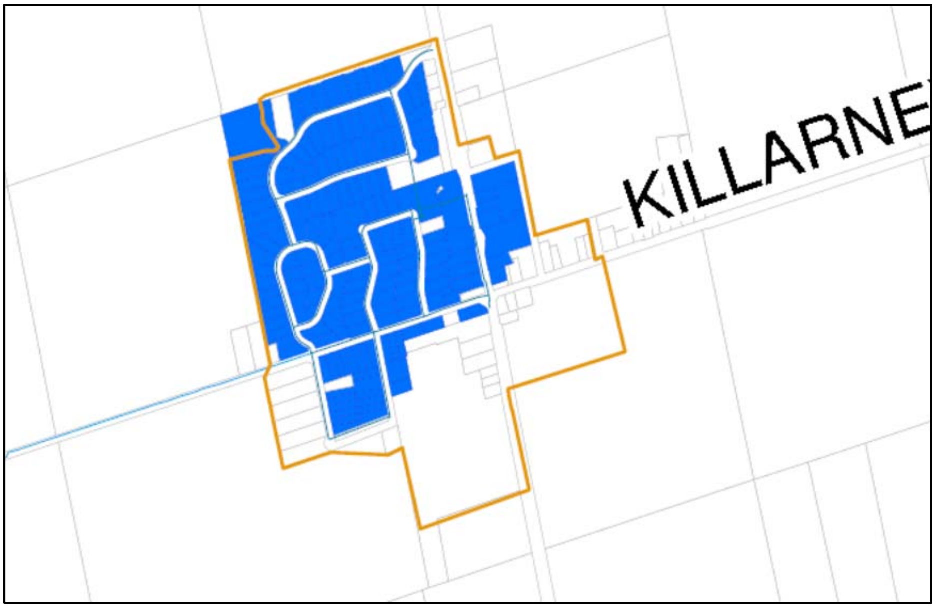
The Goldcrest Drinking Water System consists of two (2) wells, one (1) pumphouse, housing highlift pumps and a sodium hypochlorite disinfection system, two (2) standpipes, distribution watermains, and the associated appurtenances. The Goldcrest Drinking Water System currently provides water servicing to the residents and businesses located within the area of Town highlighted in Diagram 4.5.

Diagram 4.5: Goldcrest Water Treatment Facility and Distribution System existing service area

4.2.5 Churchill Water Treatment Facility and Distribution System

The Churchill Drinking Water System consists of three (3) wells, one (1) well pumphouse equipped with a sodium hypochlorite disinfection system, one (1) high lift pumping station and underground reservoir, also equipped with a sodium hypochlorite disinfection system, distribution watermains and associated appurtenances. The Churchill Drinking Water System currently provides water servicing to the residents and businesses located within the area of Town highlighted in Diagram 4.6.

Diagram 4.6: Churchill Water Treatment Facility and Distribution System existing service area



4.3 *Water System Sources and Rated Capacities*

The Town of Innisfil's existing municipal water systems have MOE approval to supply treated water for distribution to its customers from the sources listed below. Each water supply system has a capacity rating, describing the volume of water it is able to provide to its users, as outlined in Table 4.1, below:

Table 4.1: MOE rated capacity of Town of Innisfil owned Water Supply Systems

System	Source	MDWL Rated Capacity (m^3/day)	Current BWG Allocation (m^3/day)	Available Capacity for Innisfil Use (m^3/day)
Lakeshore (Innisfil only)	Lake Simcoe	28340	10700	17640
Stroud	Groundwater	2622	---	2622
Innisfil Heights	Groundwater	3110	---	3110
Goldcrest	Groundwater	324	---	324
Cookstown	Formally Groundwater	---	---	---
Churchill	Groundwater	1772	---	1772

Note that the Cookstown water system was connected to the Lakeshore Water Supply System effective April 2013 and therefore any demands from that system are now satisfied by the Lakeshore Water Supply System.

Further, the Cookstown wells are in the process of being decommissioned and provide no future water capacity for the Town's use.

It should also be noted that the Town intends on discontinuing use of the groundwater wells currently supplying water to the Goldcrest system in the summer of 2014 and the Innisfil Heights system in 2018. Following the respective distribution systems' connection to the Lakeshore Water Supply System, the wells will be decommissioned and will therefore provide no future water capacity for the Town's use. This information has been accommodated for in the future water demands calculations presented in Section 5.2, below.

5 Water Demands

5.1 *Existing Demands*

Water demands, including average and maximum daily demands were obtained from 2011 through 2013 water production data and are presented below for each of the Town's existing municipal water systems:

Table 5.1: Water Supply Systems Historical Average and Maximum Day Flows

	Water System	2011	2012	2013	Average
System Avg. Day (m^3/day)	Lakeshore (Innisfil only)	3765.28	4004.89	4289.79	**4019.90**
	Stroud	515.80	464.90	454.70	**478.47**
	Innisfil Heights	433.70	453.20	445.70	**444.2**
	Goldcrest	44.70	50.70	49.40	**48.26**
	Cookstown	476.98	446.76	---	**---**
	Churchill	126.70	120.06	117.60	**121.45**
System Max. Day (m^3/day)	Lakeshore (Innisfil only)	8046.00	7300.00	6971.00	**7439.00**
	Stroud	991.00	1034.00	1030.00	**1018.33**
	Innisfil Heights	1257.00	1249.00	1185.00	**1230.33**
	Goldcrest	147.00	118.00	228.00	**164.33**
	Cookstown	663.00	621.00	428.00	**570.67**
	Churchill	280.00	297.00	285.00	**287.33**

Based on the estimated serviced population (# of service connections X assumed 2.65 persons per service connection), the system demand data can be converted into per person water demand data and an estimation of the percentage of water being used for seasonal uses (representing irrigation and outdoor water usage) is calculated and outlined in Table 5.2, below:

Table 5.2: Water Supply Systems Historical Per Capita Average Day, Maximum Day Flows and Estimation of Percent of Seasonal Water Use

	Water System	2011	2012	2013	3 Year Average
Avg. Day (litres per capita)	Lakeshore (Innisfil only)	214.42	215.64	212.87	**214.31**
	Stroud	271.08	243.73	238.54	**251.12**
	Innisfil Heights	618.13	644.58	633.79	**632.17**
	Goldcrest	196.56	222.50	216.75	**211.94**
	Cookstown	230.80	218.59	206.96	**218.78**
	Churchill	230.23	217.49	213.48	**220.40**
Max. Day (litres per capita)	Lakeshore (Innisfil only)	521.00	447.00	383.80	**450.60**
	Stroud	521.58	544.20	542.11	**535.96**
	Innisfil Heights	1795.71	1785.29	1692.86	**1757.95**
	Goldcrest	647.58	519.82	1004.41	**723.94**
	Cookstown	476.95	446.76	---	**461.86**
	Churchill	509.09	540.00	518.18	**522.42**
Estimated Seasonal Use (%)	Lakeshore (Innisfil only)	12.01	13.50	4.71	**10.07**
	Stroud	15.54	18.73	15.09	**16.45**
	Innisfil Heights	23.45	13.83	20.04	**19.11**
	Goldcrest	22.17	13.60	14.98	**16.92**
	Cookstown	4.92	14.62	---	**9.77**
	Churchill	19.99	13.28	15.80	**16.36**

Water usage rates are highly variable from year to year. This presents difficulties in accurately estimating the magnitude of seasonal fluctuations. As such, the three (3) year average for each of the determinations made above will be utilized in any further calculations in an attempt to provide meaningful information.

5.1.1 Water Supply to Town of Bradford-West Gwillimbury

In addition to the Town of Innisfil demands presented above, the water supply agreement with the Town of Bradford West Gwillimbury (BWG) must be taken into consideration when determining the adequacy of the Lakeshore Water Supply Systems capacity in the future. The Town has entered into an agreement with BWG to provide a potable water supply. The capacity of the Lakeshore Water Supply System that is dedicated to fulfill the water supply agreement with BWG is as follows:

Table 5.3: Lakeshore Water Supply System Capacity committed to BWG

Timeline	BWG Allocated Capacity (m^3/day)
Contract Start - Jan '12	7,100
Jan '12 – Substantial Completion Phase 3	10,700
Upon Phase 3 Completion	13,000

5.2 *Future Water Demands*

In 2012, the Town completed a Town-Wide Water and Wastewater Master Servicing Plan (MSP) to identify long term servicing strategies for water and wastewater servicing within the Town of Innisfil to the year 2031. The completion of the MSP required that water demand projections be calculated to 2031, taking into consideration anticipated development within the Town. The dataset produced in the MSP is attached to this report as Appendix B.

In June of 2013, BWG completed a *BWG Water Supply Options Update and Lakeshore WTP Staging Plan – REVISED Technical Memo*. Within the Technical Memo, water demand projections for future growth from the MSP were further reviewed and refined for the Lakeshore Water Supply System. The Technical Memorandum is attached to this report as Appendix C.

5.2.1 Lakeshore Water Supply System

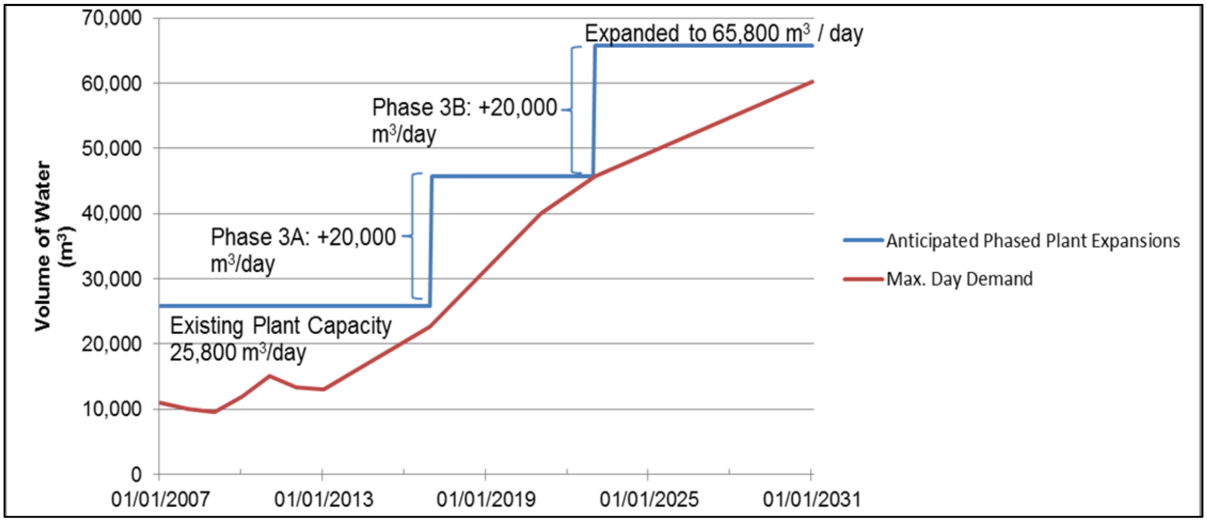
As outlined in the *BWG Water Supply Options Update and Lakeshore WTP Staging Plan – REVISED Technical Memo*, the projected water demands to 2031 for the Lakeshore WTP (including demands from both Innisfil and BWG) have been calculated as outlined in Table 5.4.

Table 5.4: Lakeshore Water Supply System Projected Water Demands to 2031

	Existing /2011	2016	2021	2031
Innisfil				
Population	16,477	21809	31434	51400
ICI Area (ha)	0	49	369	427
Max. Day Demand (ML/day)	**8.9**	**12.6**	**23.3**	**34.9**
BWG				
Population	11513	19796	25256	31694
ICI Area (ha)	0	107	415	857
Max. Day Demand (ML/day)	5.2	10	16.7	25.4
Total MDD (ML/day)	**14.1**	**22.6**	**40**	**60.3**

The water demand projections indicate that the Lakeshore Water Treatment Plant will be required to be expanded within the planning period extending to 2031 to accommodate the needs of the growing community that it services. A phased approach to plant expansion has been recommended and, in the absence of successful water conservation measures being applied, would require the phase 3A expansion be constructed in 2017, and phase 3B by 2023, as graphically displayed in Diagram 5.1.

Diagram 5.1: Lakeshore WTP Annual Maximum Day Demand Projections to 2031 and Anticipated Plant Expansion Rated Capacities



The anticipated phased plant expansions will result in capacity allocations for Innisfil and BWG, respectively, as shown in Table 5.5.

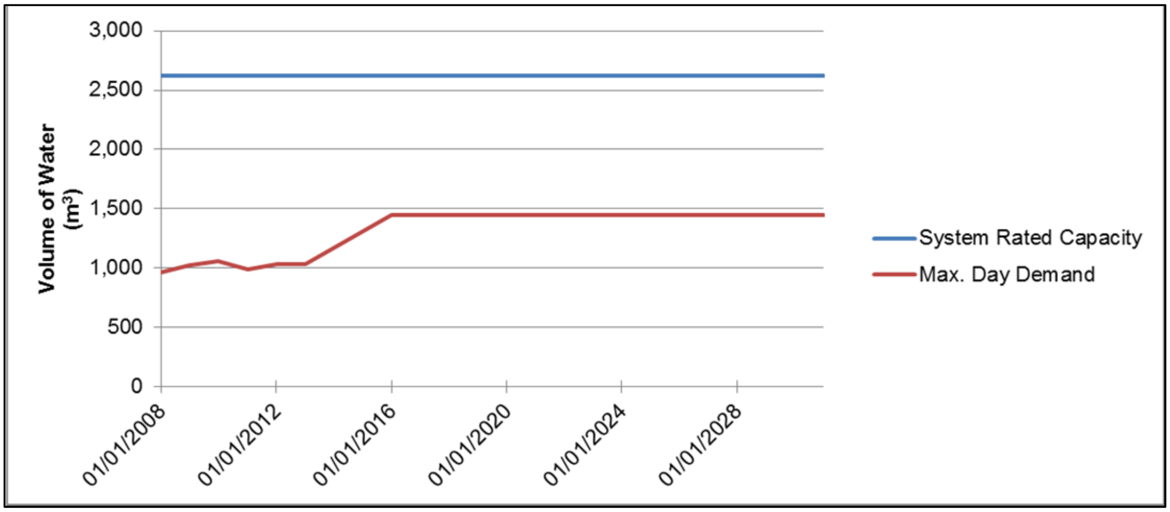
Table 5.5: Lakeshore Water Treatment Plant, Existing, Phased Expansion and Fully Expanded Plant Rated Capacities

		Phase 3 Expansion (ML/day)			
	Existing WTP (ML/day)	Phase 3A	Phase 3B	Total	Expanded WTP (ML/day)
Innisfil	15.1	7.5	14.2	21.7	40.4
BWG	10.7	12.5	5.8	18.3	25.4
Total	**25.8**	**20**	**20**	**40**	**65.8**

5.2.2 Stroud Drinking Water System

The maximum day demand projections, to 2031, for the Stroud drinking water supply system, as calculated in the Town-Wide Water and Wastewater Master Plan is represented graphically below.

Diagram 5.2: Stroud DWS Annual Maximum Day Demand Projections to 2031

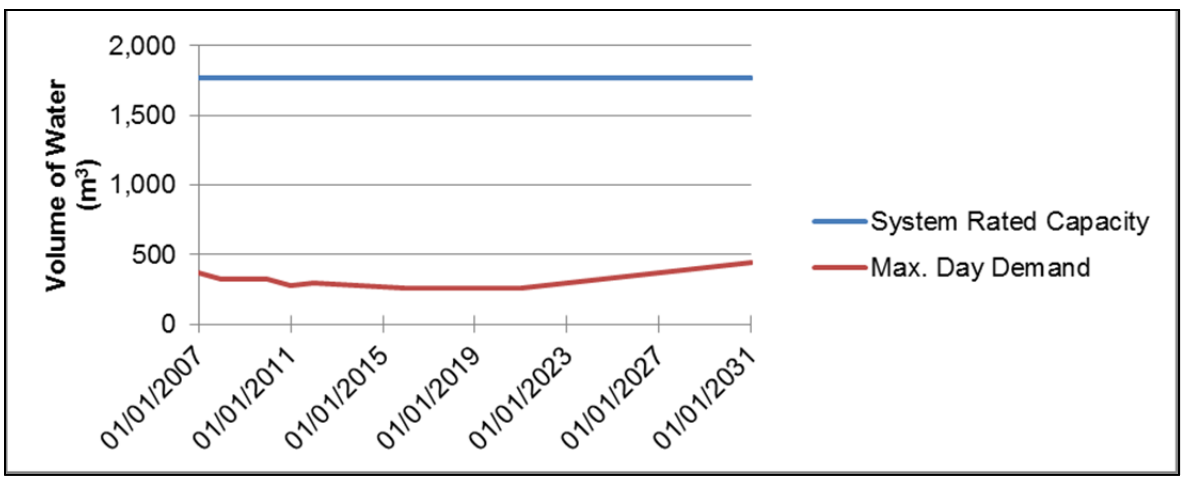


It is clear from the graphical representation of water demands to 2031, that the Stroud Water Supply System has sufficient water capacity to accommodate the anticipated growth within the community to the year 2031 and beyond. Therefore, no infrastructure deferral benefits can be realized through water conservation initiatives in Stroud.

5.2.3 Churchill Drinking Water System

The maximum day demand projections, to 2031, for the Churchill Drinking Water Supply System, as calculated in the MSP is represented graphically below.

Diagram 5.3: Churchill DWS Annual Maximum Day Demand Projections to 2031



It is clear from the graphical representation of water demands to 2031, that the Churchill Water Supply System has sufficient water capacity to accommodate the anticipated growth within the community to the year 2031 and beyond. Therefore, no infrastructure deferral benefits can be realized through water conservation initiatives in Churchill.

5.2.4 Innisfil Heights Drinking Water System

The Town intends on discontinuing use of the groundwater wells currently supplying water to the Innisfil Heights system in 2018 in order to accommodate the high volumes of water required by the anticipated customers in this area. The existing 2018 distribution system will be connected to the Lakeshore Water System.

Water savings through conservation initiatives will be realized by the Lakeshore Water Supply System. As such, the water system presents no opportunity or limitation related to system expansion deferral, etc. for the purposes of this Strategy.

Further, while the area serviced by the existing groundwater system is identified as the Town's employment lands, the current industrial and commercial properties in the area are not high water users and therefore conservation initiatives related to Industrial, Commercial, Institutional (ICI) customers will be aimed at ensuring ICI development proceeds in a water use efficiency conscious manner, rather than on reducing existing ICI water use.

5.2.5 Goldcrest Drinking Water System

The Town intends on discontinuing use of the groundwater wells currently supplying water to the Goldcrest system in the summer of 2015, following the Goldcrest distribution systems connection to the Lakeshore Water Supply System. As such, the Goldcrest Water System presents no opportunity or limitation for the purposes of this Strategy.

5.2.6 Cookstown Drinking Water System

The Town discontinued use of the groundwater wells that supplied water to the Cookstown system in Spring 2013, following the Cookstown distribution's system connection to the Lakeshore Water Supply System. As such, the water system presents no opportunity or limitation for the purposes of this Strategy.

6 Wastewater Flows

6.1 *Wastewater System and Rated Capacities*

The Town of Innisfil's existing municipal wastewater systems have MOE approval to treat wastewater and return effluent to the natural environment. Each wastewater treatment system has a capacity rating describing the volume of wastewater it is able to effectively treat on an average day, as outlined in Table 6.1, below:

Table 6.1: MOE Rated Capacity of Town of Innisfil owned Wastewater Treatment Systems

System	ECA Average Day Rated Capacity (m^3/day)
Lakeshore WPCP	14,370
Cookstown WPCP	825

6.2 *Existing Wastewater Flows*

Wastewater flows, including average and maximum daily flows were obtained from 2011 through 2013 wastewater operations data and are presented below for each of the Town's existing municipal wastewater systems:

Table 6.2: Wastewater Treatment Systems Historical Average and Maximum Day Flows

	System	2011	2012	2013	Average
System Avg. Day (m^3/day)	Lakeshore WPCP	8341	7942	8335	**8206**
	Cookstown WPCP	500	443	462	**468.3**
System Max. Day (m^3/day)	Lakeshore WPCP	14740	15025	17040	**15601.6**
	Cookstown WPCP	1650	980	1435	**1355**

Wastewater flow rates are highly variable from year to year. This presents difficulties in accurately estimating the magnitude of seasonal fluctuations. As such, the three (3) year average for each of the determinations made above will be utilized in any further calculations in an attempt to provide meaningful information.

6.3 *Future Wastewater Flows*

In 2012, the Town completed a Town-wide Water and Wastewater Master Servicing Plan (MSP) to identify long term servicing strategies for water and wastewater servicing within the Town of Innisfil to the year 2031. The completion of the MSP required that wastewater flow projections be calculated to 2031, taking into consideration anticipated development within the Town. The dataset produced in the MSP is attached to this report as Appendix B.

6.3.1 Projected Average Day Wastewater Flows

As outlined in the Town-wide Water and Wastewater Master Servicing Plan, the projected average day flows to 2031 for the Lakeshore and Cookstown WPCP's have been calculated as outlined in Table 6.3.

Table 6.3: Lakeshore and Cookstown WPCP's Projected Average Day Wastewater Flows to 2031

	Existing /2011	2016	2021	2031
Lakeshore WPCP				
Population	19894	29863	40513	66836
ICI Area (ha)	0	118	594	843
Avg. Day Flow (m^3/day)	**6057**	**11158**	**21275**	**36516**
Cookstown WPCP				
Population	1431	2054	2054	3477
ICI Area (ha)	0	81	81	143
Avg. Day Flow (m^3/day)	**465**	**876**	**876**	**1613**

The flow projections indicate that both the Lakeshore and Cookstown WPCP's will be required to be expanded within the planning period extending to 2031 to accommodate the needs of the growing community that they service.

6.3.2 Peak Day Inflow and Infiltration Flows

Sources of storm or ground water entering the sanitary system, referred to as inflow and infiltration are undesirable and add to the cost of effective wastewater treatment. Due to the Town experiencing high inflow and infiltration rates, two peak inflow and infiltration (I&I) rates were utilized in the MSP. A peak I&I rate of 760 l/capita/day was applied to areas with existing wastewater infrastructure, and a rate of 400 l/capita/day was applied to future areas of development.

The Town has an opportunity to reduce the size of, and/or defer wastewater expansion construction by addressing the extraneous flows into the collection systems through the implementation of an Inflow and Infiltration Reduction Plan.

7 Potential Climate Change Impacts

According to the Ministry of Natural Resources publication entitled *Climate Change and Ontario's Water Resources*, "recent evidence released by the Intergovernmental Panel on Climate Change suggests that the rate of warming over the last hundred years is accelerating and that the Earth's surface has warmed by 0.74 (±0.18°C). The IPCC also suggests most of this warming is due to human activities since World War II. Computer projections indicate that as greenhouse gas emissions continue to rise worldwide, earth's climate will continue to warm throughout the 21st century. Ontarians will need to respond to these warming trends and the impacts it carries on the natural environment.

As water resources are highly dependent on climate parameters such as air and water temperatures, precipitation, evaporation, and snow and ice cover, changes to these parameters will carry significant implications to overall water supplies and their management. For example greater variability in lake levels and streamflows can influence water supply quantity and quality and increases the potential of natural hazard events such as droughts, floods and erosion."

By reducing residential and commercial water use through the implementation of this Strategy, the Town is preparing itself, and its residents and businesses for the possible impacts of climate change. If the public is accustomed to utilizing less water, the impacts of climate change may feel less drastic. Through the implementation of a Summer Water Conservation By-law, which would include provisions for staged watering bans, the Town will have prepared itself, policy-wise, to respond to drought conditions or other water supply emergencies that may lead to decreased water supply.

8 Strategic Goals and Targets:

8.1 *Goals*

The goals of this WCES are to:

- Increase public awareness of conservation methods and encourage customers to undertake these methods voluntarily;
- Defer capital costs of water and wastewater plant expansions through reduced water use;
- Increase wastewater collection system integrity, decreasing extraneous flows, leading to capacity availability that will allow for the deferral of wastewater plant capital upgrades and provide capacity for allocation to service new development.
- Meet the requirements of the LSPP Policy 5.3.; and
- Satisfy the requirements of the MOE Letter.

8.2 *Targets*

The specific targets for water conservation and inflow and infiltration reduction are as follows:

8.2.1 *Reduce Annual Peak Day Water Demand*

Defer the need for expansion of water treatment facilities through a reduction in per capita peak day demand by 10% by the year 2019. Baseline: 3-yr average (2011 – 2013, inclusive), as identified for each system in Table 5.2, above.

8.2.2 *Reduce Annual Average Day Water Demand*

Defer the need for expansion of wastewater treatment facilities through a reduction in the per capita average day demand by 10% by the year 2019. Baseline: 3-yr average (2011 – 2013, inclusive), as identified for each system in Table 5.2, above.

8.2.3 *Reduce Wastewater Collection Systems Peak Inflow and Infiltrations*

Defer the need for expansion of wastewater treatment facilities through a reduction in the per capita peak day inflow and infiltration flows into the collection system by 33% by the year 2019. Baseline: 760 l/c/d, as calculated in Appendix D.

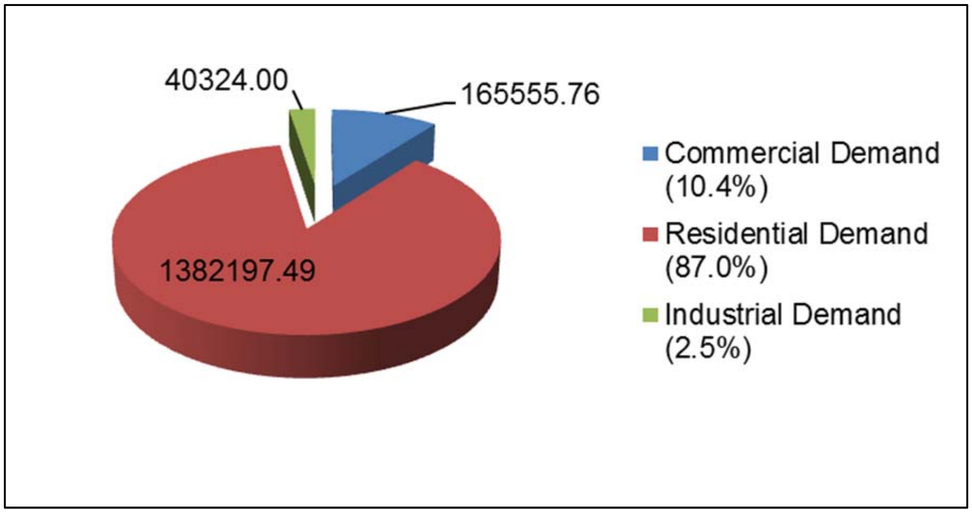
Ontario municipalities have reported mean savings through the implementation of Water Conservation Strategies, of 15%, indicating that a reduction target of 10% is a reasonable target for Innisfil to set for itself.

9 Potential Savings

9.1 *Water Demand*

Utilizing 2013 municipal billing data, a simple water balance for the Town was developed to demonstrate the water demands from each sector, as shown in Diagram 9.1:

Diagram 9.1: 2013 Billed Water Demand by Sector (m^3)



9.2 *ICI Water Efficiency Potential*

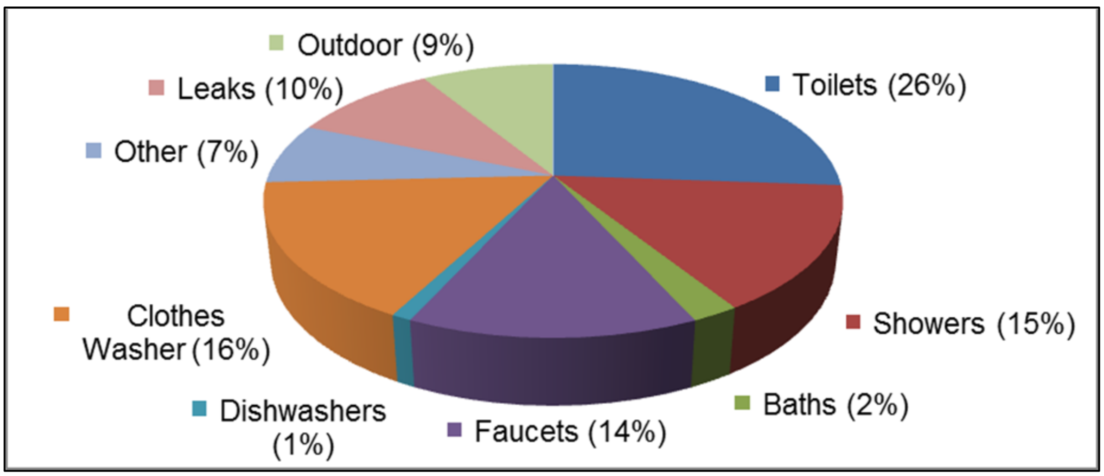
Innisfil is growing, and the expectation is that industrial and commercial sectors will grow as the residential population growth continues. Existing commercial and industrial customers are not heavy water users, and as such specific initiatives aimed at reducing their demand have been deemed unnecessary at this time. To ensure that future industrial and commercial developments utilize water in an efficient manner, it would be wise of the Town to require water conservation planning of new industrial and commercial developments and to develop a water conservation guide for ICI that would demonstrate how to use water efficiently, as recommended later in this report.

9.3 *Residential Water Efficiency Potential*

The largest use of water inside the home is toilet flushing. The efficiency of toilet flushing has improved by 70% over the past 20 years. Prior to 1993, toilets flushed with a volume of water greater than 20 litres. On August 1st, 1993, the Ontario Building Code (OBC) mandated 13.25 litre flush toilets in all new construction. The OBC was updated once again on January 1st, 1996 mandating 6.0 litre (ultra low flush or ULF) flush toilets in all new construction. Although mandated in new construction, ULF toilets were slow to make any significant market penetration in the retail replacement market. Early ULF toilet models were notorious for flushing with more than 6.0 litres and often times requiring double flushing to do the job. As such 13.25 litre flush toilets remained popular in the retail market throughout the 1990's. More recently, due to third party performance testing, most ULF toilet models are now tested and rated for performance and the amount of water flushed. The listing of tested toilets is used by municipalities and consumer groups for promoting ULF toilets. Houses built prior to 1996 have the following water consuming fixtures and appliances:

- Toilets that flush on average at 15 litres (an average between 13.5 and 18 litre flush toilets)
- Showerheads with flow rates of 13 litres per minute
- Faucets with flow rates of 13 litres per minute
- Top loading clothes washers that use 62% more water than water efficient front loading machines
- Other in-efficient appliances such as water softeners and humidifiers
- Due to older plumbing materials and techniques, leaks are more prevalent

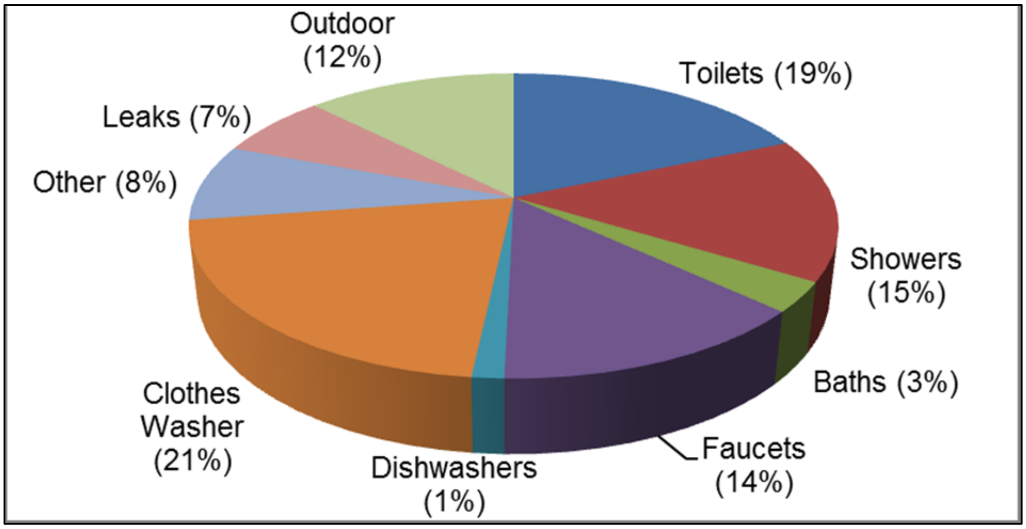
Diagram 9.2: Typical Water Use in a pre-1996 constructed house (316 L/c/day)



The houses built after 1996 have the following water consuming fixtures and appliances:

- Toilets that flush on average at 7.5 litres (an average between 6 and 9 litre flush toilets)
- Showerheads with flow rates of 9.4 litres per minute
- Faucets with flow rates of less than 8.35 litres per minute
- Generally water consuming top loading clothes washers with approximately 10% water efficient front loading machines
- Some market penetration of more efficient water softeners and humidifiers
- Less leaks due to newer plumbing materials and techniques

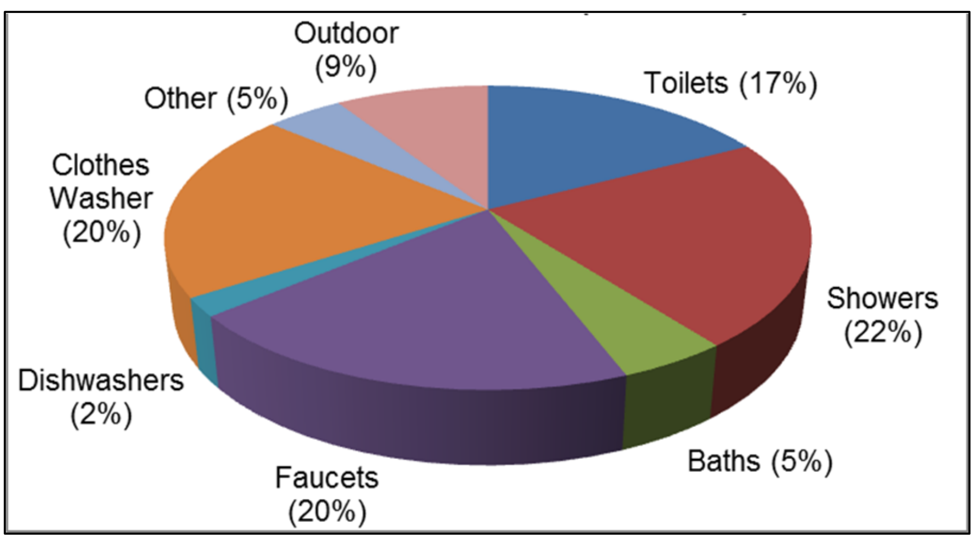
Diagram 9.3: Typical Water Use in a post-1996 constructed house (223 L/c/day)



The most efficient home would have the following water consuming fixtures and appliances:

- Toilets that flush on average at 4.8 litres
- Showerheads with flow rates of 9.4 litres per minute
- Faucets with flow rates of less than 8.35 litres per minute
- All clothes washers are water efficient Energy Star front loading machines
- All water softeners and humidifiers are water efficient models
- Less leaks due to newer plumbing materials and techniques
- All homes have water efficient landscaping and use minimal outdoor water

Diagram 9.4: Typical Water Use the most water efficient house (153 L/c/day)



The residential per capita consumption of 153 litres per day is a level that is attainable if all water consuming fixtures in the home were the most efficient available, that the landscaping was water efficient and that the habits and attitudes of the residents were water conscious. It is technically achievable and a goal to strive for but extremely difficult to reach from a cost and delivery perspective especially in the existing home market.

10 Identification and Evaluation of Water Conservation Best Management Practices

In order to meet the targets set in section 8.2, above, and, in accordance with the requirements of LSPP Policy 5.3, the Town has undertaken a review of the recommended water conservation standards and practices for the municipal sector, including those recommended by the Ontario Water Works Association. Additionally, the Town reviewed several "best in class" water conservation and efficiency strategies already in place across various Ontario communities, including York Region's "Water for Tomorrow" program, the City of Guelph's, Water Conservation and Efficiency Strategy, and the Region of Waterloo's Water Efficiency Master Plan. Proven initiatives from those plans are brought forward as recommendations for the Town of Innisfil Water Conservation and Efficiency Strategy.

For the purposes of evaluation and presentation within this report, the OWWA Best Management Practices, Town of Innisfil Current Practices, and Strategy Recommendations for the Town of Innisfil Water Conservation and Efficiency Strategy have been divided into 8 categories, as follows:

- Town Policy and By-laws
- Measurement and Monitoring
- Water / Wastewater Rates
- Public Information, Education and Communication
- School Programs
- Municipal Operations Water Use
- Rebates and Subsidy Programs, and
- Wastewater Flow Reduction Program

Best Practices are identified for each category and an evaluation is completed against the Town's current practices.   Recommendations were then established, based on the results of the evaluation of industry best practices, proven initiatives from a "best in class" review, the requirements of the LSPP, as well as the MOE Letter.

10.1 *Best Management Practices*

The best management practices identified in the *OWWA Water Efficiency Best Management Practices, 2005* publication includes following initiative(s):

10.1.1 Municipal Policies and By-laws

- Odd-even Watering Days
    - Odd-even watering days consists of a Water Conservation By-law that requires that residents with house numbers ending in an odd number are to water on odd numbered days, while those in even numbered homes are to water on even numbered days of the week.

    - The *OWWA Outdoor Water Use Reduction Manual, 2008* provides an update to this recommendation and indicates that there is a growing movement away from odd/even restrictions to a one-day-per-week restriction. This movement is based on water use trends that indicate that odd/even watering restrictions actually promote over-watering by reminding people to water on their designated days.

10.1.2 Measurement and Monitoring

- Meters for All Water Users
    - Universal metering is the installation of water meters on the service lines of all water customers. With a fully metered system, all customers are billed based on the volume of water used.

- Compile a Water Use Database
    - A water use database stores water supply information and customer demand data, including consumption and number of customers. The data is stored as it is generated and is available for future system analysis. Additional water use data is often collected and catalogued for day-to-day operations.

- Water Loss Management
    - There is a wide range of types of water loss (more commonly referred to as non-revenue water) that can be significant for water suppliers. Non-revenue water can be divided into:

        - Unbilled Authorized Consumption
            - Fire department water use in fire-fighting and training exercises
            - Water and wastewater systems maintenance
            - Parks and public garden irrigation

        - Apparent Losses
            - Unauthorized consumption
                - Theft from hydrants
                - Illegal connections
            - Metering inaccuracies
                - System input meters
                - Under/over registration of customer meters
                - Accounting procedure errors

- Real Losses
  - Leakage on distribution and transmission mains
  - Leakage and overflows at storage tanks
  - Leakage on service connections up the point of customer metering

10.1.3 Water and Wastewater Rates

- *Full Cost Pricing*
  - Full cost pricing is defined as the generation of sufficient revenues through appropriate pricing of services to pay the full cost of water and sewage systems including operating, maintenance, and administration expenditures and capital investments in facilities at a level sufficient to maintain acceptable or mandated service conditions and meet quality standards in a sustainable manner.

10.1.4 Public Information, Education and Communication

- *Public Information, Education and Communication Programs*
  - Public outreach and education is crucial to the success of any water efficiency program. An educated consumer is the best ally in support of the Town's WCES. This means that a consumer that understands the "why's and how's" of choices with regard to water efficiency will be more likely to actively participate.

- *Landscape Water Efficiency Programs*
  - Landscape Water Efficiency Programs are developed with the goal of reducing peak summer demand for water. The typical approach is to educate and encourage residents to adopt water efficient landscape design and maintenance practices.

In addition to the implementation of a Public Information, Education and Communication Program being a best practice, the LSPP specifically requires that the Town's WCES include "methods for promoting water conservation measures and water conservation initiatives, including public education and awareness programs for rural residents not served by a municipal water supply system".

10.1.5 School Programs

- *School Programs*
- Water-based educational programs, developed to fit within the context of the Ontario school curriculum, are very important tools, as reaching children at an impressionable age will affect their thinking and actions as adults. Additionally, children will pressure parents to adopt water efficient practices if they have an understanding of the issue at hand.

10.1.6 Municipal Operations Water Use

- *Implement a Municipal Water Efficiency Program*
  - A municipality needs to "get its own house in order" with respect to efficient toilets, faucets, fountains, etc. in order to demonstrate commitment to water

conservation and to garner public support for the WCES. The Municipal Water Efficiency Program should include measures aimed at reducing water use and wastewater flows in all facilities owned by the municipality (for example, pools, parks, municipal gardens, municipal garages, and municipal office buildings).

10.1.7 Rebate and Subsidy Programs

- *Industrial Commercial and Institutional (ICI) Water Efficiency Program*
  - Water efficiency in this sector can provide reductions on both the supply and wastewater sides. Landscape irrigation can be prominent and any efficiency programs can assist in managing summer peaks. For the Facility, in addition to financial benefits, water efficiency can also provide process efficiencies and health and safety improvements. An ICI Water Efficiency Program could include such things as:
    - Subsidized water use audits,
    - Recognition program
    - Capacity buy-back program

- *Indoor Residential Water Conservation*
  - A variety of steps can be taken to reduce residential indoor water use. Factors that affect indoor water consumption include the age of the home, type of dwelling, the water use habits of residents, the age of water using appliances and the state of repair of those appliances. Measures commonly attempted by municipalities to reduce indoor water consumption include rebates or financial incentives for the items listed below:
    - Water saving toilet flapper replacements
    - Replacement of 13+ litre toilets with low flow 6 litre or dual flush toilets
    - Low flow showerhead replacements
    - Low flow faucet aerator replacements
    - Water-efficient front load washing machines

10.1.8 Reducing Flows to the Wastewater Systems

- Water Conservation reduces wastewater flows by optimizing the amount of water used by plumbing fixtures that discharge to sanitary sewers. Another source of flow in the sewers to be addressed for conservation purposes is extraneous inflow and infiltration. Sources of ground or storm water entering the sanitary system are undesirable and add to the cost of effective wastewater treatment. Wastewater is an often overlooked piece of the water conservation puzzle. Reducing wastewater flows will increase the savings realized by a water efficiency program.

10.2 *Current Town of Innisfil Practice*

This section reflects on the best practices identified above and describes the current practices the Town of Innisfil is undertaking to drive the efficient use of water by its residents and businesses.

10.2.1 Municipal Policies and By-laws

The Town of Innisfil currently does not regulate outdoor water use with odd/even watering days, or one-day-per-week lawn-watering restrictions.

10.2.2 Measurement and Monitoring

The Town has an existing Water By-law No. 016-96, established in 1996, to enact rules and regulation for the maintenance and operation of, and the governing of the supply of water from the Town of Innisfil Waterworks systems. The by-law contains, in section 4.1, a requirement for all users to be metered. As a result, all Town water users are metered and are billed based on the volume of water used.

The Water Services Division of the Town of Innisfil collects and records water supply system production data on a daily basis, and has the capacity, through its Supervisory Control And Data Acquisition (SCADA) system to identify water production data on an instantaneous basis.

Customer use data has historically been collected on a quarterly basis, however, effective July 2012, meter reading services were contracted to Innisfil Hydro and the meter reading and customer billing cycle frequency was improved from a system monitoring and control standpoint to being conducted on a monthly basis. The switch to a monthly billing cycle is a positive step for Town operations, allowing for more accurate and frequent analysis of water loss, and for the customer, providing earlier warning to residents of possible leaks.

Analysis of 2013 water production versus billed customer usage indicates total system water losses in the 18-24 % range. This value is consistent with Environment Canada's 2004 Municipal Water Use Report that found that system water losses average 13% and vary from 6-25% across Canada. Effective January 2014, the Town of Innisfil Water Services Division, recognising the significance of the identified total system water loss percentage, initiated a program to attempt to quantify the water used by the Fire Department in fighting fires and in training exercises.

10.2.3 Water / Wastewater Rates

The Town of Innisfil retained Hemson Consulting to prepare a Full Cost Recovery Program in 2006 following the passage of Bill 175, *The Sustainable Water & Sewage Systems Act, 2002.* As such, the Town has adopted a full cost recovery philosophy when establishing water and wastewater pricing.

The Town's current pricing structure is described as a single block rate structure. This type of pricing structure establishes a single price that is charged per unit volume of water used. The *OWWA Water Efficiency Best Management Practices, 2005* publication describes this pricing structure as "simple and applicable, where there is no reason for more complex rates".

10.2.4 Public Information, Education and Communication

The Town of Innisfil has proactively put forward attempts to provide water conservation messaging to its customers in order to educate and increase customer awareness to the importance of the efficient use of their water resources.

Education and Outreach initiatives employed by the Town to date, include:

- Conservation messaging on water/wastewater bills
- Providing water conservation tips on the Town website
- Distributing water conservation oriented brochures through billing inserts

10.2.5 School Programs

The Town of Innisfil provides guided tours of the Water and Wastewater Treatment facilities within the Town and will make classroom educational visits upon request.

10.2.6 Municipal Operations Water Use

The Town of Innisfil currently does not have a Municipal Water Efficiency Program. Recently constructed infrastructure meets the requirements of the Ontario Building Code with respect to the installation of water efficient fixtures.

10.2.7 Rebate and Subsidy Programs

The Town of Innisfil currently does not have any water conservation oriented rebate or subsidy programs in place. Low flow aerators and rain gauges have been distributed at local events in the past.

10.2.8 Reducing Flows to the Wastewater Systems

The Town of Innisfil implemented an informal Inflow and Infiltration Reduction Program in 2011 and it appears as though significant reductions in peak day flow can be attributed to the work done to reduce infiltration, however, due to a lack of a formalized flow monitoring protocol and post-repair flow analysis, the progress made to date has not been effectively quantified. The Town is currently in the process of upgrading the Lakeshore Wastewater Systems SCADA system, which will allow for effective monitoring of flows through the collection system and treatment plant.

10.3 *Recommended Strategies*

This section outlines the recommended strategies that should be undertaken by the Town of Innisfil to drive the efficient use of water by its residents and businesses.

10.3.1 Staffing

The implementation of the ten year plan recommended would require the following permanent staff resources:

Position	Annual Expense
0.33 FTE Project Manager (Existing as Sr. Regulatory Compliance Officer)	$39,200
1 FTE Project Co-ordinator (New position)	$75,000

Responsibilities and duties of recommended staff:

Project Manager – responsible for overall development, implementation, evaluation and reporting of:

- The WCES,
- Policy and By-law initiatives,
- Staff recruitment, training, coaching and evaluation.

Program Co-ordinator – responsible for the development, implementation and evaluation of:

- Public Information, Education and Communication Programs
- School Aged Education Programs
- Rebate and Subsidy Programs
- Municipal Water Efficiency Program

10.3.2 Municipal Policies and By-laws

Relating to Town Policies and By-law, the following recommendations are made:

10.3.2.1 Enact a Summer-time Water Conservation By-law

In order to reduce peak summer demands, it is highly recommended that the Town develop and enact a Summer-time Water Conservation By-law which would include provisions restricting lawn watering as well as provide for tiered watering bans to be implemented in times of drought or other water supply emergency response.

It is recommended that the Town model the Region of Waterloo's Water Conservation By-law during the development of the by-law. Waterloo Region reports the most success of all Ontario municipalities with watering restriction by-laws in effect, with an approximate reduction of 8 – 12 % in peak demands. It should be noted, however, that the success of this type of program at reducing water use is difficult to measure due to seasonal variability (for example some summers are dryer than others).

10.3.2.2 Update Sewer Use By-law No. 45-88

Sump pump and downspout connections to the sanitary sewer system were allowed in several areas of Town during historical Town development. This practice is not deemed acceptable by today's standards and provisions should be made to have these historical connections disconnected, where feasible.

The Sewer-Use By-law requires updating to strictly prohibit any future connection of sump pumps and downspouts to the sanitary system and, where feasible, have existing connections redirected to discharge to lawns and/or dedicated storm drainage systems.

10.3.2.3 Integrate Water Conservation into Infrastructure Master Planning

It is advisable that the Town integrate water conservation into its master planning and capital works design and construction decision-making processes.

Water use during construction and on-going operations and maintenance should be taken into consideration when:

- Deciding on land-use densities
- Selecting technologies for municipal operations
- Designing landscapes (for example use of better quality soil and greater soil depth, overall turf area, use of drought resistant plants)

10.3.2.4 Require Water Conservation Planning for new Industrial, Commercial, or Institutional (ICI) developments through Site Plan Condition

While there is currently little demand from the ICI sector, the Town of Innisfil is expecting rapid growth in this sector in the foreseeable future. The Town should require, through Site Plan Conditions, that these types of developments provide a Water Conservation Plan that outlines how water use is minimized in process and site design. Significant water use efficiencies can be achieved when consideration is given to factors such as process water re-use and landscape design.

10.3.2.5 Require new Estate and ICI developments to install water efficient irrigation systems through Engineering Design Standards

Irrigation systems are notorious for water wastage. It is not uncommon to witness sprinkler heads engage and begin lawn watering during rain events. Cost-effective irrigation system technologies exist that utilize rain sensors and/or local weather forecasts and should be required for irrigation system installed within the Town in the future. A recommendation is made in Section 10.3.8.3 of this Strategy to provide a subsidy to owners of existing irrigation systems to retrofit their systems with rain sensors.

10.3.3 Measurement and Monitoring

Relating to Water System Measurement and Monitoring, the following recommendations are made:

10.3.3.1 Maintain Monthly Billing Cycle

The collection of customer water usage on a monthly basis allows for more accurate and frequent analysis of water loss throughout the Town's water supply systems. The practice of monthly meter reading and billing should be continued.

10.3.3.2 Maintain Policy of Metering all Serviced Customers

Not only does the practice of metering all serviced customers allow for the billing of actual water use per customer, it also provides the data required to assess water system performance and efficiency and allows for the tracing of water loss. The practice of metering all serviced customers should be maintained.

10.3.3.3 Retrofit Customer Meters to "Smart" Meters

Retrofitting to "Smart" meters would require the purchase and installation of radio frequency transmitters on all serviced customers' existing water meters.

The transmitters would then communicate to a centralized receiver on a set schedule, usually every 4 hours. Smart meter retrofitting is usually coupled with the deployment of a customer account website where serviced water users can view their consumption on a real-time basis. Smart metering would introduce many time and water saving benefits for the municipality and its customers, including:

- Elimination of manual meter reading expenses
- Customer access to daily water consumption data
- Increased customer awareness of water usage
- Automated detection and notification of flow in cottages and/or vacated homes, providing early detection of leaks and/or system tampering
- Automated detection and notification of abnormally high water use within the home
- Provides water operations with more accurate demand data which allows for tighter system control

10.3.3.4 Formalize a Water Use Data Review Protocol

The Town of Innisfil Water Services relies on the contracted meter reading services currently provided by Innisfil Hydro to provide customer usage data, while collecting and recording water production data on their own. It is recommended that the Town of Innisfil Water Services implement a protocol to compile both sets of data into a common database and conduct system performance analysis on a monthly basis. A regular practice of water system performance analysis could provide early notification of leaks or other operational concerns within the distribution systems.

10.3.3.5 Expand and Formalize a Non-Revenue Water Quantification Program

As mentioned in Section 10.2.2, above, effective January 2014, the Town of Innisfil Water Services initiated a program to attempt to quantify the water used by the Fire Department in fighting fires and in training exercises. While Fire Department water use can undoubtedly contribute significantly to system water loss, there are several other known contributions to total Unbilled Authorized Consumption for which quantification should be attempted including:

- Distribution system flushing
- Sanitary sewer system flushing
- Park and garden irrigation
- Residual maintenance flushing

On-going quantification of these types of unbilled authorized water consumption would provide a more accurate understanding of the true value of apparent (unauthorized takings) and real (system leakages) water losses in the distribution systems.

10.3.3.6 Formalize a Distribution System Leak Detection Program

The Town of Innisfil Water Services undertook a complete distribution system leak detection study in the summer of 2012, which resulted in a report that indicated that there were minimal leaks in the Town’s distribution systems.

Leak detection studies are an effective tool in identifying sources of real water losses throughout the system. The practice should be continued on a regular frequency. The development of a formal Distribution System Leak Detection Program would set a schedule for the completion of leak detection studies at a set frequency.

10.3.4 Water / Wastewater Rate Setting

Relating to Water and Wastewater Rate Setting, the following recommendations are made:

10.3.4.1 Maintain Full Cost Recovery Pricing

Full cost recovery is moving from a best practice towards a requirement in Ontario with the passage of Bill 175, *The Sustainable Water & Sewage Systems Act, 2002.* Regulations under the Act are pending, however, in the interest of best practice; many municipalities have adopted policies aimed at funding water systems at sustainable levels. The practice of full cost recovery pricing should be continued.

10.3.4.2 Consider Conservation-Oriented Pricing

The Town of Innisfil establishes its water volumetric rates through the completion of a Water Rates Study. The Water Rates Study that the Town is currently basing its volumetric rates on is nearing the end of its projections and the Town will be completing a rate setting study scheduled to be completed by May 2015, to establish rates for the next 6-year period. It is recommended that the Town consider altering its current practice of single block rate pricing to a water conservation-oriented pricing structure during this exercise.

The main goal of conservation-oriented pricing is to reduce peak demands that occur during the summer months. There are two different rate structures that target excess water users that should be considered during the completion of the Water Rate Study update. They are:

- *Increasing Block Rate Pricing*
  - In this type of pricing structure, rates increase as water consumption increases. Increasing block rate pricing is considered good for targeting individual high volume residential users.

- *Excess Use Rate Pricing*
  - In this type of pricing structure, a higher rate is charged for consumption exceeding a certain threshold based on usage system-wide or related to individual customer history. Excess use rate pricing is considered good for targeting increased usage during the summer.

Setting water rates based on either of these types of pricing structures will target a reduction of peak summer demand that puts a strain on the water systems and requires that infrastructure be sized to accommodate it. In instances where a reduction of water use does not take place, the individual water wasters pay an increased rate that would help to recover some of the expansion costs required to accommodate the peak summer demands that they were not interested in helping to decrease.

10.3.5 Public Information, Education and Communication

Public Information, Education and Communication initiatives are aimed at achieving a behavioral change at the community level by removing the barriers (ignorance to the "why's and how's" related to water conservation) that prevent people from adopting the desired behavior of efficient water use. In order for an education campaign to be successful, there is a need for sustained and varied forms of messaging.

Water users require the background information necessary to understand why water is important in order to evoke a consciousness to what part they play in the equation and begin to make wise decision about their water use. Therefore, it is important that the Town not only use the recommended strategies below to inform residents on how to conserve water, but to provide the whole story of water, including:

- The source of drinking water
- Source protection
- Water treatment procedures
- Quality assurance, including laboratory testing
- Safety of the drinking water
- The link between water quality and wastewater treatment, including storm sewers and the proper disposal of hazardous wastes

The following recommended strategies are aimed at providing sustained water conservation messaging that would reach all residents of the Town of Innisfil, not only those that are serviced by Town water.

10.3.5.1 Maintain Conservation Messaging on Water/Wastewater Bills

While there is limited space for significant messaging on the utility bills, this practice provides an avenue to dispense a short educational reminder on a regular basis to serviced customers on the types of things they can do to be wise water users.

10.3.5.2 Refresh and Enhance Town Water Conservation Tips Webpage

The Town of Innisfil website currently has a page dedicated to providing tips on how the Town's residents can be more water efficient, however, it is difficult to locate and would likely only be found by water users if they were looking for it specifically. It is recommended that the Town update the webpage with a fresh new look and provide links to the many resources available online to help urban and rural residents find the information they need to be more efficient users of this precious resource.

10.3.5.3 Publish the WCES to the Town Website

This report demonstrates the breadth of effort that the Town is engaging in to demonstrate its support of the efficient use of water and provides the Town's specific data that demonstrates the direct impact conserving water community-wide can have on infrastructure expansion requirements. Sharing this information with the residents of the Town will aid them in understanding why water conservation is important.

10.3.5.4 Increase Participation at Local Festivals and Events

Various community groups and other organizations host a variety of festivals and events within the Town of Innisfil on an annual basis. It is recommended that the Town seize the opportunity already provided by these types of events that attract large groups of residents together. By attending, the Town can provide education on the importance of water conservation, and make residents aware of the existing rebate and subsidy programs being made available through this Strategy.

A welcoming display (booth) could be utilized as it is important to provide interactive and educational displays to portray the intended message. Also, providing small "give-away" items, such as water bottles or rain gauges will attract visitors to the Town's display. These items and can be branded with the Town's water conservation message that would reinforce wise water use decisions long after the event.

10.3.5.5 Implement a Landscape Water Efficiency Program

The primary focus of a Landscape Water Efficiency Program is to reduce residents' use of water for irrigation purposes. Through proper planning, residents can achieve a landscape that meets their aesthetic and functional needs while minimizing the water required for maintenance. The Town of Innisfil maintains several of acres of landscaping throughout the municipality. It is recommended that the Town implement the following initiatives to add natural beauty that serves as an educational tool that will create public awareness to water efficient activities and educate and urge the residents to adopt water efficient landscapes:

- Demonstration Water Efficient Gardens (Drought resistant plants) at highly frequented locations, such as the Innisfil Recreation Centre and Town Libraries
- Offer Water Efficient Gardening workshops through the Library or as a Recreational Program

There are practical and attractive alternatives to grass covered lawns. Demonstration water-efficient gardens, over a long period of time, may help homeowners to adopt the use of native, drought-resistant plants. Coupling education and outreach initiatives with water-wise garden kits, including plant list, garden fact sheets, rain gauges, plant seeds or even discount coupons for drought tolerant plants at local participating garden centers will help to speed up the process of homeowner uptake.

10.3.5.6 Utilize Town Vehicles for Conservation-Based Marketing

Town of Innisfil Water and Wastewater fleet vehicles are out and about on Town roads going to and from various facilities to conduct checks and perform maintenance activities. It is recommended that the Town utilize these vehicles as a marketing tool, through decaling, to draw attention to various conservation-oriented initiatives and/or provide messaging as a reminder of the importance of water and its efficient use.

10.3.5.7 Distribution of an Urban and Rural Water Conservation Guide

It is recommended that the Town develop a collection of water conservation information and efficient water use tips for both urban and rural residents and distribute to all Town residences as an education initiative. Consideration should be given to the possibility of integrating this information into a format that would be kept and referenced year round by residents, such as a calendar.

10.3.6 School Programs

Regardless of venue, classroom presented programs or a Water Festival, the programs aimed at school aged children developed should educate the students about:

- The source of their drinking water
- Protecting the source water
- Water treatment processes
- Quality assurance measures
- The safety of drinking water
- The link between water quantity and water quality, wastewater treatment, storm sewers and the proper disposal of hazardous waste
- Water efficiency and conservation

Relating to School Programs, the following recommendations are made:

10.3.6.1 Develop and implement a curriculum based enrichment opportunity for school aged children

Educational programs in schools are an ideal tool to reach water users and build support for water conservation initiatives. Water based concepts are explored in grades 2 through 8 in the Ontario curriculum. It is recommended that the Town develop a curriculum based education opportunity in consultation with the local School Boards and provide the program to school-aged children.

10.3.6.2 Investigate the interest and feasibility of a County-wide Children's Water Festival

Research on current Water Festivals aimed at children indicates that the holding of such events requires an extensive amount of co-ordination which clearly outweighs the level of resources the Town of Innisfil could justify on its own.

It is recommended that Town Staff investigate the interest of neighbouring municipalities, Conservation Authorities, Simcoe County administration, and the local school boards in partnering to provide an educational tool that will allow water conservation and efficiency messaging to reach many children at one time in an outdoor, hands-on learning environment.

10.3.7 Municipal Operations Water Use

Relating to Municipal Operations Water Use, the following recommendation is made:

10.3.7.1 Develop and Implement a Municipal Water Efficiency Program

To demonstrate the Town’s commitment to the efficient use of water, it is important to display to residents that it is prepared to “walk the walk” through the development and implementation of a Municipal Water Efficiency Program. The water savings to the system as a whole may be relatively minor however the savings carry an important message to the public.

The development of the Municipal Water Efficiency Program should include:

- an assessment of current water usage for each of the Town’s facilities and municipal operations;
- identification of options to decrease water usage;
- utilization of cost/benefit analyses to assess the feasibility of implementation of the options identified;
- an implementation plan and;
- a monitoring plan.

10.3.8 Rebate and Subsidy Programs

Relating to Rebate and Subsidy Programs, the following recommendations are made:

10.3.8.1 Implement an Optimization of pre-1996 Residential Fixtures Program

Homes built prior to 1996 are assumed to have 13-20 litres/flush toilets, water inefficient showerheads and tap aerators in use. By providing an incentive to homeowners to retrofit their homes with 6 litres/flush toilets, water efficient showerheads and tap aerators, an appreciable savings in water use is attainable. The installation of water efficient fixtures could decrease water usage by 35 %.

An Optimization of pre-1996 Residential Fixtures Program would include the following components:

- Subsidized Toilet Replacement Program
- Subsidized Showerhead Program
- Low Flow Aerator Distribution Program

10.3.8.2 Implement a Commercial Kitchen Optimization Program

This measure consists of the installation low-flow, high efficiency, high-pressure pre-rinse spray valves typically found in restaurants, cafeterias and institutions.

Based on the success of the Rinse & Save program implemented by the California Urban Water Conservation Council in 2003, many Ontario municipalities have launched similar programs.

In addition to water savings, the pre-rinse valve can provide significant energy savings and greenhouse gas reductions. As such, there may be an opportunity for the Town to collaborate with the local natural gas supplier on this program.

10.3.8.3 Implement an Outdoor Potable Water Use Reduction Program

The greatest opportunity in decreasing peak water demand is related to curbing irrigation demands. Decreasing peak demands caused by high levels of irrigation can help reduce the need for infrastructure expansion, allowing money to be saved, and protecting the environment. An Outdoor Potable Water Use Reduction Program would include the initiatives listed below:

- Subsidized Rain Barrel Program
- Rain Gauge Distribution Program
- Subsidized Rain Sensor Retrofit Program

10.3.9 Reducing Flows to the Wastewater Systems

Relating to reducing flows to the Town's wastewater systems, the following recommendations are made:

10.3.9.1 *Develop a Formal Flow Monitoring Protocol*

The Town has put forth considerable effort in recent years to reduce infiltration into the wastewater collection systems, however, it is difficult to quantify the effect of this work as flow data is currently collected in various formats, with various levels of accuracy (SCADA recorded, chart recorded, physical meter reads). An upgrade to the Lakeshore WPCP SCADA system, scheduled for completion in late 2014, will provide for the recording of data in real-time.

It is recommended that the Town of Innisfil Wastewater Services implement a protocol to compile pump station of data and plant data into a common database and conduct system flow analysis on a monthly basis. A regular practice of collection system flow analysis would provide for the identification of areas of concern within the collection system, where more focused analysis would then be conducted under the Inflow & Infiltration Reduction Program.

10.3.9.2 *Formalize an Inflow & Infiltration (I&I) Reduction Program*

As systems age, there is a higher chance that inflow and infiltration (I&I) will enter the sewers. Inflow and Infiltration (I&I) is a technical term for rainwater and/or groundwater that enters the sewage system and adds clean water flow to the regular sanitary sewage flows. Excess I&I takes up sewer capacity needed for existing residents and future growth. The extra volume of water can overload the sewage collection system pipes causing back-ups and flooding.

Reducing the flows within the collection system that are entering the WPCP will increase the population service capacity of the plant. Increasing the population service capacity without expanding the plant will reduce the capital cost for development unit within the Town.

The Town has implemented an informal Inflow and Infiltration Reduction Program, and has completed a full Baseline CCTV scan of the collection system, rated the condition of collection system components and conducted repairs on sources of high levels of infiltration. The Town would benefit from, and should develop and implement a formalized Inflow and Infiltration Reduction Program that includes the following components:

- System flow monitoring analysis to identify areas of concern
- Establishment of acceptable I&I levels
- Rain flow monitoring (focused flow analysis in areas of concern to target areas for repair)
- CCTV/visual inspection (manhole to manhole) to ID specific deficiency/issue
- Priority setting protocol for system remediation
- Prioritization of repair schedule based on I&I reduction potential
- Cost analysis to determine technology best suited for the repair
- Completion of repairs
- When repairs complete, conduct rain flow monitoring again to demonstrate the effectiveness of the repair.
- Include a progress report

10.3.9.3 *Disconnection of Downspouts and Sumps Program*

Downspouts and sump pumps connected to the sanitary system are a major source of inflow into the sanitary system. This practice is no longer acceptable by today's standards.

A Disconnection Program would include:

- **Smoke Testing:** A non-toxic, stainless, odorless, vegetable-based "smoke" is pressure injected into a sanitary sewer manhole. If smoke escapes from a source that is not meant to be connected to the sanitary sewer system (ie. sump or downspouts) a source inflow is identified. Downspouts should be redirected to flow to the surface upon identification of the cross connection.
- **Surface Flow Analysis:** This process would involve analyzing the surface water flow in the area of the house with a sump pump connected to assess the feasibility of disconnecting the sump pump from the sanitary system. Where disconnection is feasible, it should be required.

11 Implementation Plan

Table 11.1, following, graphically depicts the recommended implementation plan to phase in each of the proposed strategy initiatives.

It is recommended that the Town maintain the “Our Water, Our Future” slogan for water related education and outreach and to promote all recommended initiatives under the “Our Water, Our Future” Campaign.

Table 11.1: Initiative Implementation Plan

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Staffing											
Provide staff resource for plan implementation											
Proposed Municipal Policy and Bylaw Initiatives											
Update Water By-law											
Implement a Summer Water Conservation By-law											
Update Wastewater By-law											
Integrate WCES and Infrastructure Master Planning											
Require Water Conservation Plans for ICI developments											
Water Efficient Irrigation Systems for ICI and Estate Developments											
Measurement and Monitoring											
Smart Metering With Webpage											
Proposed Rate-setting Initiatives											
Review Rate Pricing Structure											
Proposed Public Information, Education and Communication Initiatives											
Maintain Conservation Messaging on W/WW bills											
Enhance Participation in Public Forums											
Landscape Efficiency Program											
Conservation Pages - Town Website											
Messaging on Town Vehicles											
Water Billing Inserts											
Urban and Rural Publication											
Conservation Guideline for ICI											
Proposed School Program Initiative											
In-school program											
Investigate the feasibility of County-wide Children's Water Festival											
Proposed Municipal Operations Water Use Initiatives											
Municipal Water Use Efficiency Audit											
Implement a NRW Reduction Plan											
Proposed Rebate and Subsidy Initiatives											
Optimize Residential Fixtures											
Toilet Distribution Program											
Subsidized Showerhead Program											
Low flow Aerators, Rain gauge give-aways											
Optimize Commercial Kitchens											
Distribute Pre-rinse spray valves											
Decrease Outdoor Water Use											
Subsidized Rain Barrel Program											
Subsidized Rain Sensor Retrofit Program											
Proposed WWTP Flow Reduction Initiatives											
Develop a Flow Monitoring Protocol											
I&I Reduction Program											
Downspout and Sump Disconnection Program											

12 Cost-Effectiveness of Conservation

The cost-effectiveness of a water efficiency strategy is evaluated by determining the cost per cubic meter for the water saved. The cost per cubic meter for water saved is then compared to the cost per cubic meter to construct new water supply and wastewater infrastructure. If the cost per litre of saved water is less than the cost to construct new capacity, then the water efficiency strategy is deemed cost-effective.

12.1 *Water Conservation Strategy 10-year Operational and Capital Plans*

The proposed 10-year operational and capital plans for the implementation of the WCES are outlined in Table 12.1, below.

Table 12.1: Proposed 10-year Operational and Capital Plan and Proposed Funding Allocation for implementation of the WCES

10-year Operational Plan	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**10-year Total**
WCES Implementation Staff	---	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	
Total Operational	**---**	**$75,000**	**$75,000**	**$75,000**	**$75,000**	**$75,000**	**$75,000**	**$75,000**	**$75,000**	**$75,000**	**$75,000**	**$750,000**

10-year Capital Plan	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**10-year Total**
Retrofit to Smart metering	---	---	$500,000	$500,000	$500,000	$500,000	---	---	---	---	---	
Subtotal - Measurement and Monitoring Initiatives	---	---	**$500,000**	**$500,000**	**$500,000**	**$500,000**	---	---	---	---	---	**$2,000,000**
Subtotal - Rate-setting Initiatives	**Water Rate Study budget exists for 2014**											
Enhance Participation in Public Forums	---	$20,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000	
Landscape Efficiency Program	---	---	$3,000	---	---	---	---	---	---	---	---	
Messaging on Town Vehicles	$1,000	---	---	---	---	$1,000	---	---	---	---	$1,000	
Water Billing Inserts	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	
Urban and Rural Publication	---	$10,000	---	$5,000	---	$5,000	---	$5,000	---	$5,000	---	
Conservation Guideline for ICI	---	---	$5,000	---	$2,500	---	$2,500	---	$2,500	---	---	
Subtotal - Public Information and Education Initiatives	**$3,000**	**$32,000**	**$19,000**	**$16,000**	**$13,500**	**$17,000**	**$13,500**	**$16,000**	**$13,500**	**$16,000**	**$12,000**	**$171,500**
In-school education program	---	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	
Subtotal - School Program Initiative	**---**	**$3,000**	**$3,000**	**$3,000**	**$3,000**	**$3,000**	**$3,000**	**$3,000**	**$3,000**	**$3,000**	**$3,000**	**$30,000**
Municipal Operations Water Use Efficiency Audit	---	---	$10,000	$10,000	---	---	---	---	---	---	---	
Subtotal - Municipal Operations Water Use Initiatives	**---**	**---**	**$10,000**	**$10,000**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**$20,000**
Toilet Distribution Program	---	$25,000	$50,000	$50,000	$50,000	$25,000	---	---	---	---	---	
Subsidized Showerhead Program	---	---	---	$10,000	$10,000	$10,000	---	---	---	---	---	
Commercial Pre-rinse Spray Valves Distribution Program	---	---	---	---	---	---	$10,000	$10,000	---	---	---	
Subsidized Rain Barrel Program	---	---	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	---	---	
Subsidized Rain Sensor Retrofit Program	---	---	---	---	---	---	$5,000	$5,000	$5,000	$5,000	$5,000	
Subtotal - Rebate and Subsidy Initiatives	**---**	**$25,000**	**$55,000**	**$65,000**	**$65,000**	**$40,000**	**$20,000**	**$20,000**	**$10,000**	**$5,000**	**$5,000**	**$310,000**
Inflow and Infiltration Reduction Program	$275,000	$250,000	$175,000	$175,000	$175,000	$175,000	$175,000	$175,000	$175,000	$175,000	$175,000	
Subtotal - WWTP Flow Reduction Initiatives	**$275,000**	**$250,000**	**$175,000**	**$175,000**	**$175,000**	**$175,000**	**$175,000**	**$175,000**	**$175,000**	**$175,000**	**$175,000**	**$2,100,000**
Subtotal - Water Conservation and Efficiency Strategy Updates	**---**	**---**	**---**	**---**	**---**	**$20,000**	**---**	**---**	**---**	**---**	**$20,000**	**$40,000**
Total Captital	**$278,000**	**$310,000**	**$762,000**	**$769,000**	**$756,500**	**$755,000**	**$211,500**	**$214,000**	**$201,500**	**$199,000**	**$215,000**	**$4,671,500**
Total Strategy (Operational + Capital)	**$278,000**	**$385,000**	**$837,000**	**$844,000**	**$831,500**	**$830,000**	**$286,500**	**$289,000**	**$276,500**	**$274,000**	**$290,000**	**$5,421,500**

Proposed Funding Allocation	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**10-year Total**
WCES Operational Budget (Water & Wastewater Rates)	---	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$750,000
WCES Capital Budget (Water & Wastewater Rates)	$3,000	$60,000	$87,000	$94,000	$81,500	$80,000	$36,500	$39,000	$26,500	$24,000	$40,000	$571,500
I&I Reduction Program Budget (Wastewater Rates)	$275,000	$250,000	$175,000	$175,000	$175,000	$175,000	$175,000	$175,000	$175,000	$175,000	$175,000	$2,100,000
Water Rates (Direct Chargeback)	---	---	$500,000	$500,000	$500,000	$500,000	---	---	---	---	---	$2,000,000
Total Proposed Funding	**$278,000**	**$385,000**	**$837,000**	**$844,000**	**$831,500**	**$830,000**	**$286,500**	**$289,000**	**$276,500**	**$274,000**	**$290,000**	**$5,421,500**

12.2 *Cost of Constructing new Water Servicing Capacity*

The *Technical Memo – BWG Water Supply Options Update / Lakeshore WTP Staging Plan – REVISED,* completed in June 2013, provides the most current statement of probable costs for phased expansions to the Lakeshore Water Treatment Plant. The cost estimate for the Phase 3A and 3B expansions to the Lakeshore Water Treatment Plant are as indicated in Table 12.2 below:

Table 12.2: Cost of constructing new water capacity

	Capacity increase (m^3)	Estimated cost of expansion	Cost per m^3 of capacity
Phase 3A	20000	$31,120,000	$1,556
Phase 3B	20000	$19,930,000	$996
Average	---	---	$1276

12.3 *Cost of Constructing New Wastewater Servicing Capacity*

12.3.1 Lakeshore Water Pollution Control Plant (WPCP)

The Town's MSP, provides the most current statement of probable costs for expansions to the Lakeshore WPCP. The cost estimate for the next expansion, required to provide continued servicing to existing and future residents and businesses, is as indicated in Table 12.3, below:

Table 12.3: Cost of constructing new wastewater capacity at the Lakeshore WPCP

	Average Day Capacity (m^3/day)	Peak Day Capacity (m^3/day)	Average Day Capacity increase (m^3/day)	Peak Day Capacity increase (m^3/day)	Estimated Cost of Expansion	Cost of m^3 of average day capacity	Cost of m^3 of peak day capacity
Current	14000	40280	---	---	---	---	---
Phase 1 expansion	25000	70630	11000	30350	$76,000,000	$6,909	$2,504

12.3.2 Cookstown Water Pollution Control Plant (WPCP)

In comparison, the Town's MSP indicates that a new wastewater treatment facility will be required to be constructed in the future in order to service the existing and future residents and businesses in the Cookstown area. Due to the package plant design of the existing facility, a new water pollution control plant will be required to be built to accommodate future flows, at the estimated costs outlined in Table 12.4, below:

Table 12.4: Cost of constructing new wastewater capacity at the Cookstown WPCP

	Average Day Capacity (m^3/day)	Average Day Capacity increase (m^3/day)	Estimated Cost of Expansion	Cost of m^3 of average day capacity
Current	825	---	---	---
New Plant	1048	1048	$8,160,000	$7569

12.4 *Estimated Costs of Construction used for Evaluation of the Cost-effectiveness of Strategy Initiatives*

To provide a reasonable determination of the cost-effectiveness of the water conservation initiatives being recommended as part of this Strategy, the conservative values outlined in Table 12.5, which are based on an approximate 10% variance from the values indicated in Tables 12.2 to 12.4, will be utilized in the evaluation of program cost-effectiveness.

Table 12.5: Conservative Estimate of the Cost of Construction of Capacity

	Conservative Cost Estimate for Constructed Capacity ($/$m^3$)
Water Servicing Capacity	$ 1175
Wastewater Servicing Capacity (Average Day)	$ 7000
Wastewater Servicing Capacity (Peak Day)	$ 2225

12.5 *Estimation of Savings Through Strategy Initiatives*

12.5.1 Summer Conservation By-law and other policy related initiatives

The implementation of a Summer Water Conservation By-law, as well as other policy related initiatives being recommended within the Strategy, are estimated to reduce the Maximum Day Demand (MDD) on the water system by 8% (based on The Region of Waterloo's reported 8-13% reduction in MDD through the initiation of a Summer Water Conservation By-law). The economic benefit of an 8% reduction is calculated below:

Daily water savings = Lakeshore System MDD (m^3/day) X % Reduction
= 7439 m^3/day X 0.08
= 595.12 m^3/day water savings

Cost to Construct New Capacity = Daily Water Savings (m^3/day) X Cost of Constructed Water Capacity
= 595.12 m^3/day X \$1175 /m^3
= **\$699,266** to construct water capacity offset by initiation of By-law and policies recommended.

12.5.2 Rebate and Subsidy Programs (Water Capacity)

The implementation of rebate and subsidy programs, including Low-flow Toilet and Low-flow Showerhead Distribution Programs, are expected to provide a reduction of 230 litres/day/home constructed prior to 1996. It was established that the Town has approximately 3200 service connections to homes that were constructed prior to 1996. The economic benefit of a 230 l/day reduction in pre-1996 homes on water infrastructure is calculated below:

Daily water savings = savings per home (m^3/day) X # of pre-1996 homes
= 230 l/day X 3200 homes
= 736,000 litres/day / 1000 litres/m^3
= 736 m^3/day water savings

Cost to Construct New Capacity = Daily Water Savings (m^3/day) X Cost of Constructed Water Capacity
= 736 m^3/day X \$1175 /m^3
= **\$864,800** to construct water capacity offset by initiation of Rebate and Subsidy programs recommended.

12.5.3 Rebate and Subsidy Programs (Wastewater Capacity)

The implementation of rebate and subsidy programs, including Low-flow Toilet and low-flow Showerhead Distribution Programs, are expected to provide a reduction of 230 litres/day/home constructed prior to 1996 as described above. This reduction in water use directly correlates to decreased average day flows to the Wastewater plants and will therefore offset the need to construct Average Day Wastewater Capacity at the same level. The economic benefit of a 230 l/day reduction in pre-1996 homes on wastewater infrastructure is calculated below:

Reduced Wastewater Flows = Daily Water Savings (from Section 12.5.2, above)
= 736 m^3/day

Cost to Construct New Capacity = Reduced Flow Rate (m^3/day) X Cost of Constructed Average Day Wastewater Capacity

= 736 m^3/day X $7000 /$m^3$

= **$5,152,000** to construct average day wastewater capacity offset by initiation of Rebate and Subsidy programs recommended.

12.5.4 Inflow and Infiltration (I&I) Reduction Program (Wastewater Capacity)

The recommended I&I Reduction Program targets a 33% reduction in peak day I&I flowing to the wastewater plant from a baseline of 760 m^3/day, as calculated in the WPCP ESR, by 2019. A 20 % reduction in peak day I&I is utilized in the calculation below to provide a conservative estimation of the cost to construct new wastewater capacity to accommodate these extraneous flows, rather than implement the recommended I&I Reduction Program. This reduction of Peak Day I&I decreases the need for peak day capacity through new construction.

Peak Day I&I Flow Reduction = 2009 Peak Day I&I – (2009 Peak Day I&I X 0.20)

= 760 litres/capita/day – 608 l/c/d

= 152 l/c/d X 19894 (2011 serviced population)

= 3023.9 m^3/day

Cost to Construct New Peak Day Capacity = Peak Day I&I Flow Reduction (m^3/day) X Cost to construct peak day wastewater capacity

= 3023.9 m^3/day X $2225 /$m^3$

= **$6,728,178** to construct peak day wastewater capacity offset by success of the Inflow and Infiltration Reduction Program.

12.6 *Total Estimated Savings*

The total estimated savings through offset water and wastewater infrastructure construction costs is calculated in Table 12.6, below:

Table 12.6: Total Estimated Construction Cost Savings

Strategy Initiative Contributing to the Water Demand / Wastewater Flow Reduction	Estimated Construction Cost Savings
By-laws and Policies	$ 699,266
Rebate and Subsidy Programs (Water Infrastructure)	$ 864,800
Rebate and Subsidy Programs (Wastewater Infrastructure)	$ 5,152,000
Inflow and Infiltration Reduction Program	$ 6,728,178
Total Estimated Savings	**$ 13,444,244**

It should be noted that due to the difficulty of measuring the water savings generated by education initiatives and the conservation-based water rate structure recommended with the Strategy, no water savings were attributed to these initiatives in the cost benefit evaluation of the 10-year plan. The American Water Works Association suggests that education programs can generate up to an additional 4-5% reduction in water demand.

12.7 *Statement on Cost Benefit of Water Conservation*

The cost of the proposed 10-year plan is budgeted at $5,421,500. The 10-year plan is expected to reduce demands on the water system by 1331 m^3/day and reduce flows to the wastewater plants by 3759 m^3/day. Considering the $13,444,244 estimated cost to provide the equivalent capacities through the construction of new infrastructure, the cost of implementation of the recommendations made within the WCES compare favourably.

12.8 *Additional Benefits*

In addition to the economic savings in construction costs demonstrated above, there are numerous other benefits to the efficient use of water and reduction of extraneous flows to the wastewater system.

In the short term, the Town will save on operating costs associated with the treatment and conveyance of water and wastewater, including reduced use of treatment chemicals, energy, and other materials resulting in reduced greenhouse gas emissions.

Longer term savings can be realized by the Town through the adoption of the WCES through decreased demand on the water and wastewater facilities. As a result of decreased demand on the facilities, the existing infrastructure will be suitably sized to provide servicing for a longer period of time, thereby delaying expansion construction. This delay will allow for the collection of more development charges, thereby reducing the amount of monies required to be borrowed in order to facilitate the plant expansions.

13 Monitoring, Evaluation and Reporting

It is important to have a monitoring and evaluation program to ensure that the water savings and I&I flow reduction are achieved initially, and that those savings and flow reductions are sustained over time. It is recommended that the Town develop a monitoring and reporting program that will allow for the evaluation of the effectiveness of the proposed initiatives on water savings and provide an annual report that will provide information to the public and those involved in the water and wastewater strategy.

13.1 *Monitoring and Evaluation*

The Town should monitor and review the implementation of water and wastewater strategies through a range of objective performance measures/indicators in relation to each of the set targets. Each component of the water and wastewater strategy should be re-evaluated at least annually, such that experience is continually tested and the experience is transformed into knowledge, accessible to everyone involved in the water and wastewater programs.

The Town should also develop and implement a monitoring, performance measurement, and adaptive management system that will provide information to update the implementation of the Town of Innisfil's Water and Wastewater Master Plan. Collecting meaningful flow data from the Town's water and wastewater systems will be important for ensuring that the Town's servicing needs are met.

13.2 5-year Review of Strategy

The WCES should be re-evaluated every 5 years to identify new opportunities to reduce water use within the Town, investigate new technologies and evaluate the success of the plan. The Town should continually monitor water conservation practices in use in other municipalities, and consider successful practices for adoption or adaptation during the 5 year re-evaluation.

13.3 *Annual Reporting*

As required within the MOE Letter*,* the Town shall complete an annual report detailing progress on the implementation of the WCES, including inflow and infiltration reduction. The first report is required to be posted one year following finalization of the WCES and every twelve months thereafter until such date as the MOE Director, Central Region, determines the reports are no longer required and/or the Town determines that the report is no longer warranted, whichever is longer.

Each annual report shall include at a minimum, the following:

- Results of water conservation and efficiency measures and environmental and other provisions therein,
- Results of flow monitoring and visual inspections to determine the sources and amount of inflow and infiltration into the Lakeshore WPCP,
- Progress on the reduction of inflow and infiltration into the Lakeshore WPCP, and
- Details of any remedial work to the sewage system undertaken and the results of the remediation.

14 Public Engagement

To solicit feedback from members of the public, a Public Open House and Presentation was held during the Strategy development process. Through this event, held on April 8, 2014, residents and area stakeholders were introduced to the project scope and the planned recommendations. As part of the event, attendees were asked to complete a comment sheet to provide input (further recommendations or concerns) on the direction of the strategy and to solicit programming ideas. Alternatively, the public was invited to view the presentation given at the Open House on the Towns website and provide comments through an electronic survey. The presentation was made available immediately following the Open House and comment submissions via the electronic survey were accepted until April 25, 2014.

Roughly 3000 invitations to the “family friendly” Open House were distributed through the Towns Public and Catholic School Boards. A total of 8 members of the public attended and one comment sheet was received. The comments submitted demonstrated support for water conservation initiatives, and specifically requested programs for toilet and rain barrel rebates, as well as a further recommendation to provide landscape appraisal services aimed at progressing the acceptance of xeriscaping.

The Comment Sheet received during the event is attached as Appendix E to this Strategy.

Appendix ‘A’

Ministry of the Environment

Office of the Minister

77 Wellesley Street West
11th Floor, Ferguson Block
Toronto ON M7A 2T5
Tel.: 416 314-6790
Fax: 416 314-6748

Ministère de l'Environnement

Bureau du ministre

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Ontario

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Town of Innisfil
Infrastructure & Engineering

Mr. Jim Zimmerman, P. Eng.
Director of Infrastructure
Town of Innisfil
2101 Innisfil Beach Road
Innisfil ON L9S 1A1

Dear Mr. Zimmerman:

On December 24, 2010 and January 2, 2011, I received two Part II Order requests, asking that the Town of Innisfil (Town) be required to prepare an individual environmental assessment (EA) for the proposed Lakeshore Water Pollution Control Plant Expansion/ Upgrade (Project).

I am taking this opportunity to inform you that a decision has been made that an individual EA is not required. This decision was made after giving careful consideration to the issues raised in the requests, the Project documentation, the provisions of the Municipal Engineers Association's Municipal Class Environmental Assessment (Class EA), and other relevant matters required to be considered under subsection 16(4) of the *Environmental Assessment Act* (EAA).

Despite my not requiring an individual EA be prepared, I understand that a concern was raised in a Part II Order request with respect to the Water Conservation and Efficiency Strategy. Therefore, to ensure that the environment is protected, I am, pursuant to my authority under subsection 16(3) of the EAA, imposing, by order, the following conditions on the Project.

1. Water Efficiency and Inflow and Infiltration Reduction Monitoring
   1.1 The Town of Innisfil shall prepare by June 2014, to the satisfaction of the Director, Central Region, a Water Conservation and Efficiency Strategy (WCES), in accordance with policy 5.3 of the Lake Simcoe Protection Plan, for the water and wastewater flows to the Innisfil Lakeshore Wastewater Pollution Control Plant (WPCP). The WCES shall include targets for conservation, efficiency, inflow and infiltration reduction to the Innisfil Lakeshore WPCP,

and timelines for achieving the targets, as well as the strategies, tactics, programs and initiatives to be used, including the cost to implement these measures.

1.2 The Town of Innisfil shall have a peer review of the WCES completed. The peer review shall include a comparative analysis of the Town of Innisfil's proposed WCES relative to best in class tactics/strategies used by other jurisdictions.

1.3 Following completion of the peer review, the Town of Innisfil shall submit the WCES to the Director, Central Region.

1.4 The Town of Innisfil shall carry out the WCES and shall post it on the proponent's web site for the undertaking.

1.5 The Town of Innisfil shall post on its web site, an annual report detailing its progress on implementing the WCES, including inflow and infiltration reduction. The first report is required to be posted one year following finalization of the WCES and every twelve months thereafter until such date as the Director, Central Region, determines the reports are no longer required.

1.6 Each of the annual reports prepared in accordance with condition 1.5 above shall at minimum include:

1.6.1 Results of water conservation and efficiency measures and environmental and other provisions therein.

1.6.2 Results of flow monitoring and visual inspections to determine the sources and amount of inflow and infiltration into the Innisfil Lakeshore WPCP

1.6.3 Progress in the reduction of inflow and infiltration into the Innisfil Lakeshore WPCP

1.6.4 Details of any remedial work to the sewage system undertaken and the results of the remediation

With this decision having been made, the Town may now proceed with the Project, subject to the conditions I have imposed and any other permits or approvals required. The Town must implement the Project in the manner it was developed and designed, inclusive of all mitigating measures and environmental and other provisions therein. In accordance with the Class EA, any commitments made to affected agencies or members of the public must be fulfilled and implemented as part of the proposed Project.

Lastly, I would like to ensure that the Town understands that failure to comply with the EAA, the provisions of the Class EA, and failure to implement the Project in the manner described in the planning documents, are contraventions of the EAA and may result in prosecution under section 38 of the EAA. I am confident that Town recognizes the importance and value of the EAA and will ensure that its requirements and those of the Class EA are satisfied.

Sincerely,

John Wilkinson

John Wilkinson
Minister of the Environment

c: Mr. Joe Mullan, P. Eng., Ainley & Associates Limited
EA File No. EA02-03 Innisfil WPCP
Requesters

Appendix ‘B’

Table B1: Master Servicing Plan Water Flow Projections

Notes:

Max Day Peaking Factor = 1.8

		Persons Per Unit (PPU)	2031 Equivalent Units	Serviced Residential Population				Serviced ICI Development (ha)				Water Servicing								
												Rates	Average Day Flow (L/day)				Maximum Day Demand (L/day)			
				2011	2016	2021	2031	2011	2016	2021	2031	Res Flow (L/cap/day) OR ICI Flow (L/ha/day)	2011	2016	2021	2031	2011	2016	2021	2031
Sandy Cove	Existing Residential	2.65	486	0	0	0	1,288					325	0	0	0	418,568	0	0	0	753,422
	Existing Retirement	1.77	1,196				2,117					325				687,999				1,238,398
	Future Residential	2.65	1,807				4,789					300				1,436,565				2,585,817
	Future Sandy Cove Retirement (OMB Decision Case No PL080118)	1.77	767				1,358					300				407,277				733,099
	Sub-Total		4,256	0	0	0	9,551	0	0	0	0		0	0	0	2,950,409	0	0	0	5,310,735
Leonards Beach Shoreline	Existing	2.65	465	583	583	1,232	1,232					325	189,475	189,475	400,400	400,481	341,055	341,055	720,720	720,866
	Future	2.65	2			5	5					300			1,590	1,590			2,862	2,862
	Sub-Total		467	583	583	1,237	1,238	0	0	0	0		189,475	189,475	401,990	402,071	341,055	341,055	723,582	723,728
Alcona	Existing	2.65	5,234	13,870	13,870	13,870	13,870					300	4,161,030	4,161,030	4,161,030	4,161,030	7,489,854	7,489,854	7,489,854	7,489,854
	Future	2.65	3,524		4,669	9,339	9,339					275		1,284,058	2,568,115	2,568,115		2,311,304	4,622,607	4,622,607
	Future Alcona Capital Properties	2.65	242			641	641					275			176,358	176,358			317,444	317,444
	Sub-Total		9,000	13,870	18,539	23,850	23,850	0	0	0	0		4,161,030	5,445,088	6,905,503	6,905,503	7,489,854	9,801,158	12,429,905	12,429,905
Big Cedar Point Shoreline	Existing	2.65	304	297	297	297	806					325	96,460	96,460	96,460	261,820	173,628	173,628	173,628	471,276
	Future	2.65	5				13					300				3,975				7,155
	Sub-Total		309	297	297	297	819						96,460	96,460	96,460	265,795	173,628	173,628	173,628	478,431
Bell Ewart	Existing	2.65	791			2,096	2,096					300			628,845	628,845			1,131,921	1,131,921
	Future	2.65	345			914	914					275			251,419	251,419			452,554	452,554
	Sub-Total		1,136	0	0	3,010	3,010	0	0	0	0		0	0	880,264	880,264	0	0	1,584,475	1,584,475
DeGrassi Point Shoreline	Existing	2.65	134				355					325				115,408				207,734
	Future	2.65	0									300								
	Sub-Total		134	0	0	0	355	0	0	0	0		0	0	0	115,408	0	0	0	207,734
Lefroy	Existing	2.65	365		967	967	967					300		290,175	290,175	290,175		522,315	522,315	522,315
	Future	2.65	1,600			2,120	4,240					275			583,000	1,166,000			1,049,400	2,098,800
	Sub-Total		1,965	0	967	3,087	5,207	0	0	0	0		0	290,175	873,175	1,456,175	0	522,315	1,571,715	2,621,115
Gilford	Existing	2.65	555	480	480	1,471	1,471					325	155,886	155,886	477,994	477,994	280,595	280,595	860,389	860,389
	Future	2.65	119		42	315	315					300		12,720	94,605	94,605		22,896	170,289	170,289
	Sub-Total		674	480	522	1,786	1,786	0	0	0	0		155,886	168,606	572,599	572,599	280,595	303,491	1,030,678	1,030,678
Big Bay Point	Existing Shoreline	2.65	1,035				2,743					325				891,394				1,604,509
	Future within the Existing Shoreline	2.65	141				374					300				112,095				201,771
	Big Bay Point Resort –Residential/hotel within Resort	2.65	2,000		5,300	5,300	5,300					275		1,457,500	1,457,500	1,457,500		2,623,500	2,623,500	2,623,500
	Big Bay Point Resort – Non Residential within Resort		760						38	38	38	20,000		760,000	760,000	760,000		1,368,000	1,368,000	1,368,000
	Sub-Total		3,936	0	5,300	5,300	8,416	0	38	38	38		0	2,217,500	2,217,500	3,220,989	0	3,991,500	3,991,500	5,797,780

Area		Persons Per Unit (PPU)	2031 Equivalent Units	Serviced Residential Population				Serviced ICI Development (ha)				Water Servicing									
												Rates	Average Day Flow (L/day)				Maximum Day Demand (L/day)				
				2011	2016	2021	2031	2011	2016	2021	2031	Res Flow (L/cap/day) OR ICI Flow (L/ha/day)	2011	2016	2021	2031	2011	2016	2021	2031
Stroud	Existing	2.65	845	1,770	2,239	2,239	2,239					325	575,315	727,756	727,756	727,756	1,035,567	1,309,961	1,309,961	1,309,961
Stroud	Future	2.65	96		254	254	254					300		76,320	76,320	76,320		137,376	137,376	137,376
Stroud	Sub-Total		941	1,770	2,494	2,494	2,494	0	0	0	0		575,315	804,076	804,076	804,076	1,035,567	1,447,337	1,447,337	1,447,337
Churchill	Existing	2.65	234	451	451	451	620					325	146,413	146,413	146,413	201,533	263,543	263,543	263,543	362,759
Churchill	Future	2.65	53				140					300				42,135				75,843
Churchill	Sub-Total		287	451	451	451	761	0	0	0	0		146,413	146,413	146,413	243,668	263,543	263,543	263,543	438,602
Fennels Corners	Existing	2.65	74	164	196	196	196					325	53,398	63,733	63,733	63,733	96,116	114,719	114,719	114,719
Fennels Corners	Future	2.65	0									300								
Fennels Corners	Sub-Total		74	164	196	196	196	0	0	0	0		53,398	63,733	63,733	63,733	96,116	114,719	114,719	114,719
Cookstown	Existing	2.65	540	1,359	1,431	1,431	1,431					325	441,821	465,075	465,075	465,075	795,278	837,135	837,135	837,135
Cookstown	Future	2.65	772	0	623	2,046	2,046					300		186,825	613,740	613,740		336,285	1,104,732	1,104,732
Cookstown	Hwy 400 & 89 Emp Area											N/A		225,000	225,000	535,000	0	405,000	405,000	963,000
Cookstown	Sub-Total		1,312	1,359	2,054	3,477	3,477	0	0	0	0		441,821	876,900	1,303,815	1,613,815	795,278	1,578,420	2,346,867	2,904,867
Innisfil Heights	Existing Economic District (320 Ha)(Equivalent Pop No.)							20.90055	80	320	320	20,000	418,011	1,600,000	6,400,000	6,400,000	752,420	2,880,000	11,520,000	11,520,000
Innisfil Heights	Existing Residential	2.65	121	321	321	321	321					325	104,211	104,211	104,211	104,211	187,580	187,580	187,580	187,580
Innisfil Heights	Sub-Total		121	321	321	321	321	21	80	320	320		522,222	1,704,211	6,504,211	6,504,211	940,000	3,067,580	11,707,580	11,707,580
OPA No. 1 Lands	Alcona North & South Expansion - Residential	2.65	3,333			2,208	8,832					275			607,231	2,428,924			1,093,016	4,372,063
OPA No. 1 Lands	Alcona North & South Expansion - Non Residential									117.64	117.64	20,000			2,352,800	2,352,800			4,235,040	4,235,040
OPA No. 1 Lands	Expanded Economic District (200 Ha)(Equivalent Pop No.)										200	20,000				4,000,000				7,200,000
OPA No. 1 Lands	Future Expanded Economic District (125 Ha)(Equivalent Pop No.)										125	20,000				2,500,000				4,500,000
OPA No. 1 Lands	Sub-Total		3,333	0	0	2,208	8,832	0	0	118	443		0	0	2,960,031	11,281,724	0	0	5,328,056	20,307,103
6th Line Campus Node	Proposed 6th Line Campus Node										42.5	20,000				850,000				1,530,000
6th Line Campus Node	Sub-Total		0	0	0	0	0	0	0	0	42.5		0	0	0	850,000	0	0	0	1,530,000
Total Flow				**19,295**	**31,723**	**47,714**	**70,313**	**21**	**118**	**476**	**843**		**6,342,020**	**12,002,636**	**23,729,768**	**38,130,437**	**11,415,636**	**21,604,745**	**42,713,583**	**68,634,787**

Note 1 The phasing of the populations were developed by the Town of Innisifl, using supporting materials developed by Sorenson Gravely Lowes and Ainley. See notes 1.1-1.4 regarding the documentation of the existing and future units within the Town

Note 1.1 The number of units within each area was provided by Sorensen Gravely Lowes and is contained within a table entitled "Innisfil 2007 Existing and Future Units and Population for Servicing" and dated February 25, 2008.

Note 1.2 All vacant lots identified within the table entitled "Innisfil 2007 Existing and Future Units and Population for Servicing" were added to the "Future" within the aforementioned table.

Note 1.3 The existing lots for Big Bay Point are identified under existing occupied & vacant for "Shoreline" of the table entitled "Innisfil 2007 Existing and Future Units and Population for Servicing."

Note 1.4 The information associated with the 6th Line Campus was obtained from Greenland Consulting's Sixth Line Servicing Corridor - Sanitary Sewer Design Sheets dated May 07 2010.

Note 2 The Average Day flows for Highway 400 and 89 Employment Area were based on Greenland Consultating's calculated Average Day water flows in the Addendum to the Cookstown Water Supply Class EA

Table B2: Master Servicing Plan Wastewater Flow Projections

*Peaking Factors**

2011 Harmon PF =	2.62
2016 Harmon PF =	2.45
2021 Harmon PF =	2.33
2031 Harmon PF =	2.13

*Based on total flow going to the Lakeshore Plant

		Persons Per Unit (PPU)	2031 Equivalent Units	Serviced Residential Population				Serviced ICI Development (ha)				Wastewater Servicing																	
												Rates		Average Day Flow (L/day)				Peak Dry Weather Flow				Peak Inflow/Infiltration Flow (L/day)				Peak Hourly Flow (L/day)			
				2011	2016	2021	2031	2011	2016	2021	2031	Res Flow (L/cap/day) OR ICI Flow (L/ha/day)	Peak I/I Rate Residential in (L/cap/day) OR ICI /(L/day/ha)	2011	2016	2021	2031	2011	2016	2021	2031	2011	2016	2021	2031	2011	2016	2021	2031
Sandy Cove	Existing Residential	2.65	486	0	0	0	1,288					325	400	0	0	0	418,600	0	0	0	891,775	0	0	0	515,200	0	0	0	1,406,975
Sandy Cove	Existing Retirement	1.77	1,196	2,117	2,117	2,117	2,117					325	760	687,999	687,999	687,999	687,999	1,805,676	1,686,185	1,603,210	1,465,696	1,608,859	1,608,859	1,608,859	1,608,859	3,414,535	3,295,044	3,212,069	3,074,555
Sandy Cove	Future Residential	2.65	1,807				4,789					300	400	0	0	0	1,436,565	0	0	0	3,060,423	0	0	0	1,915,420	0	0	0	4,975,843
Sandy Cove	Future Sandy Cove Retirement (OMB Decision Case No PL080118)	1.77	767				1,358					300	400	0	0	0	407,277	0	0	0	867,653	0	0	0	543,036	0	0	0	1,410,689
Sandy Cove	Sub-Total			2,117	2,117	2,117	9,551	0	0	0	0			687,999	687,999	687,999	2,950,441	1,805,676	1,686,185	1,603,210	6,285,547	1,608,859	1,608,859	1,608,859	4,582,515	3,414,535	3,295,044	3,212,069	10,868,063
Leonards Beach Shoreline	Existing	2.65	465	1,148	1,148	1,232	1,232					325	760	373,100	373,100	400,400	400,400	979,213	914,414	933,032	853,002	872,480	872,480	936,320	936,320	1,851,693	1,786,894	1,869,352	1,789,322
Leonards Beach Shoreline	Future	2.65	2			5	5					300	400	0	0	1,590	1,590	0	0	3,705	3,387	0	0	2,120	2,120	0	0	5,825	5,507
Leonards Beach Shoreline	Sub-Total			1,148	1,148	1,237	1,237	0	0	0	0			373,100	373,100	401,990	401,990	979,213	914,414	936,737	856,390	872,480	872,480	938,440	938,440	1,851,693	1,786,894	1,875,177	1,794,830
Alcona	Existing	2.65	5,234	13,324	13,324	13,870	13,870					300	760	3,997,260	3,997,260	4,161,030	4,161,030	10,490,939	9,796,701	9,696,242	8,864,557	10,126,392	10,126,392	10,541,276	10,541,276	20,617,331	19,923,093	20,237,518	19,405,833
Alcona	Future	2.65	3,524		4,669	9,339	9,339					275	400	0	1,284,058	2,568,115	2,568,115	0	3,147,038	5,984,351	5,471,049	0	1,867,720	3,735,440	3,735,440	0	5,014,758	9,719,791	9,206,489
Alcona	Future Alcona Capital Properties	2.65	242			641	641					275	400	0	0	176,358	176,358	0	0	410,957	375,708	0	0	256,520	256,520	0	0	667,477	632,228
Alcona	Sub-Total			13,324	17,994	23,850	23,850	0	0	0	0			3,997,260	5,281,318	6,905,503	6,905,503	10,490,939	12,943,739	16,091,550	14,711,314	10,126,392	11,994,112	14,533,236	14,533,236	20,617,331	24,937,851	30,624,786	29,244,550
Big Cedar Point Shoreline	Existing	2.65	304	297	297	297	806					325	760	96,460	96,460	96,460	261,820	253,162	236,409	224,776	557,775	225,568	225,568	225,568	612,256	478,730	461,977	450,344	1,170,031
Big Cedar Point Shoreline	Future	2.65	5				13					300	400	0	0	0	3,975	0	0	0	8,468	0	0	0	5,300	0	0	0	13,768
Big Cedar Point Shoreline	Sub-Total			297	297	297	819	0	0	0	0			96,460	96,460	96,460	265,795	253,162	236,409	224,776	566,243	225,568	225,568	225,568	617,556	478,730	461,977	450,344	1,183,799
Bell Ewart	Existing	2.65	791	2,041	2,041	2,096	2,096					300	760	612,150	612,150	628,845	628,845	1,606,608	1,500,290	1,465,366	1,339,676	1,550,780	1,550,780	1,593,074	1,593,074	3,157,388	3,051,070	3,058,440	2,932,750
Bell Ewart	Future	2.65	345				914					275	400	0	0	0	251,419	0	0	0	535,616	0	0	0	365,700	0	0	0	901,316
Bell Ewart	Sub-Total			2,041	2,041	2,096	3,010	0	0	0	0			612,150	612,150	628,845	880,264	1,606,608	1,500,290	1,465,366	1,875,292	1,550,780	1,550,780	1,593,074	1,958,774	3,157,388	3,051,070	3,058,440	3,834,066
DeGrassi Point Shoreline	Existing	2.65	134				355					325	400	0	0	0	115,408	0	0	0	245,861	0	0	0	142,040	0	0	0	387,901
DeGrassi Point Shoreline	Future	2.65	0									300	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DeGrassi Point Shoreline	Sub-Total			0	0	0	355	0	0	0	0			0	0	0	115,408	0	0	0	245,861	0	0	0	142,040	0	0	0	387,901
Lefroy	Existing	2.65	365	967	967	967	967					300	760	290,175	290,175	290,175	290,175	761,574	711,177	676,180	618,182	735,110	735,110	735,110	735,110	1,496,684	1,446,287	1,411,290	1,353,292
Lefroy	Future	2.65	1,600			2,120	4,240					275	400	0	0	583,000	1,166,000	0	0	1,358,536	2,484,018	0	0	848,000	1,696,000	0	0	2,206,536	4,180,018
Lefroy	Sub-Total			967	967	3,087	5,207	0	0	0	0			290,175	290,175	873,175	1,456,175	761,574	711,177	2,034,716	3,102,200	735,110	735,110	1,583,110	2,431,110	1,496,684	1,446,287	3,617,826	5,533,310
Gilford	Existing	2.65	555				1,471					325	400	0	0	0	477,994	0	0	0	1,018,306	0	0	0	588,300	0	0	0	1,606,606
Gilford	Future	2.65	119				315					300	400	0	0	0	94,605	0	0	0	201,544	0	0	0	126,140	0	0	0	327,684
Gilford	Sub-Total			0	0	0	1,786	0	0	0	0			0	0	0	572,599	0	0	0	1,219,850	0	0	0	714,440	0	0	0	1,934,290
Big Bay Point	Existing Shoreline	2.65	1,035				2,743					325	400	0	0	0	891,394	0	0	0	1,899,003	0	0	0	1,097,100	0	0	0	2,996,103
Big Bay Point	Future within the Existing Shoreline	2.65	141				374					300	400	0	0	0	112,095	0	0	0	238,804	0	0	0	149,460	0	0	0	388,264
Big Bay Point	Big Bay Point Resort –Residential/hotel within Resort	2.65	2,000		5,300	5,300	5,300					275	400	0	1,457,500	1,457,500	1,457,500	0	3,572,120	3,396,340	3,105,022	0	2,120,000	2,120,000	2,120,000	0	5,692,120	5,516,340	5,225,022
Big Bay Point	Big Bay Point Resort – Non Residential within Resort								38	38	38	20,000	20,000	0	760,000	760,000	760,000	N/A	N/A	N/A	N/A	0	760,000	760,000	760,000	0	1,520,000	1,520,000	1,520,000
Big Bay Point	Sub-Total			0	5,300	5,300	8,416	0	38	38	38			0	2,217,500	2,217,500	3,220,989	0	3,572,120	3,396,340	5,242,830	0	2,880,000	2,880,000	4,126,560	0	7,212,120	7,036,340	10,129,390
Stroud	Existing	2.65	845				2,239					325	400	0	0	0	727,756	0	0	0	1,550,394	0	0	0	895,700	0	0	0	2,446,094
Stroud	Future	2.65	96				254					300	400	0	0	0	76,320	0	0	0	162,590	0	0	0	101,760	0	0	0	264,350
Stroud	Sub-Total			0	0	0	2,494	0	0	0	0			0	0	0	804,076	0	0	0	1,712,984	0	0	0	997,460	0	0	0	2,710,444
Churchill	Existing	2.65	234				620					325	400	0	0	0	201,533	0	0	0	429,340	0	0	0	248,040	0	0	0	677,380
Churchill	Future	2.65	53				140					300	400	0	0	0	42,135	0	0	0	89,763	0	0	0	56,180	0	0	0	145,943
Churchill	Sub-Total			0	0	0	761	0	0	0	0			0	0	0	243,668	0	0	0	519,103	0	0	0	304,220	0	0	0	823,323
Fennels Corners	Existing	2.65	74				196					325	400	0	0	0	63,733	0	0	0	135,774	0	0	0	78,440	0	0	0	214,214
Fennels Corners	Future	2.65	0				0					300	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fennels Corners	Sub-Total			0	0	0	196	0	0	0	0			0	0	0	63,733	0	0	0	135,774	0	0	0	78,440	0	0	0	214,214
Cookstown	Existing	2.65	540	1,431	1,431	1,431	1,431					325	760	465,075	465,075	465,075	465,075	1,220,604	1,139,831	1,083,741	990,784	1,087,560	1,087,560	1,087,560	1,087,560	2,308,164	2,227,391	2,171,301	2,078,344
Cookstown	Future	2.65	772		623	623	2,046					300	400	0	186,825	186,825	613,740	0	457,881	435,349	1,307,497	0	249,100	249,100	818,320	0	706,981	684,449	2,125,817
Cookstown	Hwy 400 & 89 Emp Area								81	81	143	N/A	20,000		225,000	225,000	535,000	N/A	N/A	N/A	N/A	0	1,620,000	1,620,000	2,860,000	0	1,845,000	1,845,000	3,395,000
Cookstown	Sub-Total			1,431	2,054	2,054	3,477	0	81	81	143			465,075	876,900	876,900	1,613,815	1,220,604	1,597,712	1,519,090	2,298,281	1,087,560	2,956,660	2,956,660	4,765,880	2,308,164	4,779,372	4,700,750	7,599,161
Innisfil Heights	Existing Economic District (320 Ha)(Equivalent Pop No.)								80	320	320	20,000	20,000	0	1,600,000	6,400,000	6,400,000	N/A	N/A	N/A	N/A	0	1,600,000	6,400,000	6,400,000	0	3,200,000	12,800,000	12,800,000
Innisfil Heights	Existing Residential	2.65	121			321	321					325	400	0	0	104,211	104,211	0	0	242,838	222,009	0	0	128,260	128,260	0	0	371,098	350,269
Innisfil Heights	Sub-Total			0	0	321	321	0	80	320	320			0	1,600,000	6,504,211	6,504,211	0	0	242,838	222,009	0	1,600,000	6,528,260	6,528,260	0	3,200,000	13,171,098	13,150,269
OPA No. 1 Lands	Alcona North & South Expansion - Residential	2.65	3,333			2,208	8,832					275	400	0	0	607,231	2,428,924		0	1,415,000	5,174,520	0	0	883,245	3,532,980	0	0	2,298,245	8,707,500
OPA No. 1 Lands	Alcona North & South Expansion - Non Residential									117.64	117.64	20,000	20,000	0	0	2,352,800	2,352,800	N/A	N/A	N/A	N/A	0	0	2,352,800	2,352,800	0	0	4,705,600	4,705,600
OPA No. 1 Lands	Expanded Economic District (200 Ha)(Equivalent Pop No.)										200	20,000	20,000	0	0	0	4,000,000	N/A	N/A	N/A	N/A	0	0	0	4,000,000	0	0	0	8,000,000
OPA No. 1 Lands	Future Expanded Economic District (125 Ha)(Equivalent Pop No.)										125	20,000	20,000	0	0	0	2,500,000	N/A	N/A	N/A	N/A	0	0	0	2,500,000	0	0	0	5,000,000
OPA No. 1 Lands	Sub-Total			0	0	2,208	8,832	0	0	118	443			0	0	2,960,031	11,281,724	0	0	1,415,000	5,174,520	0	0	3,236,045	12,385,780	0	0	7,003,845	26,413,100
6th Line Campus Node	Proposed 6th Line Campus Node										42.5	20,000	20,000	0	0	0	850,000	N/A	N/A	N/A	N/A	0	0	0	850,000	0	0	0	1,700,000
6th Line Campus Node	Sub-Total			0	0	0	0	0	0	0	43			0	0	0	850,000	0	0	0	0	0	0	0	850,000	0	0	0	1,700,000
Total				**21,325**	**31,917**	**42,567**	**70,313**	**0**	**199**	**557**	**986**			**6,522,219**	**12,035,602**	**22,152,614**	**38,130,389**	**17,117,775**	**23,162,046**	**28,929,625**	**44,168,199**	**16,206,749**	**24,423,569**	**36,083,252**	**55,954,711**	**33,324,525**	**50,170,615**	**74,750,678**	**117,520,711**

Note 1	The phasing of the populations were developed by the Town of Innisfil, using supporting materials developed by Sorenson Gravely Lowes and Ainley. See notes 1.1-1.4 regarding the documentation of the existing and future units within the Town
Note 1.1	The number of units within each area was provided by Sorensen Gravely Lowes and is contained within a table entitled "Innisfil 2007 Existing and Future Units and Population for Servicing" and dated February 25, 2008.
Note 1.2	All vacant lots identified within the table entitled "Innisfil 2007 Existing and Future Units and Population for Servicing" were added to the "Future" within the aforementioned table.
Note 1.3	The existing lots for Big Bay Point are identified under existing occupied & vacant for "Shoreline" of the table entitled "Innisfil 2007 Existing and Future Units and Population for Servicing."
Note 1.4	The information associated with the 6th Line Campus was obtained from Greenland Consulting's Sixth Line Servicing Corridor - Sanitary Sewer Design Sheets dated May 07 2010.
Note 2	The Average Day flows for Highway 400 and 89 Employment Area were based on Greenland Consulting's calculated Average Day water flows in the Addendum to the Cookstown Water Supply Class EA
Note 3	The Peak Inflow and Infiltration (I/I) flows for the Highway 400 and 89 Area were based on the development area, using the Master Plan's peak i/i infiltration rate

Appendix ‘C’

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MEMO

Date:	June 13, 2013	**Pages:** 7		**CCTA File:**	108040
To:	Jay Currier	Town of Bradford West Gwillimbury		**Via:**	e-mail
Copy:	Daniel Bertolo	Town of Bradford West Gwillimbury		**Via:**	e-mail
From:	Suzanne Troxler				
Subject:	BWG Water Supply Options Update Lakeshore WTP Staging Plan - REVISED				

As requested, we have reviewed the proposed Phase 3 expansion of Innisfil's Lakeshore WTP (WTP) and developed an alternate construction staging plan and estimate of probable costs. The objective was to identify a staging plan that more closely matches the anticipated treated water capacity needs of the Towns of Innisfil (Innisfil) and Bradford West Gwillimbury (BWG). This memo presents updated projected water demands, an alternate staging plan for the Phase 3 WTP expansion, and an estimate of probable costs for each expansion stage, for each municipality. It incorporates input received from Innisfil and BWG during meetings held in April and May 2013.

Projected Water Demands to be Supplied from the Lakeshore WTP

Innisfil completed a Class EA study for the Phase 3 WTP expansion, documented in an ESR dated March 2011. The ESR presented a total projected maximum day water demand (MDD) of 99.7 ML/d from Innisfil and BWG that the WTP is anticipated to supply by the year 2031.

Both Towns updated their water demands subsequent to this Class EA. Innisfil completed the Town-Wide Water and Wastewater Master Servicing Plan (March 2012) and BWG completed the Water Supply and Wastewater Servicing Master Plan Update (March 2011). These studies refined the water service areas, the water consumption criteria, as well as the anticipated timelines for the projected growth.

During meetings with BWG and Innisfil in April and May 2013, the projections for future growth and the associated water demands previously documented in the MSPs were further reviewed and refined.

The projected water demands to be met by the Lakeshore WTP through future expansions is presented in Table 1 and on Figure 1. The detailed water demands by service area are attached.

For BWG, it is projected that by 2031, 25.4 ML/d will be required from the Lakeshore WTP to meet the water demands. This assumes, as stated in the MSP, that the remainder of the projected water demands is met by existing groundwater sources (6.5 ML/d). The BWG demand from the WTP is less than the 32.1 ML/d assumed in the WTP expansion Class EA. The timing of BWG's requirement for water was developed on the basis of the following assumptions:

- The rate of residential growth is consistent with the 2011 Development Charges Update report.
- The Bradford Urban Area (BUA), residential and industrial, is fully developed by 2031.
- The groundwater wells supply water to the BUA.
- The Bond Head growth area is developed in the period from 2016 to 2031.
- The Hwy 400 employment area is 50% developed (200 ha) by 2021 and fully developed by 2031.

For Innisfil, it was determined after a detailed review of the population projections presented in the Class EA and the MSP that the water demands at the WTP will be less, and will occur over a longer timeframe, than presented in these documents. The maximum day demand is projected to reach 60 ML/d by the years 2050-2055. Two Innisfil growth scenarios are presented on Figure 1 overleaf. Scenario 1 (blue dashed line) includes all the proposed development projects and their anticipated time lines. Innisfil considers this scenario to represent an optimistic rate of growth. A more likely increase in demands is presented as Scenario 2 (blue full line), whereas residential development occurs at a rate of 400 building permits per year, consistent with the calculations for the development charges update.

Table 1: Updated Projected Water Demands (MDD) for Lakeshore WTP

	Exist./2011	2016	2021	2031	All Development Plans
Innisfil (Projection 2)					
Population	16,477	21,809	31,434	51,400	77,900
ICI Area (ha)	0	49	369	427	752
Max. Day Demand (ML/d)	8.9	12.6	23.3	34.9	59.7
BWG					
Population	11,513	19,796	25,256	31,694	
ICI Areas	0	107	415	857	
Max. Day Demand (ML/d)	5.2	10.0	16.7	25.4	
Total MDD (ML/d)	**14.1**	**22.6**	**40.0**	**60.3**	

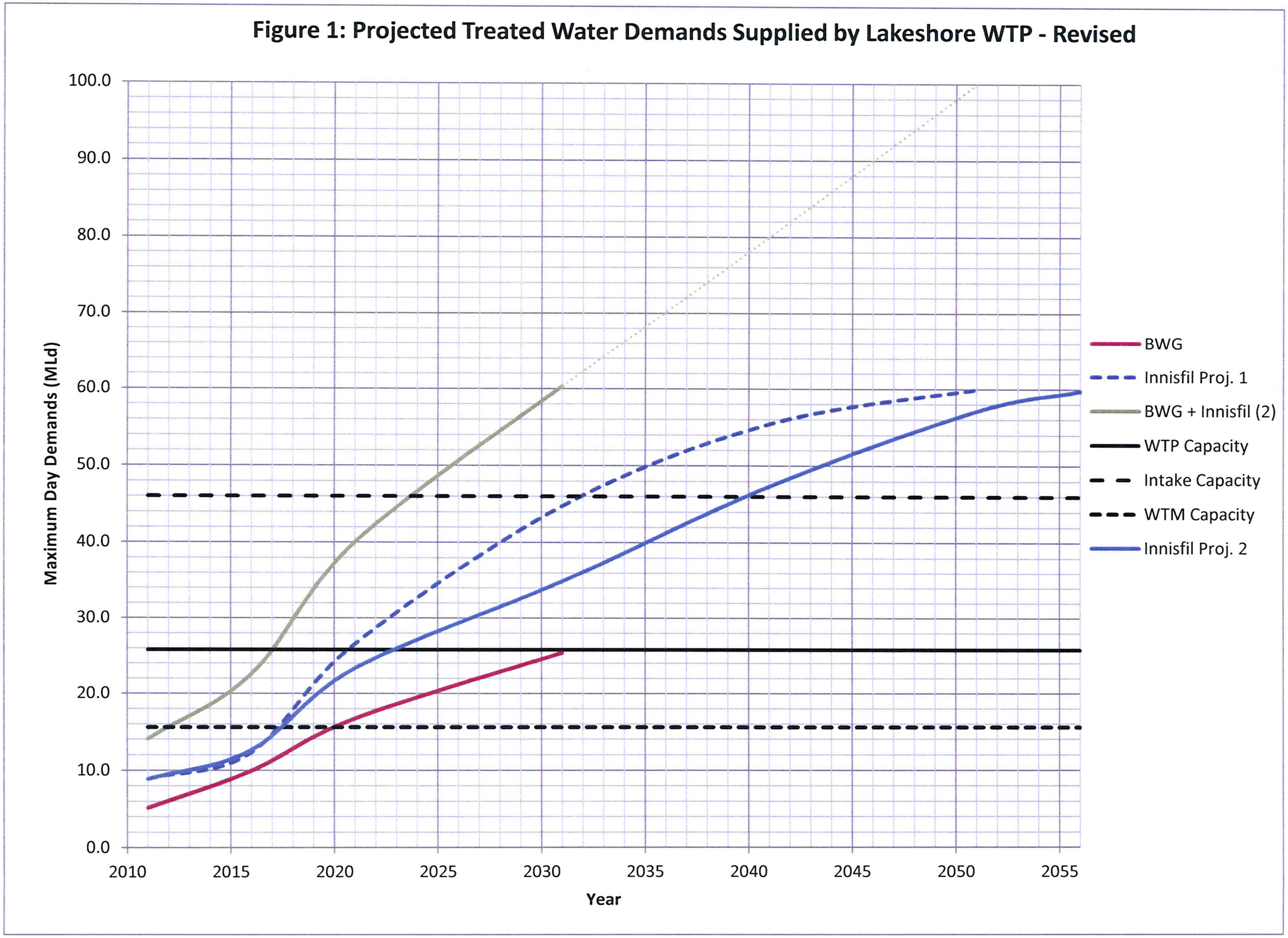


Figure 1: Projected Treated Water Demands Supplied by Lakeshore WTP - Revised
Maximum Day Demands (MLd)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
2010
2015
2020
2025
2030
2035
2040
2045
2050
2055
Year
BWG
Innisfil Proj. 1
BWG + Innisfil (2)
WTP Capacity
Intake Capacity
WTM Capacity
Innisfil Proj. 2

Considering the planning period to 2031, the maximum day water demand from both Innisfil and BWG is projected at 60 ML/d. Projections for the 20 years beyond this period would only be tentative at this time. If the water demands continued to increase in Innisfil and BWG at a constant rate, as shown by the dashed green projection line on Figure 1, a WTP expansion to 100 ML/d would be needed in 2050.

We note actual flow data at the Lakeshore WTP indicates the plant supplied a MDD of 15.0 ML/d in 2011 and 13.4 ML/d in 2012. On an average day basis, in 2012, the WTP supplied approximately equal volumes of treated water to Innisfil and BWG. This suggests the short-term water demand projections are slightly high for Innisfil and slightly low for BWG, but appropriate overall.

Potential Lakeshore WTP Phase 3 Expansion Staging

With the Phase 2 expansion, the WTP has a treated water maximum day capacity of 25.8 ML/d. The WTP is currently operated at 58% of its rated capacity.

To meet the above updated water demands, the WTP will need to be expanded by about 35 ML/d to 60 ML/d by 2031. Upon review of the capacity of the existing infrastructure, the suggested staging plan is to expand the WTP in two 20 ML/d stages.

This WTP staging allows a first phase, Phase 3A, to be built before a second water intake needs to be built. This staging plan is presented on Figure 2 against the projected water demands. Based on the current growth projections, Phase 3A will be required by 2017, Phase 3B will be required by 2023. The capacity and timing of the subsequent expansions will need to be established based on updated growth projections. The capacity of the Phase 3 B expansion exceeds the projected required capacity for 2031 but will be available to meet Innisfil's ongoing water needs.

The allocation of capacity of each WTP expansion phase between Innisfil and BWG, based on the respective projected water demands, is shown in Table 2.

Table 2: Phase 3 Expansion WTP Capacity Allocation – Staging Plan

	Existing WTP (ML/d)	Phase 3 Expansion(ML/d)			Expanded WTP (ML/d)
		Phase 3A	Phase 3B	Total	
Innisfil	18.7	7.5	14.2	21.7	40.4
BWG	7.1	12.5	5.8	18.3	25.4
Total	**25.8**	**20.0**	**20.0**	**40.0**	**65.8**

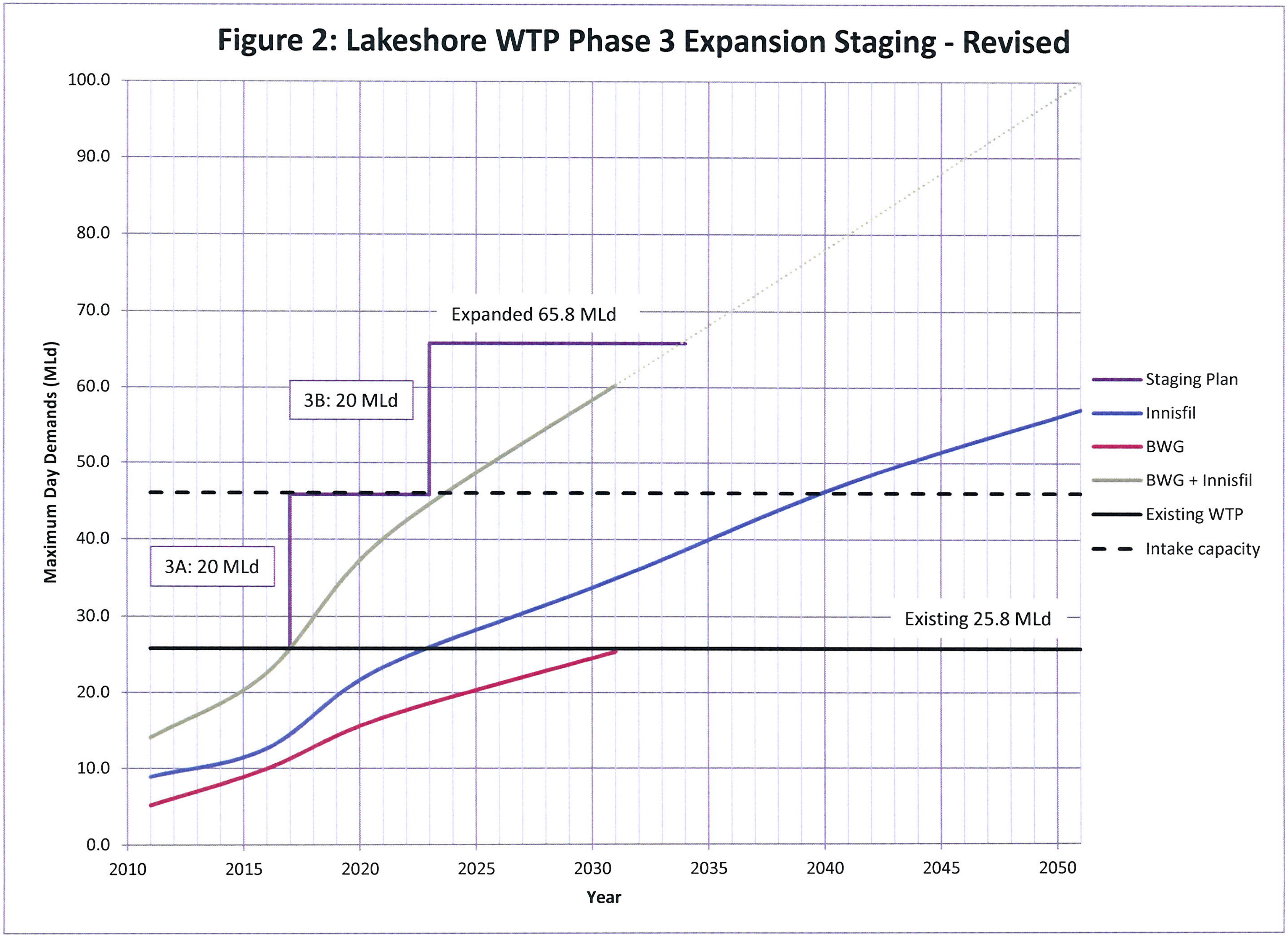


Figure 2: Lakeshore WTP Phase 3 Expansion Staging - Revised
Maximum Day Demands (MLd)
Year
Expanded 65.8 MLd
3B: 20 MLd
3A: 20 MLd
Existing 25.8 MLd
Staging Plan
Innisfil
BWG
BWG + Innisfil
Existing WTP
Intake capacity
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
2010
2015
2020
2025
2030
2035
2040
2045
2050

Phase 3 Expansion Costs by Phase and by Municipality

In developing an alternate Phase 3 expansion staging plan, we assumed the WTP expansion would follow the conceptual design presented in the ESR in terms of recommended treatment processes, residual management, and infrastructure location.

Taking into consideration the existing capacities of the main components of the WTP and the site layout, the next expansion will require a new water treatment plant and clearwell, an expansion to the low lift pumping station and a new raw water main. The new WTP will provide coagulation/flocculation, DAF clarification, filtration, UV disinfection, advanced oxidation, and chlorine addition. On-site wastewater treatment is also to be provided: a new residual management facility (RMF) will be built to provide storage, gravity thickening and centrifuging of the wastewater produced by the WTPs.

The first stage of the Phase 3 expansion has significant construction costs, as a significant portion of the infrastructure should be built at the onset and cannot be economically built in multiple small phases. However, construction and equipment installation are suggested to be phased to the extent possible in order to even out costs and better match them to the actual capacity needed. The main components of each of the suggested stages are outlined in Table 3.

Table 3: List of Major Components of the Phase 3 Expansion, by Stage

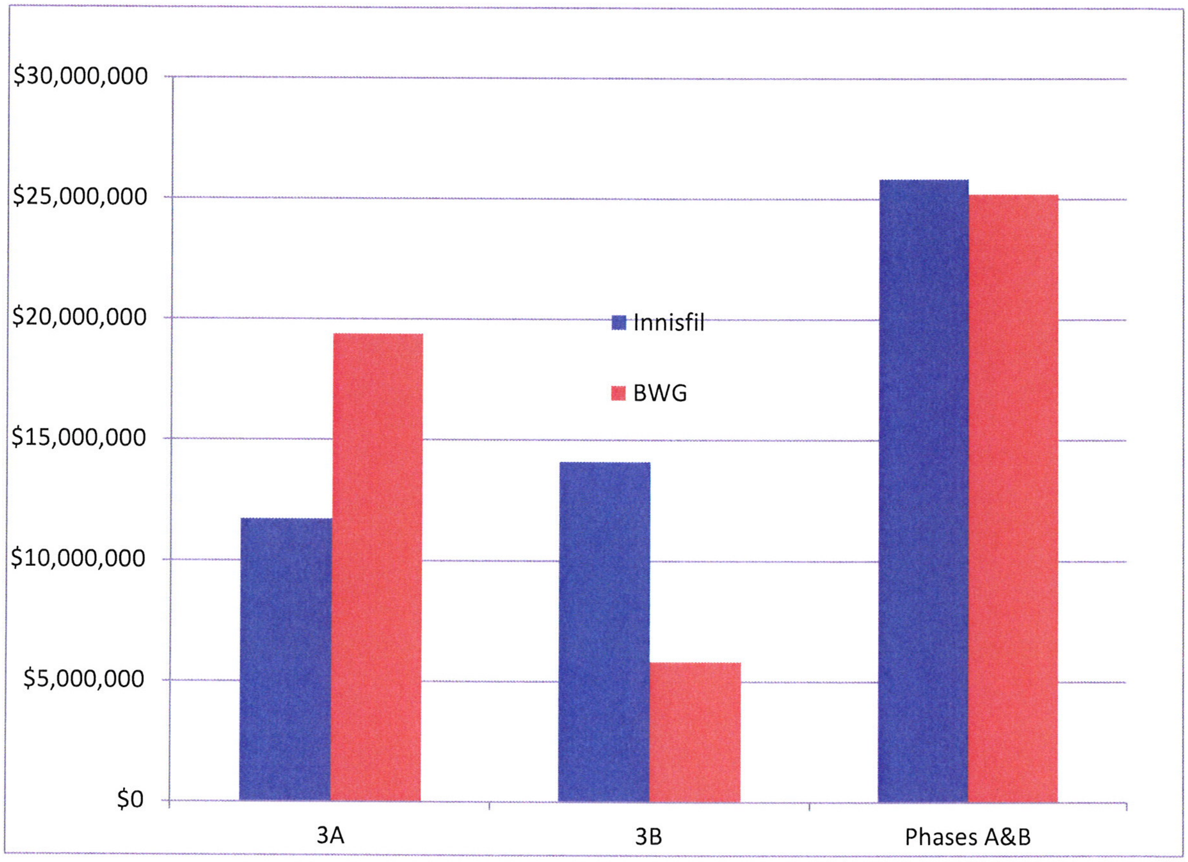
Phase	Components
3A	Low-lift pumping station building expansion; install 3 pumps. New raw watermain to WTP. New WTP building sized for 3 process trains, blowers, chemical systems, etc. Install 3 process trains (2 duty, 1 stand-by) and associated systems. New below WTP clearwell and high-lift pumping station with 3 pumps. New residual management building sized for 2 trains Install 2 waste management trains (duty, stand-by) and associated systems. Emergency generator for Phase 3A.
3B	Water intake twinning. Replace/add low lift pumps. Expand WTP building and clearwell. Install 2 process trains and replace chemical pumps. Replace/add high lift pumps. Expand RMF building. Install 1 waste management train and associated systems. Replace emergency generator for Phase 3B.

The construction costs for the revised expansion phasing were estimated by re-proportioning the Lakeshore WTP Expansion ESR's Estimate of Probable Costs (2011 $). We did not revisit the costs or conduct any value engineering. As shown in Table 4, the estimated project costs for the 40 ML/d WTP expansion are $51 M. Phase 3A costs are $31 M, of which $19.4 M, or 62%, would be attributable to the capacity needed by BWG. In total, BWG's share of the Phase 3 WTP expansion is estimated at $25.2 or approximately half the total cost. The cost allocation by municipality and by phase is shown in Figure 3 overleaf.

Table 4: Estimated Costs of the Phase 3 WTP Expansion

Components	Phase 3A	Phase 3B	Total
New Water Intake	$0	$4,000,000	$4,000,000
Low-lift Pumping Station Expansion	$3,880,000	$590,000	$4,470,000
New Raw Water Main	$800,000	$0	$800,000
New WTP Building and Equipment	$15,310,000	$8,320,000	$23,630,000
New Residual Management Facility	$3,110,000	$1,500,000	$4,610,000
Stand-by Power	$280,000	$560,000	$840,000
Site Work	$2,340,000	$1,500,000	$3,840,000
Contingency (10%)	$2,570,000	$1,650,000	$4,220,000
Sub-Total	$28,290,000	$18,120,000	$46,410,000
Engineering (10%)	$2,830,000	$1,810,000	$4,640,000
Total	**$31,120,000**	**$19,930,000**	**$51,050,000**
Attributable to BWG	**$19,390,000**	**$5,820,000**	**$25,210,000**
Attributable to Innisfil	$11,730,000	$14,110,000	$25,840,000

Figure 3: Allocation of Phase 3 WTP Expansion Costs



Alcona to Bradford Water Transmission Main

The existing water transmission main between Alcona and Bradford is designed to convey 180 L/s (15.5 ML/d) to Bradford at the John Fennel reservoir. As shown in Figure 1, it is projected BWG will reach this water demand by the year 2020. The water transmission main, as well as the trunk water main between the WTP and the Alcona reservoir, will need to be twinned to increase their conveyance capacity, at an estimated project cost of $20 M.

Conclusions

- Based on updated growth projections, the water demands for Innisfil and BWG, to be met by the WTP, are anticipated to reach 60 ML/d by 2031. These demands include 25.4 ML/d for BWG.
- The proposed Phase 3 expansion staging plan is to expand the WTP in two 20 ML/d stages. The timing of the expansion phases will depend on the actual rate of growth. The first stage will be more cost-intensive as major infrastructure needs to be added to increase the WTP's current capacity.
- The probable capital cost of a 40 ML/d WTP expansion is estimated at $51 M, based on the WTP expansion ESR costs and if built in two stages.

- The first phase (Phase 3A) is estimated to cost $31 M, of which $19.4 M can be attributed to BWG based on capacity needed. This expansion would provide an additional 12.5 ML/d capacity to meet BWG's demands to the year 2023.
- The second phase (Phase 3B), estimated to cost $20 M, of which $5.8 M can be attributed to BWG, will provide an additional 5.8 ML/d capacity to BWG to meet demands to the year 2031.
- Overall, $25.2 M of the total estimated construction cost of the Phase 3 WTP expansion can be attributed to BWG based on projected water demands.
- The supply of BWG's projected water demands from the expanded Lakeshore WTP will require a new water transmission main between Alcona and Bradford, at an estimated cost of $20 M. Current water demand projections indicate the twinning will be needed by the year 2020.

We trust the above provides the analysis you require at this time. Please do not hesitate to contact us if you have any questions.

Appendix 'D'

Innisfil Lakeshore WPCP Expansion
Environmental Study Report

Appendix C

Town of Innisfil Lakeshore WPCP Flow Analysis

File: 108128
November 2010

TOWN OF INNISFIL LAKESHORE WPCP FLOW ANALYSIS

HISTORICAL FLOWS

General

Historical flow data as provided by the Town for the years 1998 to 2009 is summarized in Table 1.

Average Dry Weather Flow (ADWF)

Column 7 in Table 1 summarizes the average dry weather flow (ADWF) from 1998 through 2009. This flow has been derived from taking the lowest average flow over three consecutive months in each year. ADWF represents a reasonable approximation of base flow, or sewage production with minimal influence from extraneous flows. ADWF increased by approximately 60% from 1998 through 2009, which is proportionate with the apparent population increase during the same period.

Average Day Flow (ADF)

Column 2 in Table 1 summarizes the average day flow (ADF) from 1998 through 2009. This flow represents the annual average flow, inclusive of extraneous flows. ADF increased by approximately 80% from 1998 through 2009, which is higher than the apparent population increase during the same period.

Maximum Month Flow (MMF)

Column 3 in Table 1 summarizes the highest average flow in a single month from 1998 through 2009. This flow represents the maximum monthly flow (MMF), inclusive of extraneous flows. MMF increased by approximately 90% from 1998 through 2009, which is higher than the apparent population increase during the same period.

Highest Weekly Average Flow (MWF)

Column 10 in Table 1 summarizes the highest average flow over seven consecutive days in each year from 1998 through 2009. This flow represents the maximum weekly flow (MWF), inclusive of extraneous flows. MWF approximately doubled from 1998 through 2009, which is higher proportionately than the apparent population increase during the same period.

Peak Day Flow (PDF)

Column 5 in Table 1 summarizes the highest daily flow in each year from 1998 through 2009. This flow represents the peak day flow (PDF), inclusive of extraneous flows. PDF approximately tripled from 1998 through 2009, which is considerably higher proportionately than the apparent population increase during the same period.

Table 1 – Historical Flow Data

Year	Average Daily Flow (ADF) m^3/d	Maximum Month Flow (MMF) m^3/d	Maximum Month Factor	Peak Day Flow (PDF) (m^3/d)	Peak Day Factor	Average Dry Weather Flow [1] (ADWF) m^3/d	Average I/I Flow (ADF – ADWF) m^3/d	Peak I/I Flow (PDF – ADWF) m^3/d	Highest Weekly Average Flow m^3/d
1998	4915	6237	1.27	8053	1.64	4423	492	3630	6971 [2]
1999	5253	6125	1.17	8462	1.61	4519	733	3943	7356 [3]
2000	6111	8104	1.33	11282	1.84	5438	690	5844	9383 [4]
2001	6384	8200	1.28	12417	1.95	5058	1340	7359	10004 [5]
2002	6940	8647	1.25	15634	2.25	5777	1163	9857	10562 [6]
2003	7138	8848	1.24	13758	1.93	6109	1024	7649	11872 [7]
2004	7416	10623	1.43	16403	2.21	5839	1574	10564	13509 [8]
2005	7280	11371	1.56	17826	2.45	5774	1506	12052	14630 [9]
2006	8116	10278	1.27	20308	2.50	6700	1416	13608	15159 [10]
2007	7648	9662	1.26	16823	2.20	6249	1399	10574	12058 [11]
2008	9340	12090	1.29	23016	2.46	7905	1435	15111	16563 [12]
2009	8843	12019	1.36	24133	2.73	7290	1553	16843	14960 [13]

Notes:

(1) Lowest average over three consecutive months.
(2) January 5 – 11, 1998
(3) January 22 – 28, 1999
(4) July 12 – 18, 2000
(5) April 2 – 8, 2001
(6) May 29 – June 4, 2002
(7) March 24 – 30, 2003
(8) March 2 – 8, 2004
(9) April 1 – 7, 2005
(10) March 9 – 15, 2006
(11) March 14 – 20, 2007
(12) January 7 – 13, 2008
(13) February 11 – 17, 2009

Average Extraneous Flow (Average I/I)

Column 8 in Table 1 summarizes the annual average daily inflow and infiltration (Average I/I) from 1998 through 2009. Average I/I approximately tripled from 1998 through 2009, which is considerably higher than the apparent population increase and the collection system expansion during the same period.

Peak Extraneous Flow (Peak I/I)

Column 9 in Table 1 summarizes the highest daily inflow and infiltration in each year from 1998 through 2009. This flow represents the peak day extraneous flow (Peak I/I). Peak I/I increased by more than four times from 1998 through 2009, which is considerably higher than the apparent population increase and the collection system expansion during the same period.

HISTORICAL FLOW ANALYSIS

The flow records reflect generally increasing extraneous flows. However, average daily and maximum monthly extraneous flows appear to have generally stabilized, with average daily I/I in the order of 1500 m^3/d since 2004. This suggests that the infiltration component of extraneous flows is not increasing.

The highest weekly average flow and the peak day flow generally reflect the impact of inflow. Again, the highest weekly average flows appear to have stabilized since 2004, with averages in the order of 14500 m^3/d, comprised of 6600 m^3/d base flow, 1500 m^3/d infiltration and 6400 m^3/d inflow. However, peak day flow continues to trend upward at a rate of about 8% per year since 2004.

The MOE Guidelines suggest that if infiltration, based upon the highest weekly average within a 12-month period, is less than 0.14 L/(mm.d)/m (litres per millimetre of pipe diameter per day per linear metre of sewer length) rehabilitation of the sewer system will not be economical. The Lakeshore WPCP collection system is currently comprised of approximately 75 kilometres of predominantly 300 mm diameter sewer pipe and an estimated 250 kilometres of 125 mm diameter service connections (8358 service connections approximately 30 metres long on average). Considering the last three years of flow records and assuming the MOE standard references all extraneous flow (not just infiltration), the highest weekly I/I from 2007 through 2009 is summarized in Table 2.

Table 2 – Highest Weekly I/I

Year	Highest Weekly Average Flow (MWF) m^3/d	Average Dry Weather (Base) Flow (ADWF) m^3/d	Highest Weekly I/I (MWF – ADWF) m^3/d	Highest Weekly I/I Per Pipe Length L/(mm.d)/m
2007	12058	6249	5809	0.17
2008	16563	7905	8658	0.26
2009	14960	7290	7670	0.23
Avg.	**14527**	**7148**	**7379**	**0.22**

The extraneous flow is excessive based on MOE Guidelines and further efforts should be taken by the Town to reduce these flows. The 0.22 L/(mm.d)/m I/I is comprised of approximately 0.04 L/(mm.d)/m infiltration and 0.18 L/(mm.d)/m inflow, indicating that surface inflow during heavy rainfalls and snowmelts is the predominant problem. Groundwater infiltration does not appear to be a significant problem at this time and, further, appears to have stabilized and has not increased since 2004.

As previously noted, peak day flows are increasing at rate of about 8% per year, which far outstrips population growth. Table 2 indicates that it will be more economical for the Town to address its current inflow problem (which will in turn reduce peak flows) than to invest in a WPCP design that incorporates an allowance for increasing peak flows. Therefore, the design flow analysis will assume peaking factors equal to but not greater than existing peaking factors. Although the effects of an enhanced flow reduction program will not be experienced immediately, there should be sufficient buffer in the WPCP to handle higher per capita peak flows in the short-term as the plant will be expanded to handle flows up to approximately the year 2024.

POPULATION GROWTH ANALYSIS

General

Until 2007 the number of service connections recorded by the Town in its Annual Reports was based on an assumption of the number of new houses constructed each year. Actual counts were not undertaken. The number of service connections dropped significantly in 2006 due to a revised estimating method in the serviced units. The revised estimation method is not known but it lowered the number of service connections significantly (to less than 1999 apparent connections). Due to the uncertainty with respect to serviced units, Ainley completed a lot count for 2007 service connections that identified 7467 total connected homes, comprised of 1196 retirement homes in Sandy Cove and 6271 non-retirement homes. An additional 441 and 57 non-retirement connections were made in 2008 and 2009 respectively (information provided by the Town).

Given the uncertainty with pre-2007 service connection records, the population and flow analysis is based on 2007, 2008 and 2009 records only. This is consistent with MOE policy of analysing the last 3 years of records to determine design flows. Flow records prior to 2007 were considered for general trending purposes, therefore the number of 1998 apparent service connections is also presented to provide an approximate baseline for the general comparison.

Population Growth

The service connections and population estimates are provided in Table 3. Population is calculated based on 2 ppu in the 1196 retirement homes and 3 ppu for the remaining units.

Table 3 – Population Growth

Year	Service Connections	Population
1998 (Baseline)	5770	16114
2007	7467	21205
2008	7908	22528
2009	7965	22699
Average 2007 - 2009	**7780**	**22144**

PER CAPITA FLOW DERIVATIONS

General

Existing flows from 2007 through 2009 are summarized in Table 4.

Table 4 – Existing Flows

Year	Base Flow m^3/d	ADF m^3/d	MMF m^3/d	PDF m^3/d	Avg. I/I m^3/d	Peak I/I m^3/d
2007	6249	7648	9662	16823	1399	10574
2008	7905	9340	12090	23016	1435	15111
2009	7290	8843	12019	24133	1553	16843
	7148 avg.	**8610 avg.**	**11257 avg.**	**24133 max.**	**1462 avg.**	**16843 max.**

Industrial, Commercial and Institutional (ICI) Flows

All flows summarized in Table 4 include industrial, commercial and institutional flows in addition to residential flows. It is assumed that wastewater flow rates for future growth of industrial, commercial, institutional and residential will remain proportionate to current flow levels and, therefore, have been incorporated into the per capita flows generated in the following sections.

Existing Per Capita Flows

Existing Per Capita Domestic Flow Production = Base Flow / Population
= 7148 / 22144
= 0.323 $m^3/c/d$
(Say 325 L/c/d)

Existing Per Capita Average I/I = Avg. I/I / Population
= 1462 / 22144
= 0.066 $m^3/c/d$
(Say 75 L/c/d)

Existing Per Capita ADF = ADF / Population
= 8610 / 22144
= 0.389 $m^3/c/d$
(Say 400 L/c/d)

Existing Per Capita MMF	=	MMF / Population
	=	11257 / 22144
	=	0.508 $m^3/c/d$
		(Say 510 L/c/d)
Existing Per Capita Peak I/I	=	Peak I/I / Population
	=	16843 / 22144
	=	0.760 $m^3/c/d$
		(Say 760 L/c/d)
Existing Per Capita PDF	=	PDF / Population
	=	24133 / 22144
	=	1.090 $m^3/c/d$
		(Say 1100 L/c/d)

Existing Per Capita Peak Hour Flow (PHF) and Peak Instantaneous Flow (PIF)

Peak Hour Flow is derived by multiplying the Base Flow by the Harmon Peaking Factor, then adding the Peak I/I. The Harmon Peaking Factor is calculated as follows:

$$\text{Harmon Peaking Factor} = 1 + \frac{14}{4 + (\text{Population} / 1000)^{1/2}}$$

The existing population is based on the population as of December 31, 2008 (ie. 22528). For this population the Harmon Peaking Factor is 2.60. Therefore:

Existing Per Capita PHF	=	(2.60 x 300) + 760
(for a population of 22528)	=	**1540 L/c/d**

Peak instantaneous flows are the flows that can be experienced at the plant when all pumps in all pumping stations (that pump to the WPCP) are running at full capacity at the same time. Although pumping stations are generally designed using the Harmon peaking factor and adding peak I/I (as per the Peak Hour Flow calculation), the inclusion of redundant pump capacity means that flows in excess of each pumping station's firm capacity can be discharged to the WPCP. The excess capacity is dependent on a number of factors, including number of pumps (eg. 50% redundant pumps versus 100% redundant pumps) and length and size of forcemain, but can be conservatively estimated to be 30% higher than a pumping station's firm capacity. Therefore:

Existing Per Capita PIF	=	1.3 x 1540
(for a population of 22528)	=	**2000 L/c/d**

The population, per capita flows and calculated total existing flows are summarized in Table 5. Note again that the existing population is taken as 22528 (the population as of December 31, 2008 in Table 3).

Table 5 – Existing Population and Flows

Existing WPCP	Population / Flow
Population	22528
Per Capita ADF	400 L/c/d
Existing ADF	***9.01 ML/d***
Per Capita MMF	510 L/c/d
Existing MMF	***11.49 ML/d***
Per Capita PDF	1100 L/c/d
Existing PDF	***24.78 ML/d***
Per Capita PHF	1540 L/c/d
Existing PHF	***34.69 ML/d***
Per Capita PIF	2000 L/c/d
Existing PIF	***45.06 ML/d***

Per Capita Flows for Future Connections

The Town of Innisfil is committed to reducing water usage in new construction through the use of high-efficiency showerheads, toilets and other efficiency measures. This water usage reduction will in turn reduce domestic sewage production. A per capita domestic sewage flow reduction of 25 L/c/d in new homes compared with existing homes is considered achievable. Therefore, the design per capita average flows for the majority of future connections are:

Per Capita Domestic Flow Production = 325 L/c/d – 25 L/c/d
(for Future Connections) = **300 L/c/d**

Per Capita Average I/I = **75 L/c/d** (per existing)
(for Future Connections)

Per Capita ADF = 400 L/c/d – 25 L/c/d
(for Future Connections) = **375 L/c/d**

Some future developments have been approved based on higher or lower per capita flows and these have been left unchanged. A ledger entitled, **"Summary of Potential Future Wastewater Flows for Service Area Including OPA1"** (overleaf) lists all existing and future connections along with their individual average per capita flow allowances.

Per Capita MMF = 510 L/c/d – 25 L/c/d
(for all Future Connections) = **485 L/c/d**

Per Capita Peak I/I = **760 L/c/d** (per existing)
(for all Future Connections)

Per Capita PDF = 1100 L/c/d – 25 L/c/d
(for all Future Connections) = **1075 L/c/d**

Per Capita Peak Hour Factors for Existing Plus Future Connections

Peak Hour Flow is derived by multiplying the Base Flow by the Harmon Peaking Factor, then adding the Peak I/I. The Harmon Peaking Factor is calculated as follows:

$$\text{Harmon Peaking Factor} = 1 + \frac{14}{4 + (\text{Population} / 1000)^{1/2}}$$

The per capita peak hour flow will decrease as the population increases. Per capita peak hour flows are provided for the following populations:

At Current WPCP Capacity (14.37 ML/d)	=	36818 (1)
At Phase 1 WPCP Capacity (25 ML/d)	=	65165 (1)
At Phase 2 WPCP Capacity (39.79 ML/d (2))	=	101809 (2)

(1) $\frac{\text{WPCP Capacity} - \text{Existing ADF}}{375\ \text{L/c/d}}$ + Existing Population *(Existing ADF is 9.01 ML/d and Existing Population is 22528 per Table 3).*

(2) As established in **"Summary of Potential Future Wastewater Flows for Service Area Including OPA1"** in Main Report.

The Harmon Peaking Factors for the above populations are:

Harmon Peaking Factor (Population = 36818)	=	2.39
Harmon Peaking Factor (Population = 65165)	=	2.16
Harmon Peaking Factor (Population = 101809)	=	1.98

Per Capita Peak Instantaneous Flow (PIF)

Peak instantaneous flows are the flows that can be experienced at the plant when all pumps in all pumping stations (that pump to the WPCP) are running at full capacity at the same time. Although pumping stations are generally designed using the Harmon peaking factor and adding peak I/I (as per the Peak Hour Flow calculation), the inclusion of redundant pump capacity means that flows in excess of each pumping station's firm capacity can be discharged to the WPCP. The excess capacity is dependent on a number of factors, including number of pumps (eg. 50% redundant pumps versus 100% redundant pumps) and length and size of forcemain, but can be conservatively estimated to be 30% higher than a pumping station's firm capacity. Therefore, applying this 30% factor to the Per Capita Peak Hour Factors previously calculated, Per Capita Peak Instantaneous Factors are:

Instantaneous Peaking Factor (Population = 36818)	=	2.39 x 1.3
	=	3.11
Instantaneous Peaking Factor (Population = 65165)	=	2.16 x 1.3
	=	2.81
Instantaneous Peaking Factor (Population = 105851)	=	1.98 x 1.3
	=	2.57

DESIGN FLOW CALCULATIONS

Based on the design populations and per capita flows derived above, the critical design flows for the current WPCP capacity (14.37 ML/d) and proposed Phase 1 and Phase 2 capacities (25 ML/d and 40 ML/d respectively) are summarized in Table 6. Note that the Per Capita and Design flows are based on a blend of existing (22528) and future population.

Table 6 – Design Flows

WPCP Expansion Phase	Current WPCP Capacity	Phase 1 Expansion	Phase 2 Expansion
Population	36818	65165	101809
Per Capita ADF	390 L/c/d	384 L/c/d	391 L/c/d
Design ADF	***14.37 ML/d***	***25 ML/d***	***40 ML/d***
Per Capita MMF	500 L/c/d	494 L/c/d	491 L/c/d
Design MMF	***18.41 ML/d***	***32.19 ML/d***	***49.94 ML/d***
Per Capita PDF	1094 L/c/d	1084 L/c/d	1081 L/c/d
Design PDF	***40.28 ML/d***	***70.63 ML/d***	***110.06 ML/d***
Per Capita PHF	1514 L/c/d	1427 L/c/d	1365 L/c/d
Design PHF	***55.72 ML/d***	***92.99 ML/d***	***138.96 ML/d***
Per Capita PIF	1968 L/c/d	1855 L/c/d	1775 L/c/d
Design PIF	***72.44 ML/d***	***120.86 ML/d***	***180.65 ML/d***

Note that the peak flow used in the design for the current WPCP rated capacity is approximately equal to the design PDF calculated above.

For the Phase 1 and Phase 2 expansions, the WPCP components are to be sized based on the following design flows:

Pumping Stations	Peak Instantaneous Flow
Screening	Peak Instantaneous Flow
Grit Removal	Peak Hour Flow
Primary Sedimentation	Peak Day Flow
Aeration with nitrification	Average Day Flow for BOD_5 loading; Peak Day Flow for TKN loading
Secondary sedimentation	Peak Hour Flow
Sludge Return	Average Day Flow (50% to 200%)
Disinfection	Peak Hour Flow

Effluent Filtration	Peak Hour Flow
Outfall Sewer	Peak Instantaneous Flow
Sludge Treatment	Maximum Month Flow

Appendix ‘E’

Innisfil

Town of Innisfil
Water Conservation and Efficiency Strategy

8

PUBLIC COMMENT SHEET

Public Open House
April 8, 2014
Innisfil Town Hall, Community Rooms

NAME: [redacted]

LAND OWNER/COMPANY: ______

ADDRESS: [redacted]

PHONE: [redacted] EMAIL: [redacted]

MY COMMENTS ARE AS FOLLOWS:

- toilet rebates
- rain barrel rebates
= garden landscape - water efficient plants.
  ↳ appraisal.
- someone to do home visits + help me w my gardens

Information will be collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record. Questions regarding this collection should be directed to the project manager.