Township of Puslinch

TECHNICAL MEMORANDUM NO.1
STUDY AREA CHARACTERIZATION AND WATER AND WASTEWATER DEMAND ANALYSIS

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1. Introduction

1.1 Background

The Township of Puslinch (Township) is undertaking a Feasibility Study to assess the viability of implementing municipal water and sewage services within key areas of the Township. Currently, water and wastewater services in the Township consist of individual on-site wells and septic systems, as well as a few small and private communal water and sewage systems servicing individual developments.

The Township is surrounded by growing urban centres on all four sides with increasing demands for resources and land. The natural setting surrounding the Township and its accessibility to major markets and urban centres make this area an attractive place for development. Realizing this potential and the limitations on opportunities for growth resulting from lack of servicing, the need to assess the viability of implementing municipal water and wastewater services for key areas within the Township was identified.

1.2 Purpose of this Technical Memorandum

The purpose of Technical Memorandum No.1 (TM-1) is to provide a general description of the study area; to summarize information obtained from the Township and the key users on current water demands; to identify current land use designations and plans for future growth and development; and to estimate future water demands and wastewater flows for use in assessing the feasibility of providing municipal water and wastewater services. The information presented in this TM-1 will provide the foundation for the development of water and sewage servicing options. TM-1 is not intended to be a design document.

2. Study Area

2.1 Overview

The Township of Puslinch is located in south-central Ontario in Wellington County, generally southeast of the City of Guelph. The Township, along with six other lower tier municipalities, make up the County of Wellington.

A study area has been delineated to comprise key growth areas within the Township. The project Study Area is generally bounded by Maltby Road to the north, Victoria Road South to the east, Highway 401 to the south, and Highway 6 to the west, plus the settlement area of Morriston south of Highway 401, as shown below in Figure 1. Two major urban centres, Aberfoyle and Morriston, are found within the limits of the study area. The City of Guelph abuts the northern most limits of the study area.

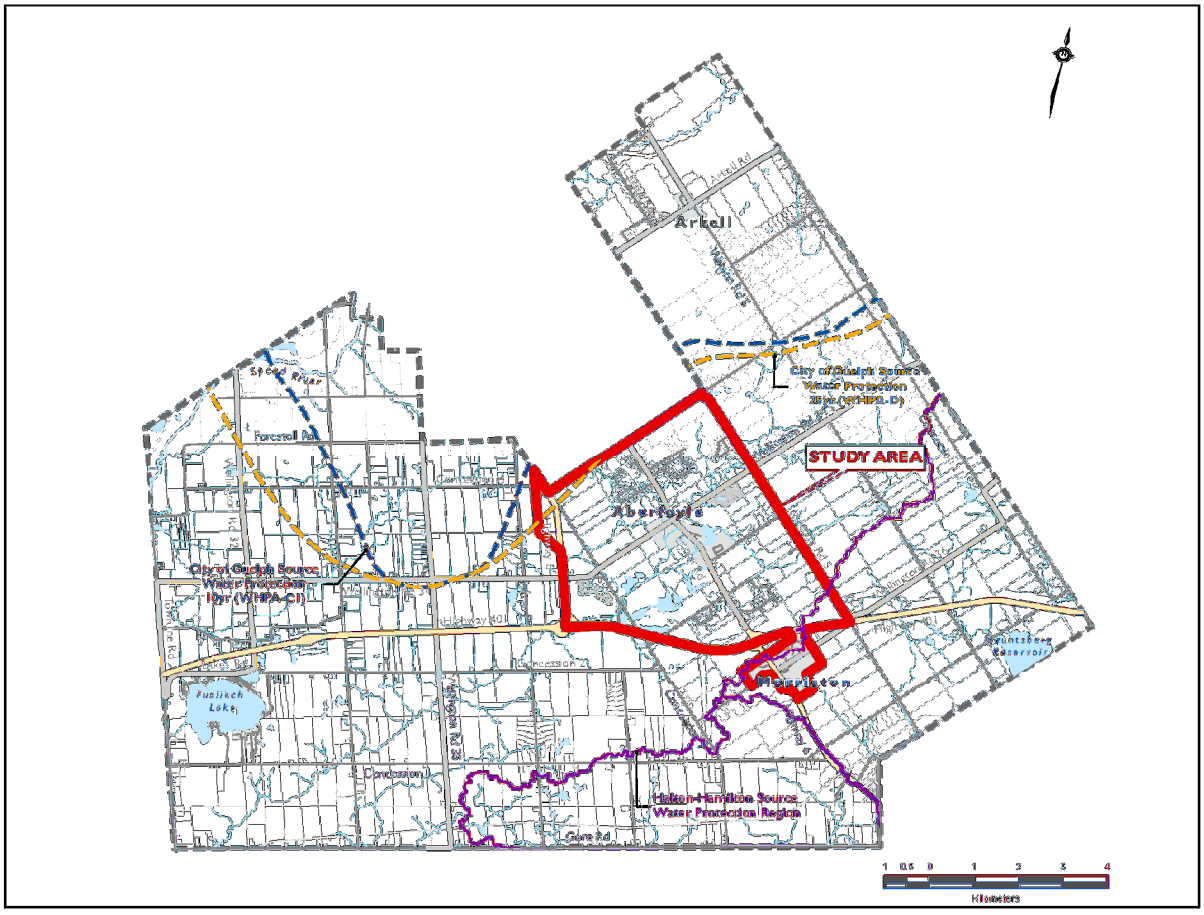

Figure 1 Study Area Map

2.2 Land Uses

The County of Wellington provides Planning Services for all growth and development related issues for the Township of Puslinch. The County, on behalf of the Township, has developed the Township's Official Plan (OP), which is used to guide all land use, growth strategies and servicing decisions for

the Township. Existing land use designations within the study area are graphically presented in Figure 2.

The predominant Land Use designation within the Study Area is Secondary Agricultural lands. A small pocket of lands considered to be Prime Agricultural areas is found in the southeast corner of the study area. Portions of the greenland system are generally identified running northwest throughout the study area. Two pockets of rural employment areas are located near the highway exits off of Highway 401 and Highway 6, which corresponds to the locations of the major business area in the study boundary. Country residential lands are generally located in the north portion of the study area, with Aberfoyle and Morriston identified as urban centres.

The community of Aberfoyle has a designated central business district along Brock Road South, and residential areas generally located adjacent to the business areas. Industrial lands are designated within Aberfoyle on the Township Municipal Office and County Works Yard lands on the north side of Wellington Road 34. Recreational designated lands are located in the centre of Aberfoyle, on the northwest corner of Brock Road and Maple Leaf Lane, where the Puslinch Community Centre, ORC, library and sports fields are located. A highway commercial area is designated in the north portion of the community. Watercourses and ponds located within the Aberfoyle Urban Centre are considered Core Greenlands.

The central area of the Aberfoyle Urban Centre is within the floodplain of Mill Creek and its tributary streams. The Official Plan also recognizes the role that Aberfoyle plays as the Township centre of rural residential, commercial and other community land uses. As such, limited development within the lands designated as “Special Policy Area PA7-7” is permitted. An area designated as Future Development area is found south of Wellington Road 34 and west of Brock Road South.

The Morriston Urban Centre is primarily designated as residential land, with Greenlands located at the east portion of the community and a Core Greenland system surrounding a watercourse. A central business district is designated along Queen Street.

2.3 Source Water Protection Areas

The City of Guelph and Hamilton Region Source Protection Areas extend into the study area (see Figure 1). The City of Guelph Wellhead Protection Areas (WHPA), WHPA-D, corresponding to the 25 year time of travel, extend into the northwest portions of the study area. Enhanced development potential within source water protection areas could result from implementation of municipal servicing in the area.

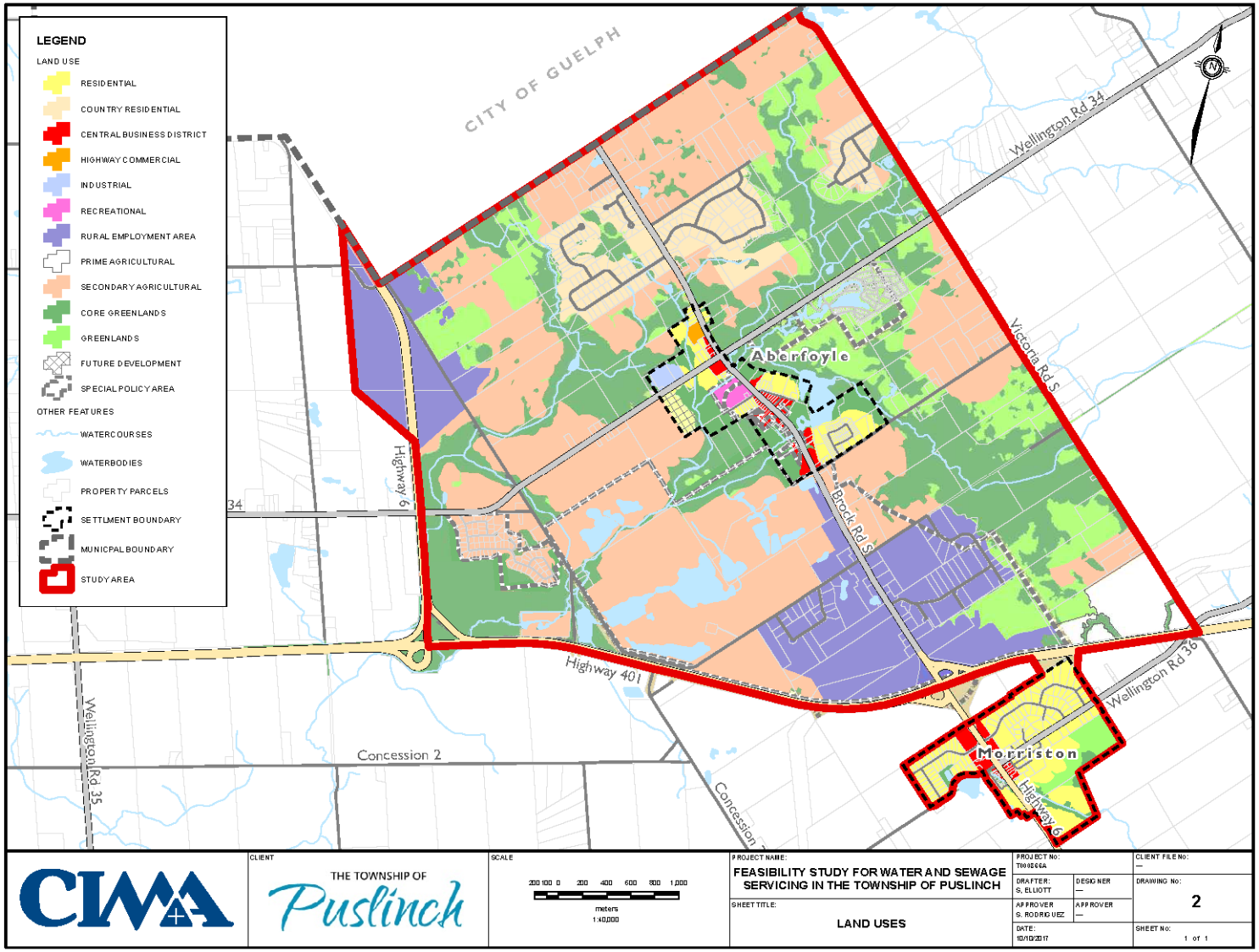

Figure 2 Existing Land Use Designations within Study Area

2.4 Population and Planning Projections

Projected growth within the study area has been set out in the County's OP. According to the OP, the majority of growth will be directed to urban centres that offer municipal water and sewer servicing and, to a limited extent, to those urban centres and hamlets that offer partial, private communal or individual on-site services. For the Study Area, the majority of the anticipated growth will be directed to the Aberfoyle and Morriston Urban Centres. Growth will also be directed, to a lesser extent, to secondary agricultural areas, provided that the planning policies for these areas are met.

2.4.1 Residential Projections

As per conversations with staff from the County of Wellington, the majority of the residential growth in the Township is expected to occur outside of the study area. Projected residential growth for the study area on the other hand, has been assumed to occur primarily within Aberfoyle and Morriston Urban Centres. The residential forecasts for these areas, as per the County's OP are shown in Table 1. Residential forecasts established in the County's OP are based on current available servicing.

Table 1 Projected Residential Growth – Aberfoyle and Morriston

Urban Centre	Projected Growth / Planning Period		
	2016	2036	2041
Aberfoyle[1]	325	345	335
Morriston[1]	480	590	620

Notes :

1. Projected Residential Growth as per Wellington County Official Plan May 6, 1999 (Last Revision September 1, 2016). Includes the net undercount adjustment which is estimated at approximately 4.1%.

Municipal infrastructure projects are normally planned for a 20-25 year planning horizon. Extended design periods are sometimes used for projects of difficult nature and high capital expenditures. For the purpose of this feasibility study, a 25 year design period corresponding to a design year 2041 has been considered adequate. As such, and consistent with the County's OP population projections, a residential population increase of 10 people in Aberfoyle and 140 people in Morriston has been used.

2.4.2 Employment Projections

Employment forecasts for the Township, as per the County's OP are shown in Table 2.

Table 2 Projected Employment Growth – Township of Puslinch

Urban Centre	Projected Growth / Planning Period		
	2016	2036	2041
Total Employment	4,017	5,161	5,632

Notes :

1. Projected Employment Growth as per Wellington County Official Plan May 6, 1999 (Last Revision September 1, 2016). Includes 'no fixed place of work' employment.

Based on a breakdown for employment forecasts for the Township, provided by the County of Wellington, it is known that a total employment population of 2,224 was considered of industrial type in 2016, representing approximately 55% of the total 4,020 employment count in 2016. For the purpose of this Feasibility Study and based on discussions with staff from the County of Wellington, the following assumptions have been made:

- All 2,224 employment recorded in 2016 have occurred within the study area, and most specifically, within the major large users known to exist in the study area. As such, water demands exerted from this employment population in 2016, have already been captured in the water demands provided by the large users.
- An employment growth of approximately 1,610 jobs will occur between 2016 and 2041 within the study area. This assumed growth includes primary, work at home, industrial, commercial, institutional and no-fixed-place-of-work job types.

The assumptions noted above are considered conservative but adequate for the level of detail required in a feasibility study. Actual employment numbers within the existing large users need to be verified if the project proceeds to the next stages (i.e. Class Environmental Assessment Study).

2.5 Existing Water and Sewage Services

Municipal servicing is currently not available in the Township. Water and sewage services in the study area currently consist of individual on-site wells, septic systems and a few on-site small and private communal water and sewage systems. The Township has an active role in monitoring the operation and efficiency of these private systems; however, all aspects of operation, monitoring, maintenance and repairs associated with private systems, are ultimately, the responsibility of the systems' owner.

Permits to Take Water (PTTW) issued by the Ontario Ministry of Environment and Climate Change (MOECC) require that each permit holder measure and record volumes and rates of water taken each day. Such records shall be submitted every year to the Ministry's Water Taking Reporting System (WTRS).

As part of this Feasibility Study, all major users within the study area were contacted directly and requested to provide the most up-to-date water and wastewater usage data, including the latest water volumes reported to the Ministry's WTRS. The following sections present a summary of water usage/consumption for each of the major large users within the study area, as per available operating records and data provided to CIMA+ for 2015 and/or 2016. Large users are not required to monitor or measure wastewater flows, and thus this information was not readily available. Wastewater information that was provided to CIMA+, when measured and recorded by the user, has been included in the corresponding section for each major user.

2.5.1 Residential Uses

Existing residential properties within the study area are generally serviced by individual on-site well and septic systems. A few major community facilities have a dedicated on-site water system which include the Puslinch Community Centre, Optimist Recreational Centre, and municipal offices. There

are also a few residential development communities that operate their own private communal water and sewage systems, including:

- Meadows of Aberfoyle,
- Mini Lakes, and;
- Millcreek Camping and Country Club.

Additional information for each of the above residential communities is provided as follows:

Meadows of Aberfoyle Communal Well Supply System

The Meadows of Aberfoyle is a single family residential development, located in the southeast area of Aberfoyle, north of Gilmour Road and east of Brock Road. It comprises 55 building lots and has been considered fully occupied since May 2011. This community is served by a communal water supply system, which consists of two wells serving the residents, as well as groundwater and surface water monitoring stations. Available water usage related data for this system is summarized in Table 3 below.

Table 3 Meadows of Aberfoyle – Water Servicing Data

Source ID	Usage Type	Max. Taking as per PTTW[1] (L/s)	Average Taking (L/s)[2]	Max. Taking (L/s)[3]	% of Permitted Max. Taking[4]
PW7	Water Supply	9.1	0.32	1.26	14%
PW6	Water Supply	9.1	0.28	1.92	21%
PW5[5]	Irrigation	0.78	-	-	-
PW2[5]	Irrigation	1.59	-	-	-
Total System Average Demand (L/s) =			**0.61**		
Unit per Capita Consumption Rate (L/cap/day)[6] =			**353**		

Notes :

1. Maximum taken as per existing PTWW #5626-7WLQ3W.
2. Two year average demands based on 2015 and 2016 data reported in the MOECC WTRS.
3. Two year average maximum demands based on 2015 and 2016 data reported in the MOECC WTRS.
4. % ratio between actual maximum taking and PTTW permitted max. taking
5. No water reported taken from well.
6. Unit per capita consumption rate calculated based on average system demands for PW7 and PW6 and a total service population of 149 people. Assumed a 2.7 PPU which is consistent with PPU for Aberfoyle for 2016 as per County's OP.

As per the 2016 Monitoring Report for this system, wells PW6 and PW7 were the only wells pumped. Wells PW5 and PW2 only serve as observation wells. In addition, water pumping and distribution system is controlled in a manner that wells PW6 and PW7 cannot be pumped simultaneously.

Meadows of Aberfoyle uses individual private septic systems for wastewater treatment and disposal.

Mini Lakes Communal Well Supply System

The Mini Lakes Mobile Home Community is a private community located just outside of Aberfoyle off of Wellington County Road 34. The drinking water system is classified as a Non-Municipal Year Round Residential System under O. Reg. 170/03. There are approximately 260 service connections to the drinking water system servicing approximately 450 people. An additional 31 services are in place for the remaining development lots.

The drinking water system consists of three production wells and three corresponding pump houses, all connected to the distribution system that consists of 50 mm to 70 mm diameter polyethylene piping. Each pump house has a dedicated treatment system. Raw water is disinfected with sodium hypochlorite prior to entering the distribution system. Water is filtered using a multi-media filtration system and passed through a series of pressure retention tanks prior to being discharged into the distribution system. The water distribution system consists of three separate pressure zones, fully interconnected and isolated by valves. Available water usage related data for this system is summarized in Table 4 below.

Table 4 Mini Lakes – Water Servicing Data

Source ID	Usage Type	Max. Taking as per PTTW[1] (L/s)	Average Taking (L/s)[2]	Max. Taking (L/s)[3]	% of Permitted Max. Taking[4]
PW1	Water Supply	1.7	0.29	0.81	48%
PW2	Water Supply	2.3	0.43	0.94	41%
PW3	Water Supply	3.7	0.81	1.56	42%
PW4[5]	-	3.4	-	-	-
Total System Average Demand (L/s) =			**1.53**		
Unit per Capita Consumption Rate (L/cap/day)[6] =			**294**		

Notes :

1. Maximum taken as per existing PTWW #7137-AG7SV2.
2. Two year average demands based on 2015 and 2016 data reported in the MOECC WTRS.
3. Two year average maximum demands based on 2015 and 2016 data reported in the MOECC WTRS.
4. % ratio between actual maximum taking and PTTW permitted maximum taking.
5. No water reported taken from well. Well decommissioned in 2015.
6. Unit per capita consumption rate calculated based on average system demands for the 3 existing wells and a total service population of 450 people.

Available wastewater flows related data for this system is summarized in Table 5 below.

Table 5 Mini Lakes – Wastewater Servicing Data

Criteria	Value
Total Average Wastewater Flows (L/s)[1] =	1.1
Total Average Wastewater Flows (m3/d) =	98.8
Unit per Capita Production Rate (L/cap/day)[2] =	219
Notes :	

1. Two year wastewater flows based on 2015 and 2016 data
2. Unit per capita consumption rate calculated based on average wastewater flows and a total service population of 450 people.

Mini Lakes is allowed under the Amended Environmental Compliance Approval (ECA) #8154-AR4J2T to treat and dispose of 158 m^3/d of treated wastewater from a maximum of 292 residential units. The wastewater treatment system consists of three pumping stations that discharge to a wastewater treatment plant. Treatment consists of a primary settling tank, rotating biological contactors (RBCs), an intermediate clarifier, a denitrification tank, and a final clarifier. The effluent pump discharges the treated wastewater for subsurface disposal to one of the five shallow buried trench absorption cells.

Millcreek Camping and Country Club

Millcreek is a manufactured home community (also known as a land leased community). A PTTW is not required for the community since the water taking is less than 50 m^3/d. Available water usage related data for this system is summarized in Table 6 below.

Table 6 Millcreek Camping and Country Club – Water Servicing Data

Source ID	Usage Type	Max. Taking as per PTTW (L/s)	Average Taking (L/s)[1]	Max. Taking (L/s)	% of Permitted Max. Taking
N/A	N/A	N/A	0.36	-	N/A
Total System Average Demand (L/s) =			**0.36**		
Unit per Capita Consumption Rate (L/cap/day)[6] =			**N/A**		

Notes :

1. Two year average demands based on 2015 and 2016 data.
N/A = Not Applicable

Millcreek uses individual private septic systems for wastewater treatment.

2.5.2 Industrial and Commercial Uses

The major industrial and commercial large water users within the study area, along with their permitted water takings, are listed below in Table 7. A brief overview of each of the large users and their reported water demands/consumptions are summarized in the following sections.

Table 7 Major Industrial and Commercial Users

ID	User Name	Usage Type	PTTW #	Max. Taking as per PTTW (L/s)	
				L/s	m3/d
1	Royal Canin Canada Company	Food processing	3782-AB6MMX	2.8	240
2	Con-Cast Pipe Inc.	Concrete pipe manufacturer	8724-9GFPQE	5.2	450
3	Maple Leaf Foods – Morguard Brock McLean Limited	Distribution centre	7431-96LRQ6	7.6	654

4	Nestle Canada Inc.	Water Bottling	1381-95ATPY	41.7	3,600
5	Dufferin Aggregates – CRH Canada Group Inc.	Aggregate extraction	7510-A34KZH	94.7	8,183
6	Capital Paving Inc.	Aggregate producers	4373-8TXQK3	212.6	18,371
7	CBM Aggregates – St. Mary's Cement	Aggregate extraction	5550-9V7HXS	272.8	23,568
			7028-7LTNV9	272.8	23,568
	Total Industrial and Commercial Max. Permitted Taking =			**910**	**78,634**

Royal Canin Canada Company

Royal Canin is a pet food manufacturer located within the rural employment designated area, north of Highway 401 and east of Brock Road South. This facility uses water and generates both process and sanitary wastewater. Their reported water usage is summarized in Table 8 below.

Table 8 Royal Canin Canada – Water Usage

Water Source	Reported Average Water Taking[1]		Max. PTTW Taking	Actual Taken / PTTW
	m3/d	L/s	L/s	%
Well PW-1	93.8	1.1	2.8	39%

Notes :

1. Two year average usage based on reported 2015 and 2016 data.

Royal Canin uses separate wastewater treatment systems for its process and domestic wastewater. They are allowed under Amended ECA #1042-A3QQRY to discharge 30 m^3/d of treated process and domestic flows for subsurface disposal. The process wastewater treatment system consists of a 40 m^3 equalization tank and a dissolved air flotation unit. A membrane bioreactor (rated treatment capacity of 75 m^3/d) is approved to be incorporated into the existing process wastewater treatment system, as well as a UV disinfection unit and osmosis unit for reuse of water for operations. The domestic wastewater treatment system consists of a pump station, a sequencing batch reactor (SBR) (rated treatment capacity of 30 m^3/d), and a sand filter (the filter is approved to be replaced with a drum filter). Both treated process and domestic wastewater discharges to a shallow buried trench system that is laid out in two beds.

The average process and domestic wastewater discharged for subsurface disposal by this facility are summarized in Table 9 below.

Table 9 Royal Canin – Wastewater Generation

Sewage Source	Reported Average Wastewater Generation[1]		System Rated Capacity	Actual Generation / Rated Capacity
	m3/d	L/s	m3/d	%
Process and domestic wastewater to buried trench	42	0.54	30	140%

Notes :

1. One year average wastewater generation based on 2016 data.

Con-Cast Pipe Inc.

Con-Cast Pipe Inc. is a precast concrete products manufacturer. The manufacturing facility is located within the rural employment designated area, north of Highway 401 and west of Brock Road South. Their footprint comprises a dry cast facility of approximately 120,000 square foot and a wet cast facility of approximately 30,000 square foot. Their reported water usage is summarized in Table 10 below.

Table 10 Con-cast Pipe Inc. – Water Usage

Water Source	Reported Average Water Taking[1]		Max. PTTW Taking	Actual Taken / PTTW
	m3/d	L/s	L/s	%
Well WSW 1	245.3	2.8	5.2	55%
Well WSW 2				

Notes :

1. Two year average usage based on reported 2015 and 2016 data.

Con-Cast Pipes is allowed under Amended ECA #3621-6HRKGC to treat and dispose of process wastewater at an average flow of 5.66 m^3/d from its pre-cast concrete manufacturing facility. The treated process wastewater is discharged to one of two on-site infiltration ponds. Based on information provided by Con-Cast Pipe Inc., process wastewater flows are not monitored.

Maple Leaf Foods – Morguard Brock McLean Limited

Maple Leaf Foods has a distribution centre within the Township that distributes the company's prepared meats throughout central and eastern Ontario. Schenker Canada operates the distribution centre on behalf of Maple Leaf Foods. Based on information received from Schenker Canada, the water is used for the cooling tower/condenser and the sprinkler; however, their water use is restricted based on the capacity of their septic bed. Their reported water usage is summarized in Table 11 below.

Table 11 Maple Leaf Foods – Water Usage

Water Source	Reported Average Water Taking[1]		Max. PTTW Taking	Actual Taken / PTTW
	m3/d	L/s	L/s	%
TW1	21.6	0.2	7.6	3%
TW2				

Notes :

1. Two year average usage based on reported 2015 and 2016 data.

In terms of wastewater generation, Maple Leaf Foods is allowed under Amended ECA #7567-94EK2F to treat and dispose of 17 m^3/d of treated domestic wastewater. The wastewater treatment system consists of two septic tanks (total capacity of 25 m^3), a tertiary treatment septic tank (rated treatment capacity of 17 m^3/d), and a polisher tank. The treated wastewater is discharged to a raised stone and sand bed for subsurface disposal. The average domestic wastewater generated by this facility are summarized in Table 12 below. Process wastewater is not produced on-site as part of their operations.

Table 12 Maple Leaf Foods – Wastewater Generation

Sewage Source	Reported Average Wastewater Generation[1]		System Rated Capacity	Actual Generation / Rated Capacity
	m3/d	L/s	m3/d	%
Domestic wastewater to septic system	14.3	0.17	17	90%

Notes :

1. Two year average wastewater generation based on 2015 and 2016 data.

Nestle Canada Inc.

Nestle Canada Inc. operates a water bottling facility, located within the rural employment designated area, south of Aberfoyle. Their reported water usage is summarized in Table 13.

Table 13 Nestle Canada Inc. – Water Usage

Water Source	Reported Average Water Taking[1]		Max. PTTW Taking[2]	Actual Taken / PTTW
	m3/d	L/s	L/s	%
TW3-80	2,117.7	24.5	41.7	59%
TW2-11[3]	-	-	-	-

Notes :

1. Two year average usage based on reported 2015 and 2016 data.
2. As per PTTW, the total taking of 3,600 m3/d must not be exceeded for the combination of the water sources.
3. Well TW2-11 is to be used for miscellaneous purposes only (such as supplying water for firefighting purposes). As per information provided, no water was taken from Well TW2-11 in 2015 or 2016. Nestle Canada Inc. has recommended that the well be decommissioned.

Nestle Waters operates under two separate approvals for its process and domestic wastewater. Amended ECA #2766-8Z6QHV allows Nestle Waters to treat and dispose process wastewater and stormwater at an approximate peak flow of 1,444 m^3/week. The process wastewater treatment system consists of a wet well/pump station, two aerated ponds, and six storage ponds. The treated process wastewater discharges to Aberfoyle Creek, which is a tributary of Mill Creek and part of the Grand River watershed. Certificate of Approval (C of A) #3152-55LQ59 permits the treatment and disposal of 15.9 m^3/d of domestic wastewater. The approved domestic wastewater treatment system consists of pumping chambers, three septic tanks (total capacity of 41 m^3), four tertiary treatment septic tanks

(total rated treatment capacity of 20 m^3/d), and a dosing chamber. The treated domestic wastewater is approved to discharge to a leaching bed and a shallow buried trench.

Based on information provided by Nestle Waters, process and domestic wastewater flows are not monitored.

Dufferin Aggregates – CRH Canada Group Inc.

Dufferin Aggregate (a division of CRH Canada Group Inc.) is an aggregate extraction business and operates three extraction pits within the Township of Puslinch. Out of the three pits, only one (Aberfoyle Pit No.1) is within the rural employment designated area, at 125 Brock Road. Their washing operation consists of a closed-loop washing system where the wash water from the wash plant is re-circulated through a settling pond system. Make-up water is periodically taken from the source pond to top-up the amount of water entering the wash plant to compensate from any loss water due to evaporation, infiltration or water adhering to aggregate products.

PTTW #5153-A49MT9 was also registered for this site as per MOECC online records. In communication with CRH Canada Group Inc., it was clarified that this PTTW was for a concrete plant that was on the same site; however, the plant is no longer onsite and water has not been taken from this source since 2010. Their reported water usage for the active wells is summarized in Table 14 below.

Table 14 Dufferin Aggregates – Water Usage

Water Source	Reported Average Water Taking[1]		Max. PTTW Taking[2]	Actual Taken / PTTW
	m3/d	L/s	L/s	%
Pond 5	8.64	0.10	94.7	0.1%
Make Up Pond 6	126.1	1.46	94.7	2%
Total	134.8	1.56	94.7	2%

Notes :

1. Average usage based on reported 2016 data.
2. As per PTTW, the total taking amount may increase from 8,182 m3/d (94.7 L/s) to 12,274 m3/d (142 L/s) for any four months between April and November, and no water shall be taken in January and December. Water must also not be taken from one of the ponds for more than 10 consecutive days in February and March. At all times, water is not permitted to be taken from both ponds simultaneously.

Capital Paving

Capital Paving is a civil construction company specializing in transportation. The head office location in Puslinch has an asphalt and concrete plant, and an aggregate pit on-site. They have four sources for water taking to supply their plant operations, aggregate washing, and office use. According to communication with Capital Paving, there are plans to build a full wash plant on site in the near future, which will increase the water demands for aggregate washing. Their reported water usage is summarized in Table 15 below.

Table 15 Capital Paving – Water Usage

Water Source	Reported Average Water Taking[1]		Max. PTTW Taking[2]	Actual Taken / PTTW
	m3/d	L/s	L/s	%
Pond B – Aggregate washing	166.1	1.92	196	1%
Well A – Office Use	2.4	0.03	1.3	2%
Well B – Asphalt Plant	51.7	0.60	6.0	10%
Well C – Concrete Plant	60.6	0.70	0.70	10%
Total	280.9	3.3	213	2%

Notes :

1. Average usage based on reported 2015 and 2016 data.

CBM Aggregates – St. Mary's Cement

CBM Aggregates (a division of St. Mary's Cement) is an aggregate extraction business and operates multiple extraction pits within the Township. The pits that have a wash plant on-site are the Aberfoyle and McNally pits, which operate under separate PTTWs to authorize aggregate washing in a closed loop system. Their reported water usage is summarized in Table 16 below.

Table 16 CBM Aggregates – Water Usage

Water Source	Reported Average Water Taking[1]		Max. PTTW Taking[2]	Actual Taken / PTTW
	m3/d	L/s	L/s	%
Aberfoyle Main (North) Pit Pond	14,411	166.8	272.8	61%
McNally Supply Pond	13,726	158.9	272.8	58%
Total	28,137	325.7	545.6	60%

Notes :

1. Average usage based on reported 2015 and 2016 data.

2.6 Summary of Large Users Demands and Flows

2.6.1 Existing Water Demands

A summary of the water demands/usage that have been established for the large users based on 2015-2016 operating / recorded data provided is presented in Table 17. It is noted that water demands for all other single residential units/dwellings within the study area are not included in Table 17. These additional demands have been calculated separately and are presented in the following sections of this memorandum.

Table 17 Summary of Existing Water Usage – Large Users

Large User Name	Average Water Taking[1]		Max. PTTW Taking	Actual Taken / PTTW
	m3/d	L/s	L/s	%
Residential Users				
Meadows of Aberfoyle	52.6	0.6	18.2	3%
Mini Lakes	132.5	1.5	7.7	19%
Millcreek Camping and Country Club	31.2	0.4	N/A	-
Total Large Residential Users =	**216.3**	**2.5**		
Large Industrial / Commercial Users				
Royal Canin Canada Company	93.8	1.1	2.8	39%
Con-Cast Pipe Inc.	245.3	2.8	5.2	55%
Maple Leaf Foods – Morguard Brock McLean Limited	21.6	0.2	7.6	3%
Nestle Canada Inc.	2,117.7	24.5	41.7	59%
Dufferin Aggregates – CRH Canada Group Inc.	134.8	1.56	94.7	2%
Capital Paving Inc.	280.9	3.3	213	2%
CBM Aggregates – St. Mary's Cement	28,137	325.7	545.6	60%
Total Large Industrial / Commercial Users =	**31,030**	**359.1**	**910.1**	**39%**

As shown in Table 17, the majority of all large users including residential and industrial and commercial, have current water demands in their systems below 60% of their permitted maximum water taking. A more representative assessment would involve a comparison between the maximum demands experienced by each system against the maximum permitted taking; however, in the absence of maximum day demand data, the average recorded flows have been compared relative to the maximum allowable water takings to provide a general indication of the current water demands for each user.

As per Table 17, Con-Cast Pipe Inc., Nestle Canada and CBM Aggregates – St. Mary's Cement, are the users with the largest volumes of water usage, relative to their existing permitted water taking capacity. Although Con-Cast Pipe Inc. uses in average approximately 55% of their permitted maximum taking capacity, the water demands for this system are very small compared to the amount of water used on an average daily basis by Nestle Canada and CBM Aggregates – St. Mary's Cement.

2.6.2 Existing Wastewater Flows

Based on information received directly from the majority of the large users, tracking of wastewater generation is not required and thus, this information is generally not available. Wastewater flow data was received from two users within the study area, but considering the different nature of the activities that occur onsite, these data are considered specific to each user and is not deemed to be

representative of the current wastewater generation for the majority of the users in the Study Area. As such, this data has been omitted from further review.

For the purpose of the feasibility study, wastewater flow generation will be calculated with consideration to the nature of the business and design guidelines provided by the MOECC. Calculated wastewater flows for the study area are presented in the following section.

3. Water and Wastewater Demand Analysis

Establishing water distribution, wastewater collection, and supply and treatment capacity design flows are integral to capital planning and are key drivers for establishing future needs and timelines for project implementation. This section describes the proposed preliminary design parameters, in terms of water demands and wastewater flows, for municipal water and wastewater servicing in the Study Area and the rationale for its development.

3.1 Water System

There are two major components to development of a new Municipal Water System; namely, the Water Supply System and the Water Distribution System.

3.1.1 Water Supply Design Basis

Water treatment systems are generally designed on the basis of projected flows for a 20-year period. A larger design period may be selected for larger systems, in cases where construction cost is an overriding factor or to satisfy the ultimate requirements of the official plan.

The drinking water system, including water supply sources, water treatment plant and treated water storage are typically designed to satisfy the projected maximum day water demand of the service area. As such, establishing the design average and maximum day demands for the system is a critical step in the planning of water systems.

In order to establish the water demands for the study area, a 25-year planning period which corresponds to the year 2041, has been assumed. Projected water demands have been calculated assuming the residential projected growth in Aberfoyle and Morriston, as established in the County's Official Plan. In addition, it is presumed that no additional growth will occur within the existing residential communities currently serviced by private communal water systems, with the exception of the Mini Lakes Community, which has reported to have an additional 31 future service connections. In terms of industrial and commercial water demands, maximum day demands for the service area have been projected based on current water usages for each of the large users and a design maximum day factor representative of the mix of industrial and commercial users in the study area.

The basis for calculating the design average and maximum day water demands for the study area are tabulated in Table 18.

Table 18 Water Design Basis

Criteria	Value	Units	Comments
Unit per Capita Consumption Rate	360	L/cap/d	Assumed as the mid-point from MOECC range of 270-450 L/cap/day and marginally above the Meadows of Aberfoyle rate of 353 L/cap/d.
Residential Max. Day Factor	2.0	-	Based on MOECC Guidelines and expected future total residential and employment population of 7,900 for the study area.
Industrial/Commercial Max. Day Factor	3.0	-	Based on MOECC suggested range between 2 and 4 for industrial uses.

3.1.2 Water Distribution Design Basis

The Water Distribution system should be designed to meet the MOECC Design Guidelines. In particular, the system shall;

- Be capable of maintaining system pressures between 350 to 480 kPa (50 to 70 psi) under normal operating conditions.
- The maximum system pressure in the distribution system should not exceed 700 kPa (100 psi). Where local areas may experience higher system pressures, pressure reducing devices should be provided to avoid damage to household plumbing and unnecessary energy consumption.
- System pressures shall not drop below 140 kPa (20 psi) under Maximum Day plus Fire Flow conditions.
- Provision of Fire Protection through the Municipal water distribution system is a Municipal decision. If the Township decides to provide fire protection via the municipal water system, the minimum fire flows should be established with consideration given to the latest Fire Underwriter's Survey document "Water Supply for Public Fire Protection" and/or the MOECC's fire flows guidelines, whichever is judged more appropriate.

3.1.3 Preliminary Projected Water Demands

Preliminary projected water demands for the study area, based on the information available to-date, including residential, employment, and industrial and commercial uses are summarized in Tables 19, 20, and 21 respectively. Existing water demands for each user are also included in the tables, where available, for comparative purposes.

Table 19 Preliminary Projected Residential Water Demands

Residential Area	Population		2016 Existing Average Day Demands	2041 Future Average Day Demands[4]	2041 Future Max. Day Demands[5]
	2016	2041	L/s	L/s	L/s
Meadows of Aberfoyle	149	149	0.6	0.6	1.2
Mini Lakes[1]	450	504	1.5	2.1	4.2
Millcreek Camping and Country Club	87	87	0.4	0.4	0.7
Aberfoyle[2]	176	186	0.7	0.8	1.6
Morriston	480	620	2.0	2.6	5.2
Other Areas[3]	731	731	3.1	3.1	6.1
Total =	**2,073**	**2,277**	**8.3**	**9.5**	**19.0**

Notes :

1. Future population for Mini Lakes assumes 31 future service connections and a PPU of 1.7 (based on reported current population of 450 people and 260 service connections in 2016).

2. Aberfoyle existing population is calculated based on the reported 325 people in 2016 as per County's Official Plan minus existing population of 149 people currenlty serviced in the Meadows of Aberfoyle community which is located within the limits of Aberfoyle. Projected growth in Aberfoyle is consistent with the County's OP projections.
3. A total of 270 residential units/dwellings have been identified outside of Aberfoyle and Morriston but within the study area boundaries. A PPU of 2.7, as reported for Aberfoyle in the County's OP, has been used to calculate the total residential population for these additional units.
4. Future average day demands assume a unit consumption rate of 360 L/cap/day.
5. Future max. day demands assume a max. day factor of 2.0.

Table 20 Preliminary Projected Employment Water Demands[1]

Area	Employment[1]		2016 Existing Average Day Demands	2041 Future Average Day Demands[2]	2041 Future Max. Day Demands[3]
	2016	2041	L/s	L/s	L/s
Study Area	1,793	3,408	7.5	14.2	28.4

Notes :

1. Preliminary projected employment water demands shown in Table 20 reflect total employment count for the study area with the exception of industrial employment count records for 2016. Water demands for 2016 industrial employment have been captured and accounted for in the water demands received from the large users. For example; total 2016 employment as per OP is 4,017, out of which 2,224 corresponds to industrial employment. Since demands for industrial employment has been assumed under demands gathered from existing users, total 2016 employment numbers for study area is 1.793 (4,017 – 2,224). Total forecasted 2041 employment as per OP is 5,632, under the same assumption of industrial employment demands already captured, total 2041 employment numbers for study area is 3,408 (5,632 – 2,224).
2. Future average day demands assume a unit consumption rate of 360 L/employment/day.
3. Future max. day demands assume a max. day factor of 2.0.

Table 21 Preliminary Projected Industrial and Commercial Water Demands

Industrial / Commercial User	PTTW Capacity		2041 Future Average Day Demands[1]	2041 Future Max. Day Demands[2]
	m3/d	L/s	L/s	L/s
Royal Canin Canada Company	240	2.8	1.1	2.8
Con-Cast Pipe Inc.	450	5.2	2.8	5.2
Maple Leaf Foods – Morguard Brock McLean Limited	654	7.6	0.2	0.7
Nestle Canada Inc.	3,600	41.7	24.5	41.7
Dufferin Aggregates – CRH Canada Group Inc.	8,183	94.7	1.6	4.7
Capital Paving Inc.	18,371	212.6	3.3	9.8
CBM Aggregates – St. Mary's Cement	47,136	545.6	325.7	545.6
Total Existing Large Users =	**78,634**	**910.1**	**359.1**	**610.4**
Total Large Users (excluding Nestle Canada Inc. and St. Mary's Cement) =	**27,898**	**323**	**9.0**	**23.2**

Notes :

1. Future average day demands for large users assume the current water usages reported for 2015 and 2016.
2. Future maximum day demands assume a maximum day factor of 3.0. However, if the calculated maximum day demands for a user would exceed their existing PTTW taking capacity, the current PTTW rate would prevail and is shown in the table.

3.1.4 Preliminary Proposed System Water Demands

Considering the financial stability of the Township for the provision of municipal services and the implementation feasibility of a municipal water system for the study area, the following was considered:

- Some large industrial users may not want to use municipal chlorinated water as it may affect their operations.
- Based on the nature and the character of the business of some of the large users, it won't be viable to provide municipal services, especially potable water services, to some of these users (e.g., Nestle Canada Inc. and St. Mary's Cement) that are currently permitted and currently use significant amounts of water.
- Provision of municipal water services should account for projected residential, employment and most ICI uses within the study area. Municipal water servicing should not account for provision of municipal potable water to Nestle Canada Inc. or St. Mary's Cement for purposes other than domestic. In other words, any water required by these companies for any industrial or process related activities should be provided directly through their own private water system.
- All other existing large users, outlined in this report as such, would connect to the municipal system. Existing average day water demands recorded for the period 2015-2016 from large users will be maintained to the 2041 planning period. Maximum day demands will increase based on the assumed max. day factor of 3.0, or the current PTTW rate, the smaller of the two.

Proposed system water demands are summarized in Table 22. Detailed calculations are provided in Appendix A for further reference.

Table 22 Preliminary Proposed System Water Demands

Service Type	Design Average Day Demand		Design Maximum Day Demand	
	m3/d	L/s	m3/d	L/s
Residential	820	9.5	1,639	19.0
Employment (outside of large users)	1,227	14.2	2,454	28.4
Industrial / Commercial / Recreational (large users excluding Nestle Canada Inc. and St. Mary's Cement)	776	9.0	2,001	23.2
Allowance for Domestic Use at Nestle Canada Inc. and St. Mary's Cement	51	0.6	152	1.8
Total Proposed System Demands =	**2,873**	**33.3**	**6,246**	**72.3**

Notes :

1. An allowance for domestic uses at Nestle Canada Inc. and St. Mary's Cement has been included in the calculations. The allowance is approximately 1% of their existing PTTW rate.

Key considerations for sizing the different water system components include:

- The supply source, either lake-based or groundwater sources, for the new system should be able to meet the projected maximum design day demands. From a groundwater perspective, multiple groundwater supply wells may be required to satisfy the projected max. day demands.
- From a treatment perspective, treatment processes should also be able to meet the projected maximum design day demands, with Peak Hour Demands and/or Fire and Emergency demands provided from storage.
- In terms of distribution system capacity, watermain sizing would have a direct impact on the cost of the system, operation and maintenance requirements in addition to water quality considerations.

3.2 Wastewater Design Basis

Wastewater treatment facilities are typically designed for average day flows, while wastewater conveyance systems are designed and rated to deliver peak wastewater flows to the treatment facilities. Similar to the rationale used to develop the water design basis, a 25-year planning period which corresponds to the year 2041, has been assumed to calculate wastewater generation in the study area.

The basis for calculating the design average and peak wastewater flows for the study area is summarized in Table 23.

Table 23 Wastewater Design Basis

Criteria	Value	Units	Comments
Unit per Capita Wastewater Generation Rate	360	L/cap/d	Consistent with unit water consumption rate.
Peak Infiltration / Inflow Rate for Industrial / Commercial Areas	10,110	L/ha/day	Assumed based on the low end of MOECC Guidelines as new system should have low I&I contribution.
Peak Infiltration / Inflow Rate for Residential Areas	10,110	L/ha/day	Assumed based on the low end of MOECC Guidelines as new system should have low I&I contribution.
Population densities for Industrial / Commercial	85	person/ha	Assumed based on 30m3/ha/d (low end of MOECC Guideline) and 360 L/cap/d.
Peak Factor	varies	-	Calculated for each drainage area based on Harmon Formula

3.2.1 Projected Wastewater Flows

Projected wastewater flows for the study area for all residential users as well as industrial and commercial users are summarized in Tables 24 and 25, respectively.

Table 24 Projected Residential Wastewater Flows

Residential Area	2041 Population	2041 Future Average Day Flows[4] (for Treatment) L/s	2041 Future Peak Day Flows[5] (for Sewer Capacity) L/s
Meadows of Aberfoyle	149	0.62	3.9
Mini Lakes[1]	504	2.10	12.3
Millcreek Camping and Country Club	87	0.36	2.4
Aberfoyle[2]	186	0.78	7.2
Morriston	620	2.58	23.5
Other Areas[3]	731	3.05	28.7
Total =	**2,277**	**9.5**	**78.1**

Notes :

1. Future population for Mini Lakes assumes 31 future service connections and a PPU of 1.7 (based on reported current population of 450 people and 260 service connections in 2016).
2. Aberfoyle existing population is calculated based on the reported 325 people in 2016 as per County's Official Plan minus existing population of 149 people currently serviced in the Meadows of Aberfoyle community which is located within the limits of Aberfoyle. Projected growth in Aberfoyle is consistent with the County's OP projections.
3. A total of 270 residential units/dwellings have been identified outside of Aberfoyle and Morriston but within the study area boundaries. A PPU of 2.7, as reported for Aberfoyle in the County's OP, has been used to calculate the total residential population for these additional units.
4. Future average day flows assume a unit generation rate of 360 L/cap/cay.
5. Peak day flows assume an I&I rate of 10,110 L/ha/d and peak factor calculated based on Harmon Formula.

Table 25 Projected Industrial and Commercial Wastewater Flows

Industrial / Commercial Areas	Drainage Area ha	Equivalent ICI Population People	2041 Future Average Day Flows[1] (for Treatment) L/s	2041 Future Peak Day Flows[2] (for Sewer Capacity) L/s
Within Aberfoyle	26	2,128	8.9	34.6
Within Morriston	9.7	809	3.4	14.1
Within other areas in Study Area	250.8	20,897	87.1	258.6
Total =	**286**	**23,835**	**99.3**	**307.4**

Notes :

1. Future average day flows for large users assume a unit generation rate of 360 L/cap/cay.
2. Future peak day flows assume an I&I rate of 10,110 L/ha/d and peak factor calculated based on Harmon Formula.

3.2.2 Preliminary Proposed Wastewater Design Flows

Wastewater design flows for the study area is summarized in Table 26. The design flows noted in Table 26 do not account for process wastewater generated by the large industries. Detailed calculations are provided in Appendix A for further reference.

Table 26 Proposed Wastewater Design Flows

Servicing Category	Design Average Day Flow (for Treatment)		Design Peak Day Flow (for Sewer Capacity)	
	m3/d	L/s	m3/d	L/s
Residential	819.6	9.5	6,746.3	78.1
Industrial / Commercial / Recreational	8,580	99.3	26,557	307.4
Total Proposed System Flows =	**9,400**	**108.8**	**33,303**	**385.5**

4. Conclusion

To assess the viability of implementing municipal water and sewage services in the study area, plans for future growth and development were identified, and current water demands and wastewater flows were requested from the key users. The information provided by the Township and key users formed the basis of the water and wastewater demand analysis. Table 27 consolidates the preliminary proposed future water demands and wastewater flows for municipal servicing in the study area.

Table 27 Summary of preliminary proposed water demands and wastewater flows

Water	Proposed Average Day Demands		Proposed Max. Day Demands	
	m3/d	L/s	m3/d	L/s
Proposed Preliminary System Water Demands	2,873	33.3	6,246	72.3
Wastewater	**Proposed Average Day Flows (for Treatment)**		**Proposed Peak Day Flows (for Sewer Capacity)**	
	m3/d	L/s	m3/d	L/s
Proposed Preliminary System Wastewater Flows	9,400	108.8	33,303	385.5

TM-1 is not meant to be a design document. This memo is preliminary in nature and is a summary of the information obtained as of the date of issuance of TM-1.

APPENDIX A - Detailed Calculations

Project Title:	**Puslinch Water and Sewage Feasibility Study**		
Client:	Township of Puslinch		
Project No.:	T000866A		
Task:	Criteria Development - Water Demands		
Prepared By:	Sandra Rodriguez	**Date:**	5-Oct-17
Reviewed by:	Stuart Winchester	**Date:**	6-Oct-17
Revision No. :	4	**Revision Date:**	3-Jan-18

ESTIMATE WATER DEMANDS FOR WHOLE STUDY AREA

Design Criteria

Description	Value	Units	Comments
MOECC Residential Unit Rate	270-450	L/cap/day	MOECC suggested range
Calculated for Ex. Communual Systems	353.0	L/cap/day	Calculated for Meadows of Aberfoyle
	294.4	L/cap/day	Calculated for Mini Lakes
Recommended Design Rate	360.0	L/cap/day	Assumed (mid point from MOECC range, marginally above Meadows of Aberfoyle rate)
Residential Max. Day Factor	2.00	-	Based on future residential and employment population of 7,909 as per adjacent numbers and MOECC Guidelines
Safety factor for ICI future conditions	1.00		Assumed
Industrial/Commercial Max. Day Factor	3.00	-	Assumed based on MOECC range between 2 and 4 for industrial uses.

Employment Forecast[1]

Employment Breakdown	2016	2041	Comments
Primary	116	114	
Work at Home	476	560	
Industrial	2224	3361	55% of the Total employment in 2016
Commercial / Population Related	651	867	
Institutional	138	182	
NFPOW	412	548	
Total =	**4017**	**5632**	Total employment projections consistent with County's OP numbers.

Notes:
1. As per breakwdown provided by County of Wellington. Source: Watson & Associates Economists Ltd. Wellington County 2014 Growth Analysis Final Report.

Residential Water Demands - Existing and Future

	Population Numbers		Existing (2016) Residential Water Demands		Future (2041) Residential Water Demands			
Residential Population within Study Area	Year		Ave.		Ave.		Max.	
	2016	2041	m^3/d	L/s	m^3/d	L/s	m^3/d	L/s
Meadows of Aberfoyle	149	149	52.6	0.61	53.6	0.62	107.3	1.24
Mini Lakes	450	504	132.5	1.53	181.3	2.10	362.6	4.20
Millcreek Camping and Country Club	87	87	31.2	0.4	31.2	0.4	62.4	0.7
Aberfoyle	176	186	63.4	0.73	67.0	0.78	134.0	1.55
Morriston	480	620	172.8	2.00	223.2	2.58	446.4	5.17
Other Areas	731	731	263.3	3.05	263.3	3.05	526.5	6.09
Total for Study Area =	**2,073**	**2,277**	**715.7**	**8.3**	**819.6**	**9.5**	**1,639**	**19.0**
Total Population Increase =	**204**							

Project Title:	**Puslinch Water and Sewage Feasibility Study**		
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Revision No. :	4	**Revision Date:**	3-Jan-18

Employment Water Demands - Existing and Future (Assumes all employment except for industrial employment numbers)

			Existing (2016) Employment Water Demands		Future (2041) Employment Water Demands			
Employment Population within Study Area	**Year**		**Ave.**		**Ave.**		**Max.**	
	2016	**2041**	**m^3/d**	**L/s**	**m^3/d**	**L/s**	**m^3/d**	**L/s**
Employment[1]	1793	3408	645.5	7.47	1226.9	14.20	2453.8	28.40
Total for Study Area =	**1,793**	**3,408**	**645.5**	**7.5**	**1226.9**	**14.2**	**2,454**	**28.4**
Total Employment Population Increase =	**1,615**							

Notes:

1. It has been assumed that the existing 2224 employment numbers in 2016 have been captured within the water demands receieved from ex. large users.

Employment Water Demands - Existing and Future (Assumes all employment including industrial employment numbers)

			Existing (2016) Employment Water Demands		Future (2041) Employment Water Demands			
Employment Population within Study Area	**Year**		**Ave.**		**Ave.**		**Max.**	
	2016	**2041**	**m^3/d**	**L/s**	**m^3/d**	**L/s**	**m^3/d**	**L/s**
Employment[1]	4017	5632	1446.1	16.74	2027.5	23.47	4055.0	46.93
Total for Study Area =	**4,017**	**5,632**	**1446.1**	**16.7**	**2027.5**	**23.5**	**4,055**	**46.9**
Total Employment Population Increase =	**1,615**							

Notes:

1. Assumes all employment categories including industrial

Industrial and Commercial Water Demands - Existing and Future

				Existing (2016) ICI Water Demands[1]		Future (2041) ICI Water Demands[2]				Ex. Ave. Usage / PTTW
Large Industrial/Commercial Users	**PTTW Capacity**			**Ave.**		**Ave.**		**Max.**		
	L/d	**m^3/d**	**L/s**	**m^3/d**	**L/s**	**m^3/d**	**L/s**	**m^3/d**	**L/s**	**%**
Royal Canin Canada Company	240,000	240	2.8	93.8	1.1	93.8	1.1	240.0	2.8	39%
Con-Cast Pipe Inc.	450,000	450	5.2	245.3	2.8	245.3	2.8	450.0	5.2	55%
Morguard Brock McLean Limited - Maple Leaf Foods	653,760	654	7.6	21.6	0.2	21.6	0.2	64.8	0.7	3%
Nestle Canada Inc.	3,600,000	3,600	41.7	2,117.7	24.5	2,117.7	24.5	3,600.0	41.7	59%
CRH Canada Group Inc. - Dufferin Aggregates	8,182,800	8,183	94.7	134.6	1.6	134.6	1.6	403.8	4.7	2%
Capital Paving Inc.	18,371,400	18,371	212.6	280.9	3.3	280.9	3.3	842.6	9.8	2%
St. Marys Cement Inc. (Canada)	47,136,000	47,136	545.6	28,136.5	325.7	28,136.5	325.7	47,136.0	545.6	60%
Total for Study Area =	**78,633,960**	**78,634**	**910.1**	**31,030**	**359.1**	**31,030.3**	**359.1**	**52,737.1**	**610.4**	**39%**
Total Excluding Nestle & St. Marys	**27,897,960**	**27,898**	**323**			**776.1**	**9.0**	**2,001.1**	**23.2**	

Notes:

1. Calculated as the 2-year average between data provided from ex. large users for period between 2015 and 2016.
2. It has been assumed that future water demands from large users will remain consistent with actual demands.

Project Title:	**Puslinch Water and Sewage Feasibility Study**		
Client:	Township of Puslinch		
Project No.:	T000866A		
Task:	Criteria Development - Water Demands		
Prepared By:	Sandra Rodriguez	**Date:**	5-Oct-17
Reviewed by:	Stuart Winchester	**Date:**	6-Oct-17
Revision No. :	4	**Revision Date:**	3-Jan-18

RECOMMENDED SCENARIO:

Provide servicing to entire service area for domestic and ICI purposes. Nestle and St. Mary's Cement to be excluded; however, a 1% allocation of total PTTW flows have been assumed for domestic purposes in both Nestle and St. Marys.

Industry Name	PTTW Capacity		1% Allocation for Domestic	
	m3/d	L/s	m3/d	L/s
Nestle Canada Inc.	3,600	41.7	3.60	0.04
St. Marys Cement Inc. (Canada)	47,136	545.6	47.14	0.55

Service Type	**Scenario V (Domestic and Industrial Uses - Excluding Nestle and St. Marys Cement)**					
	Ave. Day Demands		**Max. Day Demands**		**Peak Hour Demands**	
	m^3/d	**L/s**	**m^3/d**	**L/s**	**m^3/d**	**L/s**
Residential	819.6	9.5	1,639.1	19.0	2,458.7	28.5
Industrial / Commercial / Recreational (outside large users)	1,226.9	14.2	2,453.8	28.4	3,680.6	42.6
Industrial / Commercial / Recreational (large users excluding Nestle and St. Marys)	776.1	9.0	2,001.1	23.2	2,328.3	26.9
Allowance for Domestic Use at Nestle and St. Marys	50.7	0.6	152.2	1.8	152.2	1.8
Total =	**2,873**	**33.3**	**6,246**	**72.3**	**8,620**	**99.8**

Project Title:	**Puslinch Water and Sewage Feasibility Study**		
Client:	Township of Puslinch		
Project No.:	T000866A		
Task:	Criteria Development - Wastewater Flows		
Prepared By:	Sandra Rodriguez	**Date:**	5-Oct-17
Reviewed by:	Stuart Winchester	**Date:**	6-Oct-17
Revision No. :	4	**Revision Date:**	3-Jan-18

ESTIMATE WASTEWATER FLOWS FOR WHOLE STUDY AREA

Design Criteria

Description	Value	Units	Comments
MOECC Residential Unit Rate	270-450	L/cap/day	MOECC suggested range
Calculated for Ex. Communual Systems	219.4	L/cap/day	Calculated for Mini Lakes
Water Unit Consumption Rate	360.0	L/cap/day	Assumed
Wastewater Flow Rate	360.0	L/cap/day	Assumed to be consistent with water consumption - Very conservative
Peak Infiltration / Inflow Rate for Industrial / Commercial Areas	10,110.0	L/ha/day	Low end of MOECC Guidelines, new system should have low I&I contribution
Peak Infiltration / Inflow Rate for Residential Areas	10,110.0	L/ha/day	Low end of MOECC Guidelines, new system should have low I&I contribution
Population densities for Industrial / Commercial	83	person/ha	Assuming 30 m3/ha/d (low end of MOECC Guideline) and 360 L/cap/d, this would equeate to approx. 83 ppha.
Peak Factor	varies	-	Calculated for each area based on Harmon Formula

Residential Wastewater Flows - Existing and Future

Residential Population within Study Area	Population Numbers		Drainage Area (ha)[1]		Existing (2016) Residential Wastewater Flows		Calculated Peak Factor for Future Population	Future (2041) Residential Wastewater Flows			
	Year				Ave.			Avg. (for Treatment)		Peak (for Sewer Capacity)	
	2016	2041	2016	2041	m^3/d	L/s		m^3/d	L/s	m^3/d	L/s
Meadows of Aberfoyle	149	149	10	10	53.6	0.6	4.41	53.6	0.62	337.3	3.9
Mini Lakes	450	504	24	27	98.8	1.1	4.36	181.3	2.10	1066.2	12.3
Millcreek Camping and Country Club	87	87	7	7	31.2	0.4	4.43	31.2	0.36	208.9	2.4
Aberfoyle	176	186	31	33	63.4	0.7	4.35	67.0	0.78	625.6	7.2
Morriston	480	620	83.2	107.5	172.8	2.0	4.23	223.2	2.58	2031.6	23.5
Other Areas	731	731	135	135	263.3	3.0	4.21	263.3	3.05	2476.7	28.7
Total for Study Area =	**2,073**	**2,277**	**291**	**320**	**683.0**	**7.9**		**819.6**	**9.5**	**6,746.3**	**78.1**
Total Population Increase =	**204**										

Notes:

1. Drainage Areas calculated in Google

Industrial and Commercial Wastewater Flows - Existing (2016)

Large Industrial/Commercial/Recreational Users	Drainage Areas	Equivalent ICI Population	Calculated Peak Factor	Existing ICI Wastewater Flows			
				Average Flow (for Treatment)		Peak Flows (for Sewer Capacity)	
	Ha	people		m^3/d	L/s	m^3/d	L/s
Aberfoyle	26	2,128	3.56	766.2	8.87	2,989.4	34.6
Morriston	9.7	809	3.86	291.3	3.37	1,221.8	14.1
Other areas within Study Area[1]	197.3	16,445	2.74	5,920.2	68.5	18,204.6	210.7
Total for Study Area =	**233**	**19,383**		**6,978**	**81**	**22,415.9**	**259.4**
		83					

Notes:

1. Drainage Areas calculated in Google. It represents the built up areas north of Highway 401 currently occupied by industries and around Highway 6 (concast). See adjacent figures

Project Title:	**Puslinch Water and Sewage Feasibility Study**		
Client:	Township of Puslinch		
Project No.:	T000866A		
Task:	Criteria Development - Wastewater Flows		
Prepared By:	Sandra Rodriguez	**Date:**	5-Oct-17
Reviewed by:	Stuart Winchester	**Date:**	6-Oct-17
Revision No. :	4	**Revision Date:**	3-Jan-18

Industrial and Commercial Wastewater Flows - Future (2041)

				Future ICI Wastewater Flows			
Large Industrial/Commercial/Recreational Users	**Drainage Areas**	**Equivalent ICI Population**	**Calculated Peak Factor**	**Average Flow (for Treatment)**		**Peak Flows (for Sewer Capacity)**	
	Ha	**people**		**m^3/d**	**L/s**	**m^3/d**	**L/s**
Aberfoyle	26	2,128	3.56	766.2	8.87	2,989.4	34.6
Morriston	9.7	809	3.86	291.3	3.37	1,221.8	14.1
Other areas within Study Area[1]	250.8	20,897	2.63	7,523.0	87.1	22,345.8	258.6
Total for Study Area =	**286**	**23,835**		**8,580**	**99.3**	**26,557.1**	**307.4**

Notes:

1. Includes existing developed ICI areas plus the rural employment area around Hwy 6. Assumes only 50% of the total area to be occupied by infrastructure.

DOMESTIC & ICI FLOWS SUMMARY - 2041

Service Area	**Average Flow (for Treatment)**		**Peak Flows (for Sewer Capacity)**	
	m^3/d	**L/s**	**m^3/d**	**L/s**
Residential	819.6	9.49	6,746.3	78.08
Industrial / Commercial / Recreational	8,580	99.31	26,557	307.37
Total =	**9,400.0**	**108.8**	**33,303.4**	**385.5**

Project Title:	**Puslinch Water and Sewage Feasibility Study**		
Client:	Township of Puslinch		
Project No.:	T000866A		
Task:	Water Demand Criteria Development - Water Usages		
Prepared By:	S. Rodriguez	**Date:**	5-Oct-17
Reviewed by:	S. Winchester	**Date:**	6-Oct-17
Revision No. :	0	**Revision Date:**	

ESTIMATE EXISTING RESIDENTIAL WATER DEMANDS FOR WHOLE STUDY AREA

Existing Residential Information

1. ABERFOYLE EXISTING & FUTURE

EXISTING (2016)

Criteria	Value	Units	Comments
Total 2016 Population	325	people	As per Wellington County OP, Revision September 2016. Table 8
2016 Households	120	units	
Calculated ex. PPU	2.7	person/unit	Calculated

FUTURE (2041)

Description	Value	Units	Comments
Total 2041 Population	335	people	As per Wellington County OP, Revision September 2016. Table 8
2016 Households	130	units	
Calculated ex. PPU	2.6	person/unit	Calculated

2. MORRISTON EXISTING & FUTURE

EXISTING (2016)

Description	Value	Units	Comments
Total 2016 Population	480	people	As per Wellington County OP, Revision September 2016. Table 8
2016 Households	185	units	
Calculated ex. PPU	2.6	person/unit	Calculated

FUTURE (2041)

Description	Value	Units	Comments
Total 2041 Population	620	people	As per Wellington County OP, Revision September 2016. Table 8
2016 Households	235	units	
Calculated ex. PPU	2.6	person/unit	Calculated

3. MEADOWS OF ABERFOYLE (Communal Water System)

EXISTING (2016)

Description	Value	Units	Comments
Total 2016 Population	149	people	As per Wellington County OP, Revision September 2016.
2016 Building Lots	55	units	As per 2016 Annual Monitoring Report provided by Greg Cook on Sept 13, 2017
Assumed ex. PPU	2.7	person/unit	Assumed based on 2016 numbers for Aberfoyle. Communal system is closer to Aberfoyle.
Ave. System Water Demands	0.6	L/s	2-year Average demands as per 2015 and 2016 reported flows in MOECC WTRS
	52.6	m3/d	
Max. Day Factor	137175.0	-	Calculated based on 2015 & 2016 data
Max. System Water Demands	83479.9	L/s	Calculated
	7212661.5	m3/d	
Calculated Unit Consumption Rate	353.0	L/cap/d	Calculated

4. MINI LAKES (Communal Water System)

EXISTING (2016)

Description	Value	Units	Comments
Total 2016 Population	450	people	As per 2016 O&M Report Mini Lakes, Burnside April 2017
2016 Service Connections	260	units	
Future Service Connections	31	units	
2016 Calculated PPU	1.7	person/unit	Calculated
Water			
Ave. System Water Demands	1.5	L/s	2-year Average demands as per 2015 and 2016 in Mini Lakes Report by American Water Canada
	132.5	m3/d	
Max. Day Factor	95166.7	-	Calculated based on 2015 & 2016 data
Max. System Water Demands	145946.5	L/s	Calculated
	12609778.9	m3/d	
Calculated Unit Consumption Rate	**294.4**	**L/cap/d**	**Calculated**
Wastewater			
Ave. Wastewater Flows	98.8	m3/d	2-year Average demands as per 2015 and 2016 in Mini Lakes Report by American Water Canada
	1.1	L/s	
Max. Wastewater Flows	177.4	m3/d	Max. Flows between 2015 and 2016 as per Mini Lakes Reports
	2.1	L/s	
Calculated Unit Production Rate	**219.4**	**L/cap/d**	**Calculated**

5. OTHER RESIDENTIAL AREAS (Within the Study Area)

EXISTING (2016)

Description	Value	Units	Comments
Total 2016 Population	731	people	Calculated
2016 Service Connections	270	units	Counted number of lots already developed within the study area - Google
2016 Assumed PPU	2.7	person/unit	Assumed based on 2016 numbers for Aberfoyle. Areas closer to Aberfoyle